

# **Assessing the Effectiveness of Information & Communication Technology in Senior Students' Learning Environment at Niue High School**

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## **Context of Study**

Country Niue is a small country located in the South Pacific Ocean. With a land area of 259 square kilometers and approximately 1700 residents, the base for sustainable human development is limited and reducing. Niue's exclusive economic zone measures 390000square kilometers. For the resources, community ties remain strong. There is a prevalent attitude of care and concern for others and a general support of initiatives, fund efforts. Counteracting these factors are very serious concerns. The first is a continuing decline in population. Although natural increase is positive, continuing emigration depleting the human resource. These appears to be no immediate solution to the problem. As Niueans have New Zealand citizenship. They have the right of free entry to New Zealand. Many of the youths aspire to life in that country in preference to life in Niue.

Niue's educational indicators are amongst the highest in the Pacific region, adult literacy rates are approximately 95%. , mean years of schooling is 8.3. Although Niue provides itself on a high level of literacy, there is a proportion of the population who experience difficulty with residing and with numeracy.

As expected, given the past and present ties with New Zealand, the New Zealand education is quite followed. From 2002 onward, New Zealand Qualifications Framework has been introduced to Niue High School and internal assessment is the norm replacing examinations..

As significant organizational change in 1989 saw the closing of village schools and the centralization of schooling in Alofi . The reason for this were economic but were also guided by social considerations to ensure uniform national standards and the expectation that this larger pool of students would create opportunities for a more stimulating exchange of ideas and greater individual challenges.

In 1990, , teacher-student ration was 1:11, it declines to 1:8 in 2000. The adherence to New Zealand standards is understandable given the free movement between two countries. However, it has been long and well argued that one of the results of this is that the school follows an overly academic curriculum which is not in line with the realities of school leavers being in the iniquitous position of having no academic qualifications.

School equipments and teaching resources (for teacher's tool ) are not such a high standard and library and class sets of books, laboratory and science equipments are urgently needed. Isolation and difficult communication/transportation lead to limitations in access to information due to high cost factors.

Stunted abilities to establish useful international links to establish useful international link to education, health and business has been experienced in Niue. Especially in school learning environment, inadequate resources causes students to face the difficulties to access the necessary references. It has caused the students' poor perception on curriculum areas . The students faced the difficulties to do their project assignments. It also causes poor learning environment in the classes. The students are totally depending on teacher to access to learning resources.

To break the barrier to access the information, the Niue Government identified ICT as an important tool for Niue's future social and economic development. Internet was introduced in school learning from April 2004. The students were guided to utilize internet to access the information relevant to their studies and curriculum. The research action project aims to study how students ' learning environment changes by introducing ICT in school curriculum and study.

The study will include background for introducing ICT. And study on students' perception of personal relevance by introducing ICT in classroom learning and evaluation of students' academic results before and after ICT in school teaching and learning.

### **Background**

The small population limits the consumer and entrepreneurial base for private enterprise and affects the viability of transportation services. ICT can be an effective vehicle to enhance national development especially in school learning environment.

Niue Government identifies ICT as an important tool for Niue's future social and economic development. The costs for providing and maintaining telecommunication services is very high and albeit the high costs, the achievement of universal telephone service was through very high subsidy carried by Telecom Niue. It enables the Internet Users Society of Niue at [www.niue.nu](http://www.niue.nu) to provide internet service to people of Niue at no direct cost. To consumers with a comprehensive range of internet services including e-mail, internet access, caching service, domain name resolution, firewall , virus and spam filtering and web hosting. IUSN (Internet Users' Society of Niue) also provides access points through dial in connection and wireless WIFI connections.

Niue High School's internet system is connected to IUSN server and I takes the responsibility to look after the internet facility and coordinate the activities to integrate ICT across learning areas. I also carry out my action research project on assessing the learning environment with using ICT is a learning tool in school subjects studies.

### **Selection of Instruments.**

ICT has been introduced in Niue High School learning system for more than 5 years. Internet has been introduced since 2004 April. Now NZQA (New Zealand Qualifications Authority) 's NCEA (National Certificate of Educational Achievement) level 1 to 3 courses including IT subjects are being taught at the school. More numbers of students

are using computer for their typing and research works. It is required to survey the students' opinions, perception and effectiveness of IT facility. As the aim of the action research work is intended to assess the effectiveness of IT learning by comparing with the learning without using ICT facility, Constructivist Learning Environment Survey (CLES) which is more generalized method than the Computer Laboratory Environment Laboratory (CLEI) which is the method that analyzes ICT facility and ICT class room is selected as an instrument in the research because in the research, assessing students' learning environment without ICT use is also involved and the data got from ICT assisted learning is compared with the data got from non ICT assisted learning to assess the effectiveness if ICT application in school learning.

Another factor to select CLES is that Constructivist learning method allows students to build self placed learning and actively structure their individual learning system rather than passively absorbing the teaching, CLES method which is appropriate to assess self placed learning nature in students' project works by using computer and without using computer is selected to do data analysis and interpretation..

The action research topic "Assessing the Effectiveness of Information & Communication Technology in Senior Students' Learning Environment at Niue High School consists of two research questions.

- (1) What difficulties do Niuean students face in their senior years of studies in New Zealand curriculum at the high school?***
- (2) Can use of ICT really improve their learning environment at Niue High school? and whether ICT is an really effective learning assistance tool?***

Use of ICT provides Constructivist Learning for students. Traditional method of using chalk and talk method is teacher's center. Teacher has to provide appropriate learning materials to students. It also needs the relevant printed materials in library for students' research works. In Niue, isolation and transport difficulties cause very expensive freight cost. Lack of teaching resources and references cause students low perception on the subjects. As Niue High school uses NZQA's NCEA Achievement Standards curriculum, the achievement standards in the curriculum require the students to do a lot of self study and research. Lack of resources cause students to face difficulties in their research works. It is expected that use of ICT will improve their self placed learning and research. Therefore, Constructivist Learning Environment Survey methodology is utilized in the action research project.

Meaningful learning is also required for Niuean students to develop their cognitive process of making sense of their learning in research/project work in relation to the knowledge and instruction that their subject teachers have provided to them in classroom instruction times.

The method includes the assessment on the dimensions a critical learning environment, personal relevancy, uncertainty, critical voice, shared control and student negotiations.

The question related to concern with students' being invited to share with the teacher's control of learning environment including the articulation of learning goals, the design and management of learning activities by using ICT, the determination and application of ICT based assessment criteria and reflecting self critically on the viability of their own ideas are utilized in the method.

Manual scoring of questionnaire response was planned. It is quantitative method. By combining quantitative method, the qualitative method that assesses how ICT based & ICT assisted teaching method and curriculum can improve students' classroom learning environment is also applied. In quantitative method, the students are provided with the questionnaires that assess their learning environment after ICT has been introduced in their learning of the subjects. In qualitative method, monitoring the interaction between teacher and students in ICT assisted learning environment, students' understanding in subject is also performed.

### **ICT based constructivist learning**

In ICT based learning, the following ICT based learning activities are performed.

- Scanning the reference books. Writing into CD ROMs and transferring the digitized lesson files into school server computer. From which students computer terminals can access the lessons.
- Creating data bases and search engine to find out the information.
- Collecting the URLs of educational web sites and curriculum areas.
- Guide the students to utilize effective search technique to retrieve information.
- Guide the students to collect, edit and present the information that they find out.
- For example, the students need to find the information about ultra sound for physics lessons, no books in the school library contains the information related to ultra sound. The students are asked to use internet, use search engine such as Yahoo, Google to type in the word "Ultra Sound" and retrieve the information. Then the teacher provides more related information about ultra sound.

The students' opinion survey is performed by using questionnaires. Teacher's interaction with students in ICT based learning classroom is also examined. As an ICT coordinator, I meet and discuss with other subject teachers and discuss with them how to effectively use ICT and how their students' learning improves in ICT based learning classroom.

The action research is aimed to assess the associations between laboratory environment and students' attitudes. As IT teaching is introduced to Niue High school and due to poor financial capacity of Niue Government which is totally depending on New Zealand for budget subsidy, school computers are mostly second hand ones with Windows 98 operating systems. Hardware capacity is low and it is merely enough to access and provides the basic computing needs with office software. CLEI scale that mainly focuses on computer specialized learning will provide the poor result. As Niue High School is providing ICT service with limited budget, survey results obtained in research action

project will persuade the government and donors to invest more for ICT teaching and facilities, I aim to prove whether ICT is effective for school curriculum studies or not.

Lee states that computers are beneficial tools that are autonomous entities, Gressard & Loyd provides the scale that anxiety for fear of computers, confidence in one's ability to use or learn about computer, Campbell provided the scales of usefulness, effectance, motivation, anxiety. Those scales are relevant to Constructivist Learning Environment Survey. How computers are useful to learn about society, how computer course is useful to improve their learning to learn other subjects, how computer instruction and technical assistance can reduce their anxiety to use computer and to speak out their experience and how the students enjoy the usage of computer and use computer to communicate in their study matters are to be assessed.

The reason to introduce the computer for Science learning is to assess students' investigation of phenomena with questions rather than the way to be learned because Science curricula should emphasize on higher level of cognitive learning.

The role of teacher in computer laboratory is facilitator/initiator. The interviews are also arranged to know teachers' perceptions and students' perceptions on computers and ICT facilities.

### **Methodology used for Constructivist Learning Environment Survey**

The Constructivist Learning Environment Survey (CLES) includes the assessment on the dimensions of a critical learning environment, personal relevance, uncertainty, critical voice, shared control and students negotiation. The assessments are made on how ICT assists students' self placed study and research work, how ICT assists students' requirements, how ICT assists teacher to control the class and negotiation with students in their study matters can be effectively achieved.

4 CLES scales of Learning about Society, Learning to Learn, Learning to Speak out and Learning to Communicate are used and questionnaires are planned. The questionnaires are based on the original CLES questionnaires but modification is made to enable Niuean students to understand and to provide effective answers to achieve meaningful results that reflects their situation.

-Learning about society- How does ICT assist student' self placed study and research?

-Learning to speak out- How does ICT assisted learning allow the students to make their voice.

Learning to Learn- How does ICT assisted learning justify the students' critical requirement such as research work for their career?

Learning to Communicate- How does ICT assisted learning allow the students to share their learning with others.?

Haug and Freaser (1997) reported that qualitative data involving interviews with teachers and students ' classroom observation were collected to complement the qualitative information and to clarify the reason for pattern and difference means in each country. In Niue interviews with teacher and students were conducted in the research action project. How teacher and students percept the computerized clasroom is examined.

Fraser and Wubbles (1995) stated that learning environment assessment should be used in addition to student learning outcome measured to provide the information about subtle but important aspects of classroom life because teachers and students have systematically different perception of the same classroom. Especially in Niue, life of Niuean students is largely influenced by their country's natural disasters.

In January 2004, Niue island was hit by cyclone Heta. Most of the infractures were destroyed. Although the school as safe, school teaching and learning resources were largely damaged. Such kind of natural disaster and struggles in life caused Niuean students to look for the opportunities in New Zealand by using available information sources while the teachers who are recruited from New Zealand wish to impose New Zealand curriculum and updated information. Twacher's aim is to use ICT as a tool to assist the running of New Zealand curriculum but the students aim is to use ICT as their communication tool with their relatives in New Zealand. Such different perception between teachers and students are also to be taken account in the research.

Jill M Aldridge , Barry J fraser, Tai Chu Iris Huang stated that the nature of the curriculum was largely responsible for the type of teaching approaches used in each country. The teachers recruited from New Zealand have New Zealand environment with fully equipped classroom, well stuffed resources and library. But in Niue teaching aids and curriculum materials are poor. Only ICT and internet can assist the Niuean students to take part in problem based learning and have a creativity. For this reason effectiveness of ICT in their learning is to be measured.

### **Data Source**

The data collection is done in Niue High School. There are over 200 students attending the high school in the classes ranging from Year 7 to 13. About 40 students are attending Year 11 to 13.. 30 students are effectively using school ICT facility in their learning. The selection of students in the research is based on their selection of academic subjects at NCEA level.

In Niue High School, senior year level learning areas are Information Technology, Technology, Food, Nutrition, Textile and clothing, Visual Arts and Physical Education as options and English, Mathematics and Social Studies are compulsory subjects. Year 11 is NZQA/NCEA Level 1, Year 12 is Level 2 and Year 13 is level 3.

The following is the structure of senior NCEA level subject. The study in the structure is important to select the appropriate group of students to take part in the research And to provide the meaningful answers for the questionnaires.

<b>Subject Options</b>	<b>Level 1 NCEA</b>	<b>Level 2 NCEA</b>	<b>Level 3 NCEA</b>
Arts-----	Visual Arts-----	Visual Arts-----	Design or Painting
	Performing Arts-----	Performing-----	Performing Arts
Commerce-----	Accounting & ----- Economics	Economics-----	Economics
Technology-----{	Foods & Nutrition----	Hospitality ----- Pathway	Hospitality ----- Pathway
-----{	Hard Materials-----	Hard Materials----- Pathway	Hard Materials----- Pathway
-----{	Graphics-----	Graphics-----	Graphics-----
-----{	Information----- Technology Essentials	Information----- Technology Essentials	Information----- Technology Essentials
Social Science-----	Social Studies----- {	Geography-----	Geography-----
	-----{	History-----	History-----
Science-----	Science-----{	Biology-----	Biology-----
	-----{	Chemistry-----	Chemistry-----
	-----{	Physics-----	Physics-----
	Agriculture-----{	Agriculture-----	Agriculture-----
Mathematics-----	Mathematics-----	Mathematics-----{	Maths with Calculus
		-----{	Maths with Statistics
English-----	English-----	English-----	English-----
Physical Education	PE-----	PE-----	PE-----
Niuean-----	Niuean		

Among the subject areas, Technology and Science need extra readings and references. Information integration is majorily done for those curriculum areas. Student learning environment is assessed in technology and science classes at two situation of with and without ICT as a learning assistance tool. Survey is done for Level 1, 2 & 3. The following is the list of the students who took part in the action research project.

### **Year 11 NCEA Level 1**

<b>Student No</b>	<b>First Name</b>	<b>Gender</b>	<b>Compulsory subject 1</b>	<b>Compulsory subject 2</b>	<b>Compulsory subject 3</b>	<b>Option A</b>	<b>Option B</b>	<b>Option C</b>
1	Togia	M	English	Maths	Physical Education	Visual Arts	Design Tech	Graphics
2	Benjamin	M	English	Maths	Physical Education	Visual Arts	Design Tech	Graphics
3	Jeriel	M	English	Maths	Physical	Visual	Design	Graphics

					Education	Arts	Tech	
4	Sam	M	English	Maths	Physical Education	Visual Arts	Design Tech	Graphics
5	Folly	M	English	Maths	Physical Education	Visual Arts	Design Tech	
6	Pula	M	English	Maths	Physical Education	Visual Arts	Design Tech	Graphics
7	Darren	M	English	Maths	Physical Education	Visual Arts	Design Tech	Graphics
8	Adam	M	English	Maths	Physical Education	Visual Arts	Design Tech	Graphics
9	Glen	F	English	Maths	Physical Education	Science	Food Nutri Textile Clothing	Information Technology
10	Silakivai	F	English	Maths	Physical Education	Science	Food Nutri Textile Clothing	Information Technology

All students take both Design & technology or Information Technology or science as their options.

### Year 12 NCEA Level 2

Student No	First Name	Gender	Compulsory subject 1	Compulsory subject 2	Option A	Option B	Option C	Option D
1	Kit	M	English	Physical Education	Visual Arts	Design Tech	Maths	Graphics
2	Kita	M	English	Physical Education	Information Technology	Economic	Maths	Physical Education
3	Lefu	M	English	Physical Education	Information Technology	Economic	Maths	Graphics
4	Taihia	M	English	Physical Education	Information Technology	Design Tech	Maths	Physical Education
5	Fernandez	M	English	Physical Education	Information Technology	Design Tech	Maths	Graphics
6	Neville	M	English	Physical Education	Visual Arts	Design Tech	Maths	Physical Education
7	Drucillah	F	English	Physical Education	Information Technology	Horticulture	Maths	Physical Education
8	Falala	F	English	Physical Education	Biology	Horticulture	Maths	Physical Education
9	Lucy	F	English	Physical Education	Biology	Horticulture	Maths	Physical Education
10	Quintar	F	English	Physical Education	Information Technology	Horticulture	Maths	Physical Education



All students take both Design & technology or Information Technology or science as their options.

**Year 13 NCEA Level 3**

Student No	First Name	Gender	Compulsory subject 1	Compulsory subject 2	Option A	Option B	Option C	Option D
1	Steve	M	English	Physical Education	Information Technology	Design Tech	Maths Statistics	Graphics
2	Harley	M	English	Physical Education	Information Technology	Design Tech	Visual Arts	Graphics
3	Alex	M	English	Physical Education	Information Technology	Design Tech	Maths Statistics	Graphics
4	Losi	F	English	Physical Education	Information Technology	Chemistry	Maths Statistics	Physical Education
5	Kayla	F	English	Physical Education	Information Technology	Economics	Maths Statistics	Physical Education
6	Sisiliah	F	English	Physical Education	Information Technology	Chemistry	Maths Statistics	Physical Education
7	Ebony	F	English	Physical Education	Physics	Chemistry	Maths Statistics	Physical Education
8	Juvena	F	English	Physical Education	Information Technology	Geography	Maths Statistics	Maths Calculus
9	Alisha	F	English	Physical Education	Information Technology	Chemistry	Maths Statistics	Biology
10	Hender		English	Physical Education	Information Technology	Geography	Maths Statistics	Maths Calculus

All students take both Design & technology or Information Technology or science as their options.

The data are collected in science and technology classes attended by Niue High school students. The students' performance before and after ICT application, internet research in teaching classes are also discussed with the respective subject teachers. Questionnaires are prepared and provided to the students. Both teachers and students' comments on how ICT assists completion of their research report, internet search for subject matters, comparison between ICT based research and library printed materials studies are also performed.

The questionnaires aim how ICT assist classroom learning environment, students' confidence to search for the facts, simplicity in research work, development of knowledge and understanding the scientific words are developed and discussed with both teachers and students.

For design and technology students, research and survey works are done to determine the changing learning environment that how ICT assists them to search for technical products, technical specifications, manufacturers' information, technical data model,

performance, detailed information and further links to manufacturing companies and development of students' interest.

The source of data that are collected by using the questionnaires are quantitative. The data are justified with qualitative assessment by comparing students' marks in their assignment projects assessments before and after utilization of ICT in their study, by comparing students' success rates in NCEA achievement standard units and quality of students' portfolio, students' attendance rates in science and technology classes with and without ICT application.

The data source consists of answers for the questions, assessment of students' portfolio, students' performance results, detention and penalty rates in the class with and without ICT application in learning, students' attendance rates are also examined.

To get the sufficient data to do analysis, the questionnaires are designed to assess the ICT based learning environment. Appropriate questionnaires and assessment methods are developed for each CLES scale.

The followings are questionnaires prepared for assessing the classes with ICT application and without ICT application.

**GROUP (A)**

**Questionnaires for Assessing the learning environment of the class with no ICT facility**

Learning About Curriculum Area		Almost Never	Seldom	Sometime	Often	Almost Always
		1				
	<b><i><u>Learning about cities Society &amp; Language</u></i></b>					
C1	I learn about societies, customs and language					
C2	My new learning at senior years subjects begins with difficulties					
C3	I learn how to understand societies inside & outside of school is part of my life					
C4	I get better understanding outside of school					
C5	I learn the interesting things about the world outside of school					

C6	What I learn has nothing to do with my outside school life					
C7	It is OK for me to ask the question for the way I am being taught					
	<b><u>Learning to speak out</u></b>					
C8	It is OK for me to question the way I am being taught					
C9	It is OK for me to ask the teacher why do I have to learn it					
C10	It is OK for me to question the way I am being taught in practical research & observation					
C11	It is OK for me to complain about teaching activities that are confusing.					
C12	It is OK for me to complain about any thing that prevents me from learning.					
	It is OK for me to express my opinion					
	It is OK for me to speak up for my right					
	<b><u>Learning to learn</u></b>					
C13	I help the teacher to plan what I am going to learn.					
C14	I help the teacher to plan what I am going to learn as home study					
C15	I help the teacher to decide how well I am learning.					
C16	I help the teacher to decide what activities are best for me.					
C17	I help the teacher to decide which activities I do.					
C18	I help the teacher to decide how much time I spend on learning activities.					
C19	I help the teacher to decide which activities I do out side school					
	<b><u>Learning to communicate</u></b>					
C20	I talk with other students about how to solve the problem.					

C21	I get the chance to talk to other students.					
C22	I explain my understanding to other students.					
C23	I ask other students to explain their ideas.					
C24	Other students ask me to explain my ideas.					

**GROUP (B)**

**Questionnaires for Assessing the learning environment of the class with ICT facility**

Learning About Curriculum Area		Almost Never				
		1				
	<b><u>Learning about cities Society &amp; Language</u></b>					
C1	I learn well by using ICT					
C2	My research works in Science & Technology subjects start with problem but ICT assisted me to overcome the difficulties					
C3	I learn how to use computer in my study and use of computer is part of my life and home study					
C4	I got better understanding outside of school by applying ICT					
C5	What I learn by using ICT is nothing to do with my study	1				
C6	I learn the interesting things about the world outside if school by applying ICT.					
C7	By using ICT, it is OK for me to search what I need and ask teacher to discuss with him about what I found.					
	<b><u>Learning to speak out</u></b>					
C8	It is OK for me to raise further questions and difficulties that I face in study by applying ICT and using computer					
C9	It is OK for me to ask the teacher why do I have to learn it					

C10	By using computer, it is OK for me to break anything that prevents me from getting knowledge					
C11	It is OK for me to complain about teaching activities that are confusing.					
C12	It is OK for me to use e-mail to express my opinion .					
	<b><u>Learning to learn</u></b>					
C13	ICT helps me to plan what I am going to learn in the class					
C14	ICT assists me to examine how well I am learning in the class					
C15	ICT helps me to decide what information is the best for me in my project & class work					
C16	ICT assists me to decide what I will do to simplify my research work for study.					
C17	ICT assists me to decide how much time I need to spend for project/research work.					
C18	ICT assists me to explore what activities can be done outside school.					
C19	I get the chance to discuss my study with my friends at home by using e mail	1				
	<b><u>Learning to communicate</u></b>					
C20	I use e-mail to discuss with other students how to solve the problems.					
C21	By using e-mail, I can effectively explain my understanding to others					
C22	I use e-mail to ask other students to explain their idea	1				
C23	Other students use e-mail to ask me to explain my idea					
C24	Other students use e-mail to explain their idea to me.					

### **Role of Participants**

In action research project, survey method in both quantitative and qualitative method is applied by using Constructivist Learning Environment Survey to assess the classroom learning environment of science and technology classes being attended by them.. The aim is to assess whether the students can be provided with meaningful learning by using and applying ICT in their classrooms.

NOVAK(1978) presented the learning theories of Ausubel and Piaget in the aspect of difference between meaningful learning and rote learning, progressive differentiation and superordinate learning. NOVAK emphasizes in the key concepts of Ausubel's assimilation theory of learning. The meaningful learning can be achieved by doing the conscious effort on the part of the learner to relate new knowledge in a substantive non arbitrary way to relevant concepts or propositions in the learner's cognitive structure.

As the teachers of science and technology classes have to provide the meaningful learning to Niue High school senior students by applying ICT in teaching and learning, the interviews with teachers focuses on how teaching strategies are developed by using ICT to provide the meaningful learning to the students and how effective learning environment can be created and maintained in science and technology classes.

In the interview with the students, the students also play the role as the commentators on how teacher's putting effort to utilize ICT in teaching and learning, how they can achieve good understanding and information relevant to their senior years project works are also assessed. I also made the discussions with the students in the aspects how teachers' actions to use ICT provide the effective link with their previous knowledge in the subject areas and teachers' brief explanation and guidelines for the research are useful for them to browse the net to find out their required information. I also assess how ICT can promote the learning environment in Niue High School.

#### **Information collected from the interviews with teachers**

Science , Mathematics and Technology teachers answer that they can use server based internet network to allow students to do advanced research work. They can provide self placed and individualized learning to students while fast learners are busy with internet research works, they can provide one to one discussion to slow learners. By this way, they can control the class. They can reduce students' playing in the class and behavioural problems can be reduced. The teacher also respond that use of ICT can effectively promote learning in curriculum areas. The students can visit the relevant New Zealand educational sites. They can also acquire the updated information about their NCEA curriculums. They are more interested in their studies in the subjects and wasting time to look for the information is reduced. Teachers also responded that the students can use e-mail to ask them the questions at weekends. By this way learning to speak out, learning to communicate and learning to learn skills can be improved.

#### **Information collected from the interviews with students**

The students told me that they were bored in classroom and study before introducing internet. They frequently faced with the situation that they could not find any relevant

reference materials for the assignments given teachers. After internet was introduced, they can find out more information on the net. It is easier for them to find the meaning of the words, detailed explanation, further study and further links to subject matters. Some students replied that at first, they had to learn how to use internet and how to find information by browsing the net. Later they enjoy the IT class most as they are happy with internet use for their study.

Most students answer that they do not need to use e mail facility to discuss with their teachers and students because they can easily go and discuss as every day they meet their friends and teachers. Furthermore, although they get free internet service at the school, they can not afford to pay phone bill for using the internet at their home because telephone charges in Niue is NZ\$ 10 cents per 10 minutes and it is expensive for them to use internet at home. So they can not send e –mail to teacher to ask the questions at week ends and instead, they ask them the questions in their study times at the school.

Most students respond that ICT assists them to do their homeworks, prepare reports, assignments. They can get more clear understanding by looking at the facts that they got from the net. Previously when they want to ask something, they have to meet teachers. Now, they can get the answers from the net by using search engines.

By reviewing both teachers and students' answers, it is found that ICT promotes classroom learning environment and it makes the students to have more interest in study matters. I also reviewed the last years students' assignments before internet was introduced in teaching and learning at Niue High School. It is also found that quality in students' assignments is improved as the students can download more perfect information from the net.

### **Data Collection**

NCEA level 1, 2 and 3 students are provided with the questionnaires. They are asked to answer the questionnaires for two conditions.

1. Before ICT/ Internet is introduced, the students used phone or meet personally with their friends or teachers to discuss their study matter. They use printed materials from the library to search for the facts. For this situation Group (A) questions are provided for assessing their learning environment
2. After ICT/Internet has been introduced, they use internet for their research work, they use e-mail to discuss with their friends and teachers to discuss their study matters. For this situation , Group (B) questions are provided for assessing their learning environment

Students' answers are surveyed and research work is performed. Data collected for NCEA Level 1, 2 and 3 are compared. Quantitative data is justified with the following qualitative research action processes.

<b>CLES Scale</b>	<b>Assessment strategies / Assessment Questioning in Qualitative Assessment</b>
Learning in ICT based/ ICT assisted curriculum area and subjects	Examine students' research work, compare with previous works that were done by using printed materials in library. Compare the quality.
ICT assisted me to search what I need and encourage me to speak out	The activities include discussions with teachers. How the students use computer to search. How they behave in the classroom while they are using computers. How the students submit their assignments. Whether they can find what they need within timeline. How the students use e-mail to contact teachers and friends to ask the questions for their study.
ICT assists me learning to communicate	Discussions are made with teachers and students. Activities aim to find out how often the students use e mail to discuss with teachers and friends.
ICT assists me learning to learn	Students' work plans, checking the most frequently visited sites. Discussions with students whether they can understand what they are learning in their study by using computers in their research works. Discussion with the students how they find out ICT is useful in their research projects and assignments. Number of times the students use ICT equipments are also recorded.

Those records are categorized in accordance with levels. Analysis is also done on these qualitative research activities.

### **Triangulation**

Comparing quantitative survey results and qualitative survey results are performed. Justification and examination is done whether two results are agreed or opposite. Although there are more than 50 NCEA level students in the senior classes, the students who can provide verifiable and justifiable answers and performance in both quantitative and qualitative assessments are taken for analysis. 29 model answers are analyzed.

### **Data Collection**

Survey with action research has performed for NCEA level 1 to 3 students who come to use IT facility. The senior students including both IT option and no IT option are provided with the questionnaires that are used for assessing their Learning Environment with ICT and without ICT. Difference in learning environment with ICT use and without ICT use are also analyzed.

As the senior NCEA levels need research work for their Achievement Standard, use of ICT and effectiveness of ICT are to be examined in their learning needs. As CLES



methodology provides effective raising of research questions that assesses the learning environment scales of Learning About Societies, Learning to Learn, Learning to Speak Out and Learning to Communicate, the senior students' use of computers for their study assistance purpose is assessed on the facts including how well they can utilize the computer & ICT for their research work (Learning About Societies), how well they can use ICT facility for organizing and preparing their lessons and exercises (Learning to Learn), how well they can discuss with teacher who organizes their ICT activities for them (Learning to Speak out) and how well they can use ICT for communicating with others in their study (Learning to Communicate) .

The students are provided with questions. They include all NCEA levels. 30 responds were recorded in Excel Worksheet and analysis and graphing is done . The questions and results are in the attached sheets.

### **Results & Data Analysis**

The following results are obtained in the research / survey work.

Means for CLES scales , for classes and for two situations : learning environment for the class with and without ICT facility are calculated. Graphs are prepared.

#### **Assessing the learning environment of the class with no ICT facility for Year 11**

Level 1 Year 11	Learning about Society	Leaening to speak out	Learning to Learn	Learning to communicate	
Student	Points scored in questions				
1	30	19	22	25	
2	10	10	12	15	
3	30	21	29	16	

4	29	23	26	25
5	22	20	24	12
6	25	9	14	25
7	20	11	5	25
8	29	20	19	25
9	19	16	21	16
10	24	17	10	25
TOTAL	238	166	182	209
MEAN	23.8	16.6	18.2	20.9

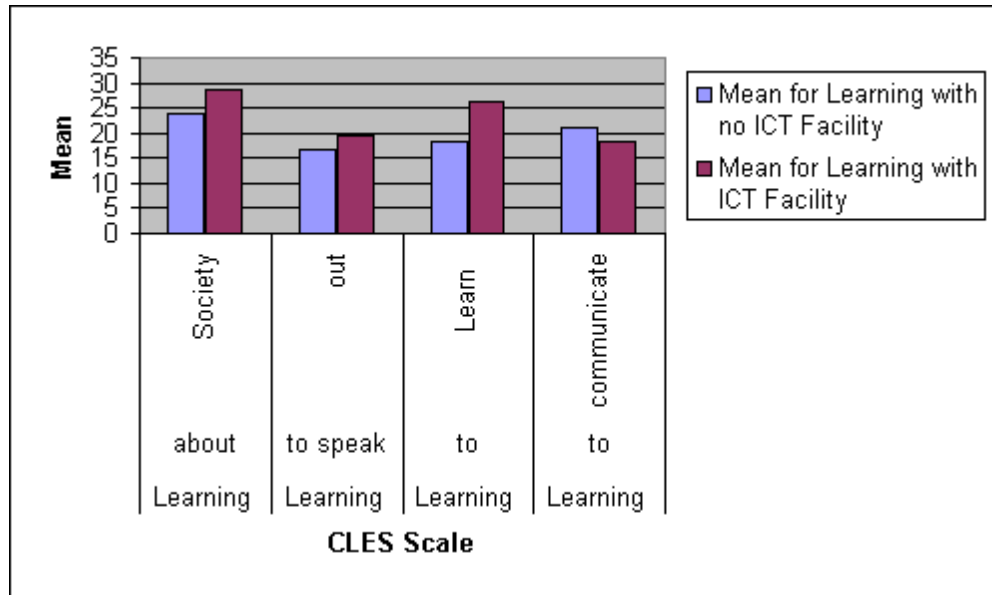
**Assessing the learning environment of the class with ICT facility for Year 11**

Level 1	Learning about Society	Learning to speak out	Learning to Learn	Learning to communicate	
Student	Points scored in questions				
1	26	23	22	20	20
2	26	17	18	18	18
3	30	20	30	20	20
4	31	19	23	25	25
5	30	20	34	25	25
6	30	17	35	5	5
7	34	20	23	25	25
8	26	20	28	20	20
9	25	16	24	11	11
10	28	23	27	12	12
TOTAL	286	195	264	181	181
MEAN	28.6	19.5	26.4	18.1	18.1

**Comparing means for two situations: with No ICT facility & with ICT facility for Year 11**

Year 11 Level 1	Learning about Society	Learning to speak out	Learning to Learn	Learning to communicate	
Mean for Learning with no ICT Facility	23.8	16.6	18.2	20.9	
Mean for Learning with ICT Facility	28.6	19.5	26.4	18.1	

**Comparing Learning Environment between Learning without ICT Facility and with ICT Facility for Year 11 (NCEA Level 1) Students**  
**facility and Learning with ICT Facility for Year 11 (NCEA Level 1) Students**



**Assessing the learning environment of the class with no ICT facility for Year 12**

Level 2	Learning about Society	Learning to speak out	Learning to Learn	Learning to communicate
Year 12	Society	out	Learn	communicate
Student	Points scored in questions			
11	26	16	16	21
12	28	21	19	15
13	21	15	9	19
14	21	8	5	15
15	26	16	26	20
16	12	11	5	15
17	23	8	27	25
18	21	18	19	18
19	15	9	13	5
20	22	17	22	19

TOTAL	215	139	161	172
MEAN	21.5	13.9	16.1	17.2

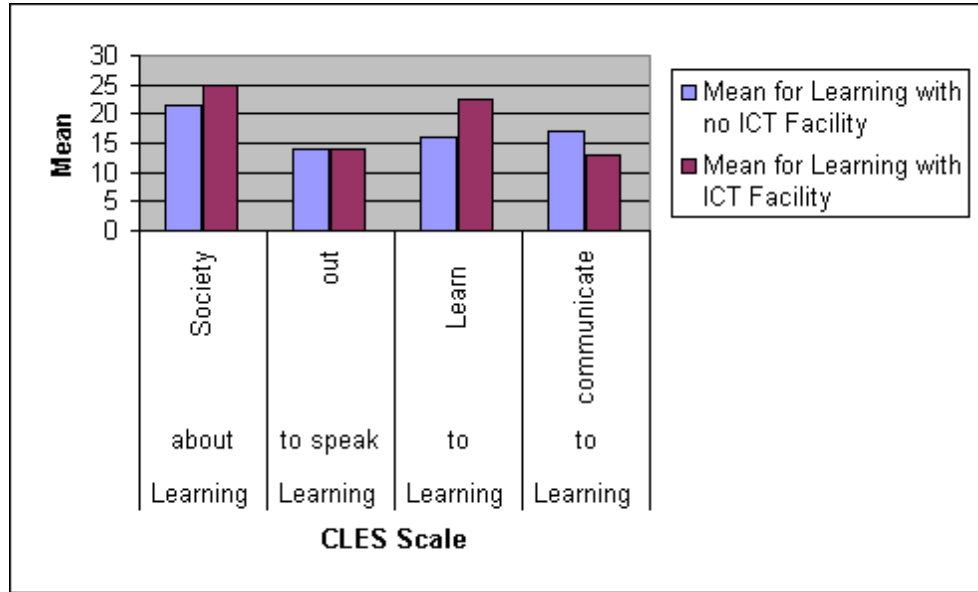
**Assessing the learning environment of the class with ICT facility for Year 12**

Level 2	Learning about Society	Leaening to speak out	Learning to Learn	Learning to communicate	
Student	Points scored in questions				
11	25	18	27		19
12	29	18	33		17
13	24	13	22		14
14	29	10	17		8
15	22	20	29		19
16	17	10	16		7
17	35	15	21		21
18	25	18	23		12
19	18	5	7		6
20	26	14	30		7
TOTAL	250	141	225		130
MEAN	25	14.1	22.5		13

**Comparing means for two situatioun: with no ICT facility & with ICT facility for Year 12**

Year 12 Level 2	Learning about Society	Learning to speak out	Learning to Learn	Learning to communicate	
Mean for Learning with no ICT Facility	21.5	13.9	16.1		17.2
Mean for Learning with ICT Facility	25	14.1	22.5		13

**Comparing Learning Environment between Learning without ICT Facility and with ICT Facility for Year 12 (NCEA Level 2) Students**



**Assessing the learning environment of the class with no ICT facility for Year 13**

Level 3 Year 13	Learning about Society	Leaening to speak out	Learning to Learn	Learning to communicate
Student				
21	17	13	9	18
22	21	18	35	25
23	20	13	9	18
24	24	16	18	25
25	26	25	24	22
26	27	18	28	25
27	23	11	13	18
28	23	11	13	18

	29	18	16	26	19
	30	INVALID	0	0	0
TOTAL		199	141	175	188
MEAN		22.111111	15.66667	19.4444444	20.8888889

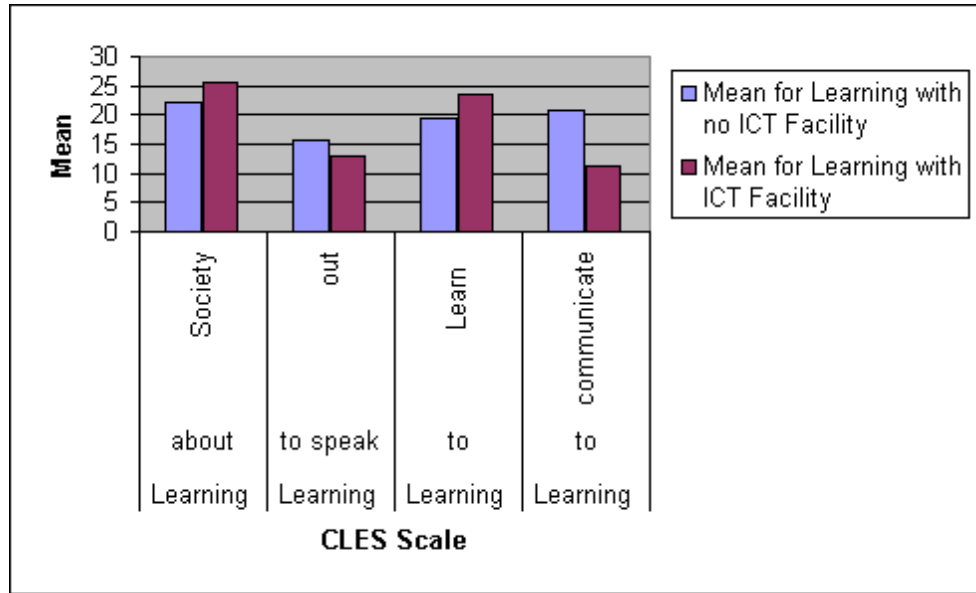
**Assessing the learning environment of the class with ICT facility for Year 13**

Level 3	Learning about Society	Learning to speak out	Learning to Learn	Learning to communicate	
Student					
21	22	7	18		7
22	27	25	31		8
23	22	7	18		6
24	27	13	23		14
25	18	14	22		15
26	30	11	33		25
27	27	14	22		6
28	27	14	22		6
29	30	12	23		13
30	INVALID	0	0		0
TOTAL	230	117	212		100
MEAN	25.55556	13	23.55556		11.11111111

**Comparing means for two situatiuon: with no ICT facility & with ICT facility for Year 13**

Year 13 Level 3	Learning about Society	Learning to speak out	Learning to Learn	Learning to communicate	
Mean for Learning with no ICT Facility	22.111111	15.66667	19.44444	20.8888889	
Mean for Learning with ICT Facility	25.55556	13	23.55556	11.11111111	

Comparing Learning Environment between Learning without ICT Facility and with ICT Facility for Year 13 (NCEA Level 3) Students



**OVERALL MEAN**

**Assessing the learning environment of the class with no ICT facility for all NCEA Level 1 to 3**

Learning about Society	Leaening to speak out	Learning to Learn	Learning to communicate
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Level 1	23.8	16.6	18.2	20.9
Level 2	21.5	13.9	16.1	17.2

Level 3	22.11111	15.66667	19.4444444	20.8888889
Overall Mean	52.67037	35.72222	40.7814815	45.06296296

**Assessing the learning environment of the class with no ICT facility for all NCEA Level 1 to 3**

Learning about Society	Learning to speak out	Learning to Learn	Learning To communicate
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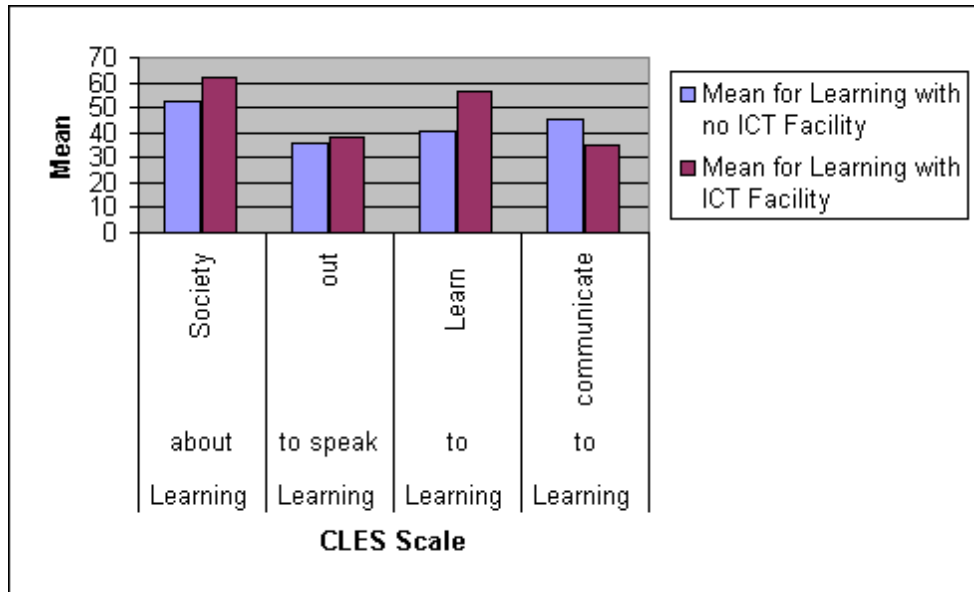
Level 1	28.6	19.5	26.4	18.1
Level 2	25	14.1	22.5	13
Level 3	25.55556	13	23.55556	11.11111111
	62.11852	37.93333	56.75185	34.8037037

**Comparing Overall Means for all NCEA Level 1 to 3 Classes for learning without ICT facility & Learning with ICT facility**

Overall	Learning about Society	Learning to speak out	Learning to Learn	Learning to communicate
Mean for Learning with no ICT Facility	52.67037	35.72222	40.78148	45.06296296
Mean for Learning with ICT Facility	62.11852	37.93333	56.75185	34.8037037



**Facility and Learning with ICT Facility for ALL Senior (NCEA Level 1 to 3) Students**



**Findings**

Mean for learning with ICT facility in Learning about Society and learning to learn are greater than mean for learning without ICT for all senior classes.

Mean for learning with ICT facility in Learning to Communicate is less than mean for learning without ICT for all senior classes.

In learning to speak out scale, the Level 1 scores the highest, level 2 is middle and level 3 is the last. Both level 1 & 2 's overall means in Learning to Speak Out scale with ICT exceeds that without ICT facility but at Level 3, overall means in Learning to Speak Out scale with ICT is less than that without ICT facility

Futrthermore, the higher the NCEA level, students ' overall mean in Learning to Speak Out scale is found decreasing.

### **Interpretation**

<b>Finding</b>	<b>Interpretation</b>
Mean for learning with ICT facility in Learning about Society and learning to learn are greater than mean for learning without ICT for all senior classes.	ICT is effective in their learning especially in research work, assignment and project work
Mean for learning with ICT facility in Learning to Communicate is less than mean for learning without ICT for all senior classes.	As Niue is small place and it is unnecessary for the students to use e mail to contact themselves and to teachers to discuss their study matter, use of electronic communication is lower than other mean of communication.
Furthermore, the higher the NCEA level, students ' overall mean in Learning to Speak Out scale is found decreasing.	The more junior students make more discussion with teacher related to their study matter, but the senior classes prefer more independent and self placed learning

### **Over All Result**

Mean for learning with ICT facility in Learning about Society , Learning to Speak Out and Learning to Learn are greater than those for learning without ICT for all senior classes.

### **Conclusion**

It is found that use of ICT in study improves students' actual performance in their academic study at high school and the students' perception on ICT subject as well as use of ICT facility is positive but communication between students to students and students to teachers need to be improved if ICT is used as learning assistance tool at Niue High School. The students are also guided to use ICT in their communication for academic works.

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