

# Integrating Information and Communication Technology (ICT) in Teaching Principles of Food Safety, Hygiene and Sanitation: An e-Learning Approach

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**Abstract:** The samples were four sections of first year college students of Far Eastern University (FEU-Manila) enrolled in Principles of Food Safety, Hygiene and Sanitation (PRNSHS) taking up BS in Hotel and Restaurant Management (BS HRM). The two sections were classified as ICT (Information and Communication Technology) group, while the other two is Traditional lecture-discussion (TLD) group. There were twenty three (23) matched-pairs formed in each section. First, the ICT group had time to familiarize with e-learning and was administered a pretest on achievement and attitude. These two groups were given the posttest on achievement and attitude towards Principles of Food Safety, Hygiene and Sanitation. The t-test for independent samples was used to determine the difference between the pretest, posttest, and gain scores of the ICT group and TLD groups as well as their attitude towards Principles of Food Safety, Hygiene and Sanitation before and after the intervention. The results indicated that the use of e-Learning approach as a cognitive tool, produced a significant difference in academic gain and attitude scale for the students under the ICT group of the HRM students. It is important to choose appropriate teaching-learning approach so that concepts and elaboration related to the subject matter enhance the students' achievement and performance in their learning. Also, it is clear that the major advantage of e-Learning approach is that the ICT group was more actively involved in the learning process. The different ICT materials the students were guided by the Rubrics scale, instructional goals and objectives that met the needs of students learning. The nature of students' learning must drive the type of performance used to assess students' knowledge.

**Keywords:** Information and Communication Technology (ICT), Traditional lecture-discussion, e-Learning, Principles of Food Safety, Hygiene and Sanitation (PRNSHS)

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## I. INTRODUCTION

The rapid advances recently made in ICT (Information and Communication Technology), particularly in the Internet, have very important implications for educators. In the beginning of 21<sup>st</sup> century it is almost impossible to imagine what ICT will be like by the end of the century. Certainly no one knows exactly what the future will bring, even though experts may be able to make educated predictions, the future will always surprise us in the way it evolves. Given this scenario, in the not too distant future it is reasonably expect the following developments to impact strongly on how to approach teaching and students' learning. In the near future, advances in ICT will mean an enormous increase in the amount of information available to our students as they study their courses and as they move into the workplace. Many educationists in their initial attempt to use the Internet have merely used it to provide on-line materials to students primarily as information resources. However, if teachers wish to provide students with a quality education in hospitality education, also consider

more than just the transmission of information, which will be facilitated immensely by the advances we expect to occur. Teachers can employ ICT better in the future to change teaching and learning more fundamentally by promoting such activities as networking, communities of learning and research, solving of real-world, complex, interdisciplinary problems, individualized learning supported by AI (Artificial Intelligence). As the pace of change increases the more important it will become to ensure our students acquire a breadth of thinking skills and attitudes to keep abreast of developments. Hospitality management courses like Hotel and Restaurant Management and Tourism and other programs in business progresses through a process of inquiry, rather than just building a body of factual information.

The main purpose of the study is to find-out the effects of using ICT in teaching selected topics in Food Safety, Hygiene and Sanitation of 1<sup>st</sup> year BS HRM students. This research seeks to answer the following questions:

1. Is there a difference between the ICT and TLD groups in terms of achievement test in Food Safety, Hygiene and Sanitation?
2. Is there a difference between the ICT and TLD groups in terms of the final examination in Food Safety, Hygiene and Sanitation?
3. Is there a difference between the ICT and TLD groups in terms of attitude towards Food Safety, Hygiene and Sanitation?
4. What were the perceptions of the ICT group on using e-Learning as an instructional guide in teaching some concepts in Food Safety, Hygiene and Sanitation?

The results of the study will enable the *students* to do self-tutoring and self-remedial activity. The different ICT supplementary materials will serve also as an additional guide or reference, hence, better comprehension and use of cognitive skills by students could be achieved.

The results of the study would enable *teachers* to use an approach to teaching which is creative and innovative (Lederman, 1992). The use of e-Learning would enable them also to observe and enrich the approaches they use in teaching science subjects (Enochs & Riggs, 1990). This will help them find ways to make the understanding of the subject easier. This will help *parents and guardians* to monitor the performance of their children since they can be part in solving problems and chemical concepts. It would also enable them to help their children form a good study habits.

The term “e-learning” has only been in existence since 1999, when the word was first utilized at a Computer-based training (CBT) systems seminar. Other words also began to spring up in search of an accurate description such as “online learning” and “virtual learning”. However, the principles behind e-learning have been well documented throughout history, and there is even evidence which suggests that early forms of e-learning existed as far back as the 19th century (Epignosis,2013).

With the introduction of the computer and internet in the late 20th century, e-learning tools and delivery methods expanded. The first MAC in the 1980's enabled individuals to have computers in their homes, making it easier for them to learn about particular subjects and develop certain skill sets. Then, in the following decade, virtual learning environments began to truly thrive, with people gaining access to a wealth of online information and e-learning opportunities (Epignosis, 2013).

By the early 90s several schools had been set up that delivered courses online only, making the most of the internet and bringing education to people who wouldn't previously have been able to attend a college due to geographical or time constraints. Technological advancements also helped educational establishments reduce the costs of distance learning, a saving that would also be passed on to the students - helping bring education to a wider audience (Slavin,2002).

In the 2000's, businesses began using e-learning to train their employees. New and experienced workers alike now had the opportunity to improve upon their industry knowledge base and expand their skill sets (Epignosis,2013). At home individuals were granted access to programs that offered them the ability to earn online degrees and enrich their lives through expanded knowledge.

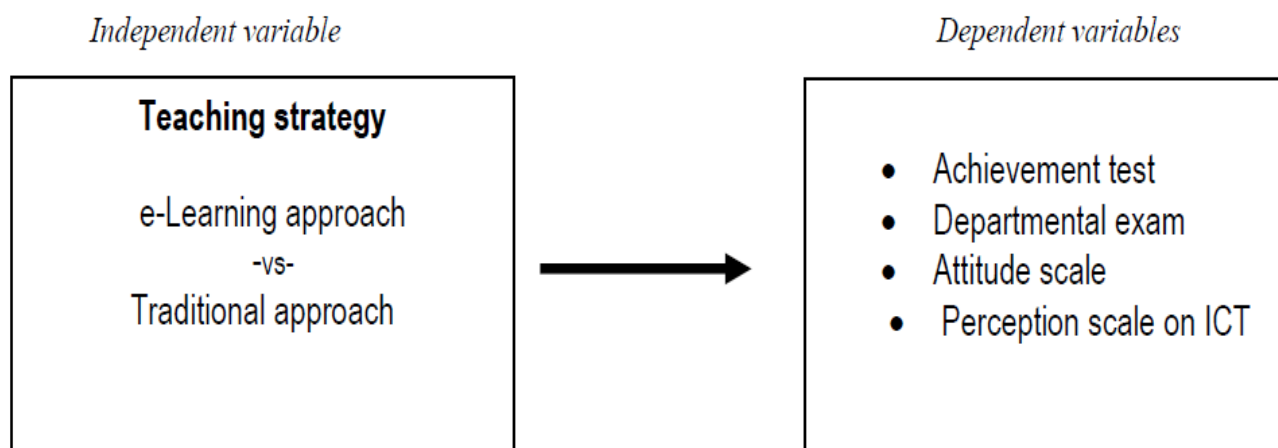
The constructivist view of learning suggests that learners construct their own knowledge, strongly influenced by what they already know. In this way, learners build their own individual sense of 'reality' (Glynn, Yeany & Britton, 1991). Constructivism encourages educators to recognize their students' strongly held preconceptions and to provide experiences

that will help them build on their current knowledge of the world. Social constructivism acknowledges that learning is a social activity in which learners are involved in constructing consensual meaning through discussions and negotiations. During these discussions, students can identify and articulate their own views, exchange ideas and reflect on other students' views, reflect critically on their own views and when necessary, reorganize their own views and negotiate shared meanings. Although individuals construct their own understandings, it is not done in isolation but in a social context.

According to Levin, J. R., & O'Donnell, A. (1999), it was Jerome Bruner in 1966, who influenced the definition of Discovery learning which uses cognitive psychology as a base. Discovery learning is an approach through which students interact with their environment by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments. The idea is that students are more likely to remember concepts they discover on their own. Teachers have found that discovery learning is most successful when students have prerequisite knowledge and undergo some structured experiences- *learning* is defined as instruction delivered on a computer via internet or CD-ROM (Clark & Mayer, 2003). It can be self paced or instructor led and includes media in the form of text, streaming video, and audio and builds user knowledge to improve organizational functioning. *e-learning* commonly refers to training delivered electronically in an organizational setting while Online Learning is used to differentiate courses delivered via the internet in educational settings. Today e-Learning approach in teaching uses computer simulations which has computer programs that hold a model of some real system. While the term ICT is the combination of computing and communication technologies (including computer networks and telephone systems) that connects and enables systems such as the Internet. The model can be provided with input which causes output to be generated (Mayer,2003). In instructional settings learners generally are expected to discover properties of the model by giving input to the model, and analyzing the output.

This study involves the integration of ICT in teaching and learning Principles of Food Safety, Hygiene and Sanitation for BS HRM students. There are two groups-experimental and control, the former will use ICT, while the latter will use lecture-discussion approach. The students will share the online ICT experience, which is then utilized among their classmates.

The conceptual framework of this study is based on *e-Learning* approach, which refers to an inductive method of guiding students to discuss and organize ideas and process themselves (Mayer,2003). This statement implies that the nature of the environment is as important as the characteristic of the learner and that altering the environment may lead to different learning outcomes.

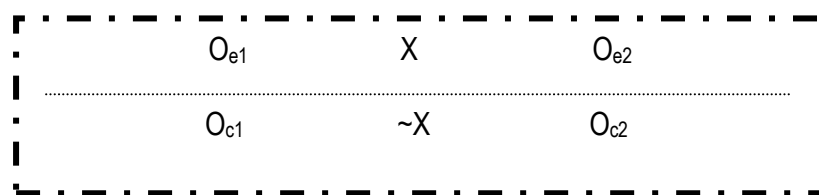


**Fig. A** The Research Paradigm

The diagram shows the method of instruction affecting the students' achievement, attitude and perception in Principles of Food Safety, Hygiene and Sanitation. In the study, the experimental or ICT group and control or the traditional group were subjected to two (2) different methods of instruction, the independent variable, in order to measure what is more effective in enhancing students' scientific learning.

## II. METHODOLOGY

The samples were three sections of first year college students of Far Eastern University (FEU-Manila) enrolled in Principles of Food Safety, Hygiene and Sanitation (PRNSHS) taking up BS in Hotel and Restaurant Management. The two sections were classified as ICT group, while the other is traditional (TLD) group. The group leaders and class officers of the ICT group each section were the major participants of this research paper since they were the ones who will ask feedbacks in each ICT supplementary materials used. The pretest-posttest control group design in a quasi-experimental research was adopted as the model for the study. The result was used to evaluate the effects of ICT in teaching Food Safety, Hygiene and Sanitation. The pretest was administered to all the respondents – control or TLD and experimental or ICT groups prior to the conduct of the experiment. The ICT group was treated using ICT as an alternative approach in student's evaluation, while the control group undergone traditional assessment. The pretest served as an aid in establishing the initial similarity of the two groups, and subsequently giving instruction and assessing their performance. Both quantitative and qualitative data was analyzed to answer the questions posed in this research.



**Fig. B** The Research design

In the procedures, a pretest-posttest experiment with random assignment of classes of ICT and TLD groups was employed to examine any possible treatment effect due to the exposure to different ICT supplementary materials. After this, a matched-pair was formed using Achievement and Attitude test in Food Safety, Hygiene and Sanitation. There were twenty three (23) matched-pairs formed in each section. First, the ICT group had time to familiarize with e-learning and was administered a pretest on achievement and attitude. These two groups were given the posttest on achievement and attitude towards Principles of Food Safety, Hygiene and Sanitation. The t-test for independent samples was used to determine the difference between the pretest, posttest, and gain scores of the ICT group and TLD groups as well as their attitude towards Principles of Food Safety, Hygiene and Sanitation before and after the intervention. The following instruments were used in collecting data.

### 1. Achievement test

This instrument was a teacher-made examination composed of 50 items covering topics on Food Safety, Hygiene and Sanitation from 1<sup>st</sup> Prelims until the Final period. The topics includes:

- Food Safety and Sanitation
- Microbial World
- Food Flow
- Hazard Analysis Critical Control Point

### 2. Departmental Examination in Principles of Food Safety, Hygiene and Sanitation

This is a final exam given before the end of the semester in all sections taking up Food Safety, Hygiene and Sanitation. The type of questions varied from matching type and multiple choice. The topics covered from the beginning of the course until the last topic. This is an 80-item test given to all students taking the subject.

### 3. Attitude scale

This instrument is an adaptation of an existing instrument by Ibe (1985), the reliability of which is 0.92. For this study it was field tested at FEU involving 10 students and it garnered a reliability index of 0.83. This is a ten (10) item of the Likert-scale type, fifty percent positive statement and the other fifty percent will be negative. Its purpose is to measure the student's attitude in Principles of Food Safety, Hygiene and Sanitation before and after undergoing the study. For the interpretation of the response in each statement, the following scores was used:

Mean Range	Verbal interpretation
4.21-5.00	Strongly agree
3.41-4.20	Agree
2.61-3.40	Not sure
1.81-2.60	Disagree
1.81-2.61	Strongly disagree

#### 4. ICT Supplementary Materials

This instrument was prepared by the teacher-researcher for the purpose of investigating whether there's an effect on students' performance and attitude. The following ICT supplementary guides was used in this action research:

- a. Powerpoint presentations
- b. Film showing / movie clips
- c. Moodle
- d. Yahoo Group
- e. Internet downloads and researches
- f. You Tube and Yahoo Videos

Frequencies, percentages, means and standard deviation for group data was used to describe the students profile. Also, it will be used to determine the significant difference in the different instruments like Achievement test, Final examination, Attitude scale and Perception scale in Principles of Food Safety, Hygiene and Sanitation. The t-test for independent samples was used to determine the difference between the pretest, posttest, and gain scores from the ICT and TLD groups before and after the intervention. The respondents were matched based on the results of their pretest scores in the Achievement test and also their attendance.

### III. RESULTS

The samples were four (4) sections of first year college students of Far Eastern University who were matched based on the result of the pre-Achievement and pre-Attitude tests. These students were enrolled in Principles of Food Safety, Hygiene and Sanitation (PRNSHS) taking up BS in Hotel and Restaurant Management under the Institute of Tourism and Hotel Management (ITHM).

#### Achievement Test, Departmental Exam, and Attitude Test in Principles of Food Safety, Hygiene and Sanitation:

**Table 1: Comparison of the Mean Scores in the Achievement test**

	Mean score	Mean differences	Standard deviation	Computed t-values	Remarks*
<b>Pretest</b>					
ICT Group	19.83	0.35	2.57	0.44	NS
TLD Group	19.70		2.43		
<b>Posttest</b>					
ICT Group	27.20	3.60	3.56	3.32	S
TLD Group	23.60		3.30		

\*critical value at 0.05 level of significance at 23 degrees of freedom is 2.81

The computed value of 0.44 is much lower than the critical value of 2.81 at 0.05 level of significance. Hence, the difference in the pretest score of the ICT and TLD groups is not statistically significant. Both groups started with the same knowledge and background in Principles of Food Safety, Hygiene and Sanitation at the beginning of the study. The mean difference of 0.35 in the ICT and TLD groups indicated that the pretest scores were not varied in both groups.

In the ICT group, the mean score in the posttest is 27.20 with a standard deviation of 3.56. In the TLD group, the mean score in the posttest is 23.60 with a standard deviation of 3.30. The spread scores in the ICT and TLD groups were not varied as seen in the results of their standard deviations. Computing the t-test for independent samples, the computed t-value at 3.32 is higher than the tabular value at 2.81 at the 0.05 level of significance. This shows a significant difference between the posttest results of both groups in favor of the ICT group. Therefore, the students treated with e-Learning approach performed better than the students who used the lecture-discussion approach in learning.

Based on the results, it is clear that one major advantage of e-Learning is that the ICT group was more actively involved in the learning process. This ICT materials were guided by Rubrics scale, the instructional goals and objectives were evident. The different ICT materials products included in this study are the outcomes of the students' academic performance and cognitive development. Achievement depends upon students being taught the things on which they are being assessed, like a scoring Rubrics and checklists. In this aspect, e-Learning can be used to remedy specific weaknesses in the student-learning process; since the purpose of the study is to determine how much did the students have learned from the instruction and in the ICT supplementary material.

**Table 2: Comparison of the Mean Scores in the Departmental Examination in Principles of Food Safety, Hygiene and Sanitation**

Group	Mean score	Mean differences	Standard deviation	Computed t-values	Remarks*
ICT Group	67.34	13.21	1.77	5.59	<b>S</b>
TLD Group	54.13		2.30		

\*critical value at 0.05 level of significance at 23 degrees of freedom is 2.81

The study showed that the ICT group had a mean score of 67.34 in the Departmental Exam in Principles of Food Safety, Hygiene and Sanitation, which is higher by 13.21 than the score of the traditional group with 54.13. The difference had a computed t-value of 5.59, which was significant at the 0.05 level for 23 degrees of freedom. The ICT group were able to understand the basic concepts and principles behind each topic. Also the students in this group remembered the essentials Principles of Food Safety, Hygiene and Sanitation.

Based on the results of the Achievement test and Departmental exam, e-learning provides stimulus beyond traditional learning methodology from textbook, manual or classroom based instruction. Also, e-learning offer user-friendly solutions for satisfying continuing education requirements. Instead of limiting students to attending courses or reading printing manuals, students are able to acquire knowledge and skills through methods that are much more conducive to individual learning preferences. And also it offer visual learning benefits through animation or video, not typically offered by traditional lecture discussion method of teaching.

The evidences from previous studies including the result of this research showed that e-Learning is a very powerful mechanism in promoting students' meaningful learning and enhancing their achievement and performance. More study must be made to know how this strategy can be used more easily and effectively in the hospitality education.

**Table 3: Comparison of the Mean Scores in the Attitude Test**

Achievement test scores	Mean score	Mean differences	Standard deviation	Computed t-values	Remarks*
<b>Pretest</b>					
ICT Group	33.40	0.04	3.75	1.62	<b>NS</b>
TLD Group	33.44				
<b>Posttest</b>					
ICT Group	37.78	2.99	3.20	3.85	<b>S</b>
TLD Group	34.79				

\*critical value at 0.05 level of significance at 23 degrees of freedom is 2.81

The results pretest mean attitude of 33.40 in the ICT group and 33.44 in the TLD group posted a mean difference of 0.04. This difference in attitude is not significant at the 0.05 level of significance. This shows that both groups are comparable as far as their attitude towards the subject is concerned. The standard deviations of the scores of the ICT and TLD groups has a slight difference at 3.75 and 3.20, respectively, meaning they are not varied from one another.

The posttest mean attitude score of the ICT group is 37.78 while in the TLD group, the posttest mean attitude score is 34.79. Computing the t-test for independent samples, the t-ratio of posttest attitude scores of both groups is 2.99, which is greater than the critical t-value of 2.81 at 0.05 level of significance. This implies that there was a significant difference in the attitude towards the subject of both groups after immersion in the subject. This difference was attributed to the use of different ICT supplementary materials.

The use of ICT has developed in different ways to meet the needs of learners in different curricular areas. The use of ICT can help learners be creative, be a useful aid to problem solving, provide ready access to a world of knowledge and research; and improve the quality of presentation. Effective teachers use the power of ICT to promote the uniqueness of the content and skills relating to particular curricular areas. They have a clear understanding of the learning process as it relates to that area, and are confident that the technology will help them to improve pupils' attainment and capacity to learn. They assess the impact on students' achievement and attitude of using ICT to ensure that it adds value to the learning and teaching process.

#### Perception Scale on e-Learning:

**Table 4: Perception Scale of the ICT Group on the Use of e-Learning Approach**

Item no.	Statement	Mean Rating	Verbal Interpretation
1	e-Learning approach help improve my performance in the subject.	4.11	Agreeable
2	e-Learning approach help me become more creative.	3.77	Agreeable
3	e-Learning approach provided me an access to a world of knowledge and research.	4.30	Strongly Agreeable
4	e-Learning approach promotes uniqueness of content and skills related to particular curricular areas.	3.10	Not Sure
5	e-Learning approach adds value to the learning and teaching process.	4.19	Agreeable
6	e-Learning approach promotes lifelong learning.	4.11	Agreeable
7	e-Learning approach is a new strategy that opens new opportunities in learning.	4.33	Strongly Agreeable
8	e-Learning approach is a useful guide in doing my assignment.	3.41	Agreeable
9	e-Learning approach develops inquiry and communication skills.	4.31	Strongly Agreeable
10	e-Learning approach helps in my decision making, critical thinking, and problem solving activities.	3.39	Not Sure
Average Mean rating = <b>3.90</b>		The Overall Verbal Interpretation is <b>Agreeable</b>	

The average mean of the Perception Scale in the use of different ICT supplementary materials in Principles of Food Safety, Hygiene and Sanitation is 3.90. It has an overall verbal interpretation of “Agreeable”, meaning the ICT group perceived e-Learning should be part of the curriculum. As seen in Table 4, e-Learning can help students become motivated because the enjoyment, responsibility, and goal-oriented that they experience.

Based on the observation of the researcher, when e-learning is utilized to its fullest potential, students become more willing to accept responsibility for their learning and more likely to recognize the relationship between classroom and the industry. The students will also begin to understand how to assess and evaluate their own learning, which is necessary for lifelong education. In addition, learning does not end at completion of formal education, it continues throughout one’s life through educational experiences.

#### IV. DISCUSSION

This indicates that the use of e-Learning approach as a cognitive tool, produced a significant difference in academic gain and attitude scale for the students under the ICT group of the HRM students. It is important to choose appropriate teaching-learning approach so that concepts and elaboration related to the subject matter enhance the students' achievement and performance in their learning.

Learning by integration is often also referred to as “hybrid” learning, and can take on a variety of forms in online education environments (Schnotz, 2002). While some organizations may only use blended learning techniques on rare occasions, others might utilize it as a primary teaching method within their curriculum. There are two key principles commonly associated with integrated learning: students who can share information and work with other students directly in a collaborative setting have a more enriched learning experience, and collaboration between students can be improved upon if group activities rely on information gathered from online resources or lessons. It's also been suggested that students who complete online coursework followed by interactive, face-to-face class activities have richer educational experiences.

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The use of ICT has developed in different ways to meet the needs of learners in different curricular areas. The use of ICT can help learners be creative, be a useful aid to problem solving, provide ready access to a world of knowledge and research; and improve the quality of presentation. Effective teachers use the power of ICT to promote the uniqueness of the content and skills relating to particular curricular areas. They have a clear understanding of the learning process as it relates to that area, and are confident that the technology will help them to improve pupils’ attainment and capacity to learn. They assess the impact on students’ achievement and attitude of using ICT to ensure that it adds value to the learning and teaching process. Also, it is clear that the major advantage of e-Learning approach is that the ICT group was more actively involved in the learning process. The different ICT materials the students were guided by the Rubrics scale, instructional goals and objectives that met the needs of students learning. The nature of students’ learning must drive the type of performance used to assess students’ knowledge.

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