

CHAPTER THREE

Methodology

Introduction

The quantitative method was used to design research and analyze the outcome of the study. Quantitative research is composed of two main sub-methods, descriptive and inferential statistics. It also represents the results by numbers (Schumacher & McMillan, 1993). Both are utilized in order to derive appropriate conclusions and recommendations.

Descriptive Statistics

These describe the output from data analysis in order to give a clear view of the situation, allowing the researcher to draw ideal conclusions and give decision makers a way to base their decisions on rational study. Descriptive statistics involve various forms of information in terms of the mean, standard deviation, histogram, bar graph, whisker plot and scatter plot (McMillan & Schumacher, 2001).

Inferential Statistics

These were used for the testing of hypotheses to test the dependent variable(s) with independent variable(s) in order to know the relationship between them (Wiersma, 2000). Wiersma indicated, “Inferential statistics, ...measures of the sample and parameters are measures of the population. Inferences are made about the parameters from the statistics” (p. 345). Aron and Aron (1997) pointed out “Inferential statistics are to be used for drawing conclusion and inferences, which are based on the numbers from research study, but go beyond the numbers” (p. 2).

The qualitative method was used for analyzing question 11, which is open-ended question and the participants’ comments. Analyzing of the qualitative data based on these steps:

1. Preparing and organizing the data for analysis.
2. Exploring the data.
3. Describing and developing themes from the data.
4. Representing and reporting the findings
5. Interpreting the findings. (Creswell, P. 257, 2002)

The study attempted to find answers to the research questions, which are:

Part One: Descriptive Questions

1. What are the perceptions of respondents toward using information technology in instruction?
2. What are the perceptions of the respondents toward the development of an information technology plan?
3. What are perceptions of the respondents toward using information technology to assist with administrative work?
4. What are the perceptions of the respondents toward the skills of information technology?
5. What are the perceptions of the respondents toward staff development (SD)?
6. What type of method of teaching and philosophy do they use?

Part Two: Hypotheses Testing

- 7a. Is there any significant interaction between position levels and the level of genders

on a combination of information technology in instruction and information technology plan?

- 7b. Are there significant differences between teachers and administrators on a combination of information technology in instruction and information

technology plan?

7c. Are there significant differences between male and female on a combination of information technology in instruction and information technology plan?

Population

The population of the study included administrators (principals and *assistants'* principal) and teachers male and female in Saudi high schools in Riyadh city. All the population information about high schools that are under the Ministry of Education is based on the Ministry of Education Statistical Report issued in the year 2000. The information about the Presidency of Girls' Education is based on a call with the Presidency of Girls' Education.

McMillan and Schumacher (2001) defined the population as,

A group of elements or cases, whether individuals, objects, or events, that conform to specific criteria and to which we intend to generalize the results of the research. This group is also referred to as the target population or universe (p. 169).

Table 3

Distribution Number of Administrators and Teachers (male and female) in High Schools of Ministry of the Education and the Presidency of Girls Education in Riyadh

	Administrators	Teachers
Male	206	2433

Female	224	4152
Total	430	6585

Table 4

Distribution Percentage of the Population

	Administrators	Teachers
Male	48%	37%
Female	52%	63%

Sample Description

Wiersma (2000) defined sample as “A subset of the population to which the researcher intends to generalize the results.” (p. 269). Besides, McMillan and Schumacher (2001) stated sample size as “The number of subjects in a study...represented by the letter n.” (p. 177). Gay (1981) suggests that sampling is the appropriate approach to collecting data that represents the population.

Generalizations of the results that are derived from the study require that the sample should be representative of the population of the study (McMillan & Schumacher, 2001).

McMillan and Schumacher point out that there are important components that should determine in the sample size,

The determination of sample size should take into consideration several factors—the type of research, research hypotheses, financial constraints, the importance of the results, the number of variables studies, the methods of data collection, and the degree of accuracy needed (2001, p. 177).

Choosing the samples from the population depended on many factors that must be determined to figure out the sample size. These elements are:

1. The statistical procedure, which is a two-way MANOVA.
2. The desired power is (.80)
3. The effect size is moderate.
4. Number of groups are two
5. The level of significant is .05.
6. Numbers of independent variables are two, which are gender and position

(Stevens, 2002; Aron & Aron, 1997)

There is not a special method to be used in multivariate analysis (MANOVA) to consider the sample size. In the study, it was used analysis of variance (ANOVA) and one way multivariate analysis to derive how many subjects could be involved in the study (Stevens, 2002). The sample size was 180 participants. Ninety of the participants were administrators and the ninety were teachers, which represent the population. Table 5, identifies the number of administrators and teachers from both boys' and girls' high schools based on the percentage each of them has from the entire population.

Multivariate Assumption

There are three assumptions for multivariate analysis of variance (MANOVA). These are:

1. Independence of observation.
2. Homogeneity of covariance.
3. Normality of the distribution (Stevens, 2002, p. 257)

Table 5

Distribution Sample Numbers among Administrators and Teachers

in Both Girls' and Boys' High Schools

	Administrators	Number of Administrators	Teachers	Number of Teachers
Male	48%	43	37%	33
Female	52%	47	63%	57
Total	100%	90	100%	90

Instrumentation

Selection and Development of the Instrument

The instrument was constructed and was based on the literature review. There was not an appropriate instrument found to fit the study and enable to deal with the research components under study. The instrument was divided into four main parts, which are illustrated in Appendix A. These parts are:

Section I: Demographic information, which includes 11 items.

Section II: Information technology, which includes 44 items.

Section III: Staff Development, which includes 4 items.

Section IV: Teaching method and philosophy, which includes 16 items.

The second part that is information technology is divided into five categories which are: information technology and instruction (which includes items 12, 13, 20, 21, 22, 29, 36, 37, 40, 43, 44, 49, 51, 55); knowledge and skills of information technology (which is composed of items 15, 16, 27, 28, 33, 38, 41, 45, 47, 50, 53, and 54); information technology and administrative work (which includes items 18, 19, 25, 26, 31, 32, 39, 42, 46, 48, 52); and information technology plan (which includes item numbers 14, 17, 23, 24, 30, 34, 35). The third part is information technology and staff development, which includes item numbers 56, 57, 58, 59. The fourth part is the

teaching philosophy and method that includes sixteen check statements that represent element of constructivism and behaviorism theories.

The dependent variables include information technology in instruction, and information technology plan. These dependent variables were tested in order to learn whether or not there were differences among perceptions based on gender and position. The independent variables are gender (male and female) and position, which includes administrators (principal and assistant principal) and teachers.

Wiersma (2000) discussed different types of Likert Scales that measure participants' responses and these were used in the study. The scale consists of five degrees, which are:

SA= Strongly Agree; A= Agree; U= Uncertain; D= Disagree; SD= Strongly Disagree.

The degree for each part of scale in the study is measured as:

SA= 1, which is Strongly Agree; A= 2, which is Agree; U= 3, which is Uncertain; D= 4 which is Disagree; SD= 5, which is Strongly Disagree.

The first part is information technology that includes information technology in instruction, information technology planning, information technology skills, and information technology in administrative work are measured based on the Likert Scale.

There is an open-ended question, which is number eleven, after the demography section and before the participants start choosing the appropriate answer on the Likert Scale, so that the researcher can determine their knowledge in employing information technology in school.

Staff development is composed of four questions, three of which have yes or no answers. If the first answer is yes the participant(s) should write down the course title of the computer and the Internet class that they have taken and the time. The

second question is about staff development plans whether or not school has a staff development plan. If the response is yes, the participant(s) should explain their plan. The third question measures the degree of need for staff development. The last question measures multiples of information technology needs, and participants have the freedom to choose what they need, from “a” to “k”. The fourth part, which is teaching philosophy and method, includes seventeen check statements that teacher and administrators mark the points that they used in school

The instrument was written in the English Language. The study was conducted in Saudi Arabia. This demanded the quality to be translated into Arabic. There were two main points to be considered:

1. The instrument was to be compatible with the meaning in English.
2. It was to be understood by the participants in order for them to answer the questions properly.

To implement the previous components, it requires a person to translate the original from English to Arabic and vice versa. Two Ph.D. students of Arab origin and fluent in Arabic Language skills translated the survey. One of them was from Instructional Technology Department and the other was Supervision and earned bachelor in English as a second Language. During the pilot study, they also suggested a change in some items in order to make it clearer. The feedback from both improved the Arabic version content. One of them suggested a terminology in Arabic language that could be used for multimedia, instead of translating it as it is. Behling and Law (2000) asserted that “...the translation must be done correctly, not only from the language perspective, but that we pick up the nuances, etc. that would allow our instrument to achieve validity, reliability, and possess the appropriate psychometric properties” (p. 1)

Item Analysis

Developing coherent items for research depends on the quality of the instrument questions. The outcome of item analysis is critical for redeveloping and revising the questions that are given to the participants in the pilot study. The discrimination index is an appropriate method that ranges from -1 to +1, where a negative correlation indicates that the item(s) is poor and needs to be deleted, zero correlation that means the item(s) needs to be deleted or revised, and a positive correlation means that item(s) is appropriate. When the item has a high discrimination factor, it becomes a good item. Item analysis allows the researcher to learn the quality of each item to be deleted or revised in the instrument (Wiersma & Jurs, 1990). The discrimination index is part of the reliability result after running the Statistical Package of Social Studies (SPSS) which is the corrected item total correlation. Ebel and Frisbie (1991) suggested a range of degree for index of discrimination to evaluate the items. Their suggestions are shown in Table 6.

Table 6

Item Evaluation

Index of Discrimination	Item Evaluation
0.40 and up	Very good items.
0.30 to 0.39	Reasonably good but possibly subject to improve.
0.20 to 0.29	Marginal items, usually needing and being subject to improvement.
Below 0.19	Poor items, to be rejected or improved by revision.

Note: From *Essentials of Educational Measurement*, Ebel & Frisbie, 1991, p. 232.

Pilot Study

It is imperative to conduct a pilot study in order to identify the reliability of the survey items. Indeed, the pilot study is the lens that enables the researcher to know the effectiveness of all items that represent each dependent variable. According to Wiersma (2000),

Before preparing the final form of the questionnaire, the items should be tried out with a small group in a pilot run. This is a pretesting of the questionnaire, and deficiencies may be uncovered that were not apparent by simply reviewing the items. (p. 171)

Based on the result of the pilot study, weak items can be removed or revised to enhance the construction of the instrument and make it ready to be utilized without major problems. The pilot study gives enriched feedback that is very useful to adjust the instrument. Tuckman (1999) identified that “Most studies benefit substantially from the precaution of running pilot tests on their questionnaires, leading to revisions based on the results of the test” (p. 256).

The pilot study was conducted in city of Athens, Ohio in the United States that included 21 male participants. It provided information that helped in revising some items. There were items numbers 18, 19, 21, 25, 30, 31, 40, 44, 56, 57, and 58. All of these items were adjusted based on the participants’ feedback in the pilot study. All of the previous items were revised in order to be comprehensible. Additionally, 57, which had a degree measure of merely yes or no, was adjusted to three degrees: yes, no, and I don’t know. In addition, item 58 was adjusted from four degree to three degrees, which are presently no need, somewhat need and strong need. Additionally, some of the participants in the pilot study reported there is a similarity between items 19 and 25 and they suggest removing them. Then they were revised in order to remove the ambiguity.

Validity

The data that were collected from the participants during the pilot study indicated that the content of the survey was valid for the study. McMillan and Schumacher (2001) declared validity is “a judgment of the appropriateness of a measure for specific inferences, decisions, consequences or uses that result from the scores that are generated” (p.181). Gay (1981) defined validity by stating that it should measure all items of the instrument that the researcher needs to measure.

The validity of the instrument used in the study was confirmed by two experts in the College of Education at Ohio University. One of the experts, Dr. Teresa Franklin, was from the Instructional Technology Department and the other, Dr. George Johanson, was from the Research and Evaluation Department.

All the items used in the survey are based on a review of the literature, so that the content of the survey is a valid representation of all the dependent variables and other categories in the study. There is additional information that supports the validity of the content.

Information Technology Plan

Bucher (1998) pointed out “ideally, a technology plan is created by a team representing all individuals who have an interest in outcomes” (p. 5)

Information Technology and Instruction

Leu and Leu (1999) indicated, “Communicating with others around the world on a common classroom project provides opportunities for your students, opportunities they will not experience without the Internet. You should seek out these opportunities for your students and integrate them into your curriculum” (p. 128)

Hoffman and Scheidenhelm (2000) noted that "...the Web provides teachers and students unique opportunities to learn and teach in ways that would have been impossible even a few short years ago" (p.86). Najjar (1996) pointed out that

Computer-based multimedia instruction allows the learner to personally set the pace of learning. Traditional classroom instruction does not. Self-paced learning is probably a more effective way to learn because the learner can move on to new material when the learner is ready.

Rada (2000) noted, "In a successful virtual organization, the technology fits into the workflow of the people. To place a school onto the information superhighway, one needs a model of the school. The model must accommodate students, teachers, administrators, marketers, and more" (p. 150). Moreover, from Oswego City School District (1997), "New information and communication technologies continually appear to enable individuals to access the best information in the shortest time to identify and solve the most important problems and then communicate those solutions to others."

Information Technology and Administrative Work

Fulmer (1995) cited that "in the automated mode, computers calculated daily average attendance data by class, building, and district at a much faster rate. However, in spite of the speed and accuracy in calculations, the intent of the system to manage the information remained the same" (p. 4). Visscher (1995) said,

As modern tools such as relational database management system (RDBMS) and query languages become available, high levels of management support become possible; the query language in

combination with a RDBMS enables the definition of, and response to, questions in which school managers are interested (p. 18).

Hsu (1995) said, “To cope with such changes, Information Technology has been in some schools and the Education Department (ED) to support their routine operational, administrative and management processes” (p. 50).

Appendix C was created in order to enhance the content validity.

Reliability

McMillan and Schumacher (2001) declared reliability is “the consistency of measurement” (p. 181). The purpose of the reliability gives indications that inform the researcher as to which items work better than the others to measure what is supposed to be measured. That enables the items to be revised or omitted from the instrument to make the survey consistent. Likewise, they mentioned that reliability has a foremost goal that made them to confirm, “The goal of developing reliable measures is to minimize the influence on the scores of chance or other variables unrelated to the intent of the measure.” (McMillan & Schumacher, 2001, p. 181). When the instrument is reliable that means it has minimal errors. In this case, when the result of the reliability is close to one, it indicates that the instrument is more reliable (Gay, 1981).

There were twenty-one participants in the pilot study (N=21). The reliability determined for two categories that represents dependent variables. The first is information technology in instruction, the second is information technology plan. The analyses of the data that was collected by the pilot study indicated that the Cronbach Alpha degree for the first dependent variable is .88. The Cronbach Alpha degree for

the second dependent variable is .78. The corrected correlation of information technology in instruction and information technology plan items, whose represented item analyses were above 0.26, indicated that all items had good quality and distinguished among the participants, based on the suggestions of Ebel & Frisbie (1991).

Data Collection Procedure

The survey was used to collect data of the study. It is based on the sample that is composed of teachers and administrators (principals and assistant principal) that includes both males and females. In this research, random sample that represent participants will be used to collect the data from the population. Tukman (1999) said that

The researcher selects a sample or representative group from this population to serve as respondents. As one way to ensure that this sample is representative of the larger population, a researcher might draw a random sample, because random selection limits the probability of choosing a biased sample (pp. 258-259).

As a precaution, Gay (1981) pointed out that those who are doing research should ensure that all of the participants in the study have a willingness to participate voluntarily and that they are available in their school. This researcher sent the instrument to his friends and brothers in Riyadh, Saudi Arabia, in order for the data to be collected.

Data Analysis Procedures

The researcher plans to test three null hypotheses, and answer six descriptive questions. These are:

Part One: Descriptive Questions

1. What are the perceptions of respondents toward using information technology in instruction?
2. What are the perceptions of the respondents toward the development of an information technology plan?
3. What are perceptions of the respondents toward using information technology to assist with administrative work?
4. What are the perceptions of the respondents toward the skills of information technology?
5. What are the perceptions of the respondents toward staff development (SD)?
6. What type of method of teaching and philosophy do they use?

Part Two: Hypotheses Testing

7a. Null hypothesis is

H₀₁. There is no significant interaction between position levels and the level of genders on a combination of information technology in instruction and information technology plan?

This hypothesis tests against the alternative hypothesis.

H_{A1}. There is significant interaction between position levels and the level of genders on a combination of information technology in instruction and information technology plan?

7b. Null hypothesis is

H₀₂. There is no significant differences between teachers and administrators on a combination of information technology in instruction and information technology plan?

This hypothesis tests against the alternative hypothesis.

H_{A2}. There is significant differences between teachers and administrators on a

combination of information technology in instruction and information technology plan?

7c. Null hypothesis is

H_{03} . There are no significant differences between male and female on a combination of

information technology in instruction and information technology plan?

This hypothesis tests against the alternative hypothesis.

H_{A3} . There are significant differences between male and female on a combination of information technology in instruction and information technology plan?

In analyzing the data, there were three null hypotheses, which are 1a, 1b, and

1c. Multivariate Analysis of Variance (MANOVA) method was used to test them.

Descriptive method was used to analyze all the six questions descriptive. Crosstabs, percentages, frequencies, standard deviation, mean, and bar charts were used to analyzed the data.

The Statistical Package of Social Studies (SPSS V. 10.1, 2001) was used to test the null hypotheses and descriptive analysis in the study which is available at Alden Library in Ohio University.

