THE COGNITIVE ABILITY AND LEARNING STYLE OF STUDENTS
ENROLLED IN HOME ECONOMICS OCCUPATIONAL COURSES
IN SAN JUAN AND BAYAMON, PUERTO RICO

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
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By

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DEDICATION

To the memory of my father Ismael Martín Roldán
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# TABLE OF CONTENTS

DEDICATION ........................................... ii

ACKNOWLEDGEMENTS ................................... iii

VITA ..................................................... v

LIST OF TABLES ........................................ x

**Chapter I: INTRODUCTION**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Cognitive Ability</td>
<td>6</td>
</tr>
<tr>
<td>Learning Styles</td>
<td>8</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>11</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>13</td>
</tr>
<tr>
<td>Research Objectives</td>
<td>14</td>
</tr>
<tr>
<td>Limitations of the Study</td>
<td>15</td>
</tr>
<tr>
<td>Significance of the Study</td>
<td>15</td>
</tr>
</tbody>
</table>

**CHAPTER II: REVIEW OF LITERATURE**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose of the Study</td>
<td>17</td>
</tr>
<tr>
<td>Introduction</td>
<td>17</td>
</tr>
<tr>
<td>Occupational Home Economics in Puerto Rico</td>
<td>20</td>
</tr>
<tr>
<td>Cognitive Levels of Instruction</td>
<td>22</td>
</tr>
<tr>
<td>Introduction</td>
<td>22</td>
</tr>
<tr>
<td>Definitions of Thinking Skills</td>
<td>23</td>
</tr>
<tr>
<td>Summary of Bloom's Taxonomy</td>
<td>30</td>
</tr>
<tr>
<td>Validity and Reliability of Bloom's Taxonomy</td>
<td>32</td>
</tr>
<tr>
<td>Gender Variables in Thinking Skills</td>
<td>32</td>
</tr>
<tr>
<td>Teaching Implications in the Student Cognitive Ability</td>
<td>33</td>
</tr>
<tr>
<td>Learning Styles</td>
<td>35</td>
</tr>
<tr>
<td>Definitions</td>
<td>35</td>
</tr>
<tr>
<td>Learning Styles Classifications</td>
<td>37</td>
</tr>
<tr>
<td>Field Dependent and Field Independent Theory</td>
<td>43</td>
</tr>
<tr>
<td>Field Dependent</td>
<td>44</td>
</tr>
<tr>
<td>Field Independent</td>
<td>46</td>
</tr>
<tr>
<td>Gender as a Variable in Learning Style</td>
<td>47</td>
</tr>
<tr>
<td>Teaching Implications in the Student</td>
<td>48</td>
</tr>
</tbody>
</table>

vi
CHAPTER III: METHODOLOGY

Methodology.............................................. 52
Research Objectives.................................. 52
Research Design........................................ 53
Population and Subjects Selection............... 54
Instrumentation......................................... 56
Developing Cognitive Abilities Test,
Level K.................................................. 58
Group Embedded Figure Test....................... 59
Data Collection......................................... 61
Data Analysis........................................... 61
The Developing Cognitive Abilities
Test....................................................... 62
The Group Embedded Figure Test................. 62
Research Objectives Analysis..................... 62
Summary.................................................. 65

CHAPTER IV: FINDINGS

Students' Characteristics............................. 66
Gender of Students.................................... 68
Age of Students....................................... 68
Occupational Area of Study....................... 68
Grade Point Average of Students............... 69
Grade of Students.................................... 70
Schools of Participants............................ 71
Handicapped Students............................... 72
Students' Cognitive Abilities....................... 74
Cognitive Abilities by Gender...................... 75
Cognitive Abilities by Grade Point
Average................................................ 76
Students Learning Style.............................. 77
Learning Style by Gender........................... 78
Learning Style by Grade Point
Average................................................ 80
Correlates of Students' Cognitive Abilities... 80
Students Characteristics.......................... 80
Basic Cognitive Abilities......................... 81
Application Abilities.............................. 82
Critical Thinking Abilities....................... 82
Correlates of Students' Learning Style......... 83
Students' Characteristics........................ 83
Relationship Between Cognitive Abilities
and Learning Style of Students............... 84
Regression of Developing Cognitive
Abilities Test on Students
Characteristics................................. 85
CHAPTER V: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Purpose of the Study.............................................. 88
Problem Statement.............................................. 88
Research Objectives........................................... 89
Methodology..................................................... 90
  Research Design............................................. 90
  Instrumentation........................................... 91
Data Collection and Analysis................................. 92
Population and Subjects Selection............................ 92
Summary and Discussion of Findings.......................... 93
  Students Characteristics.................................. 93
  Students' Cognitive Abilities............................... 94
  Cognitive Abilities by Gender.............................. 94
  Cognitive Abilities by Grade Point Average.............. 95
Students Learning Style...................................... 96
Learning Style by Gender.................................... 96
Learning Style by Grade Point Average..................... 97
Correlates of Students' Cognitive Abilities.................. 98
  Basic Cognitive Abilities................................ 98
  Application Abilities...................................... 98
  Critical Thinking Abilities............................... 98
Correlates of Students' Learning Style and Students Characteristics.................. 99
Relationship Between Cognitive Abilities and Learning Styles of Students.................. 99
Regression of Developing Cognitive Abilities Test on Students Characteristics............. 100
Conclusions, Implications and Recommendations.............. 100
Recommendations for Further Research...................... 110

VI. APPENDICES

A. Description of Bloom's Taxonomy of Educational Objectives.................. 112
B. Letter for Permission of Parents........................................... 122
C. Letter to Students............................................... 124
D. Answered Sheet of the DCAT, and to Collect the Demographic Data............ 126
E. Instruction Sheet for the Developing Cognitive Abilities Test............. 129

F. Instruction Sheet for the Group Embedded Figure Test............. 134

G. Occupational and Instrument Code... 137

H. Panel of Experts..................... 139

I. Location of Vocational Institutions by Municipality and Educational Regions.................. 141

J. Organizational Chart, Vocational Education in Puerto Rico............. 143

VII. REFERENCES......................................... 145
List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Taxonomy of Educational Objectives - Cognitive Domain</td>
<td>7</td>
</tr>
<tr>
<td>2. Population: Bayamón Region</td>
<td>55</td>
</tr>
<tr>
<td>3. Population: San Juan Region</td>
<td>55</td>
</tr>
<tr>
<td>4. Population by School: Bayamón Region</td>
<td>56</td>
</tr>
<tr>
<td>5. Population By School: San Juan Region</td>
<td>57</td>
</tr>
<tr>
<td>6. Respondents by school and course</td>
<td>67</td>
</tr>
<tr>
<td>7. Gender of Students</td>
<td>68</td>
</tr>
<tr>
<td>8. Age of Students</td>
<td>69</td>
</tr>
<tr>
<td>9. Occupational Area of Study</td>
<td>70</td>
</tr>
<tr>
<td>10. Grade Point Average of Students</td>
<td>71</td>
</tr>
<tr>
<td>11. Grade of Students</td>
<td>71</td>
</tr>
<tr>
<td>12. Schools of Participants</td>
<td>73</td>
</tr>
<tr>
<td>13. Handicapped Students</td>
<td>73</td>
</tr>
<tr>
<td>14. Performance of students in the Developing Cognitive Ability Test, Level K</td>
<td>75</td>
</tr>
<tr>
<td>15. Developing Cognitive Abilities Test by Gender: Females</td>
<td>76</td>
</tr>
<tr>
<td>16. Developing Cognitive Abilities Test by Gender: Males</td>
<td>77</td>
</tr>
<tr>
<td>17. Cognitive Abilities by Grade Point Average</td>
<td>78</td>
</tr>
<tr>
<td>18. Learning Style by Gender</td>
<td>79</td>
</tr>
<tr>
<td>19. Learning Style by Grade Point Average</td>
<td>81</td>
</tr>
<tr>
<td>Table</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>20. Relationship Between Developing Cognitive Abilities Scores and Students Characteristics</td>
<td>82</td>
</tr>
<tr>
<td>21. Relationship Between GECT Scores and Students Characteristics</td>
<td>84</td>
</tr>
<tr>
<td>22. Relationship Between Cognitive Abilities and Learning Style of Students</td>
<td>85</td>
</tr>
<tr>
<td>23. Regression of Developing Cognitive Abilities Test on Students Characteristics</td>
<td>87</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Movements of reform based on the needs of the nation and the global economy are guiding vocational educators to find the most appropriate ways to prepare students for lifelong careers, the work environment, and family living. The challenge to provide opportunities for students to improve their quality of life as individuals and members of the family has been a major issue on the vocational agenda (Thomas & Englund, 1989).

The United States Department of Labor, in the Secretary’s Commission on Achievement Necessary Skills Report (SCANS Report, 1991), concluded that traditional jobs were changing in their environment and new jobs were created everyday. The new jobs require from the employees abilities that were not required: the ability to learn, the creativity in the performance of the work, the ability to resolve problems, and the skills and attitudes on which employers can build their companies and enterprises are some of the new abilities required from the employees (SCANS Report, 1991). In other words, the new job settings require high levels of performance. The employee, besides the abilities identified,
must have the commitment to excellence and product quality. According to the SCANS Report (1991), the goals for the excellence and product quality can be achieved by developing employees with solid performance bases, and with the ability to make adequate decisions in the lower levels of the enterprise or company. Five competencies were identified for the solid performance of the employees. The competencies were: the ability to allocate resources, such as time, money, materials, space and staff; interpersonal skills for team work, teaching others, leading negotiating and work well with people from cultural diverse backgrounds; acquire, organize, interpret, communicate and evaluate information; understand social, organizational and technological systems; and select, apply and maintain technology (SCANS Report, 1991). The foundations to perform the competencies were identified as: basic skills, thinking skills, and personal qualities. The SCANS Report (1991) assured that the effective performance of workers absolutely required high levels of performance in all three parts of the foundation areas.

One of the goals of the Carl D. Perkins Vocational and Applied Technology Education Act of 1990 was the integration of vocational and academic education through the development of basic skills in the vocational courses. This vocational and academic integration moves vocational education to provide the students with the opportunity to achieve the vocational and academic competencies. On the other hand, higher standards for
the preparation of the academic and occupational competencies of students and systematic evaluations of the delivery system for vocational education were required (Carl D. Perkins, 1990).

The new requirements which call for a better prepared work force will alert educators to the fact that vocational education must be concerned, not only in the teaching of knowledge related with a particular task or job, but in the application of such knowledge into particular contexts and situations in the work setting and life (Thomas & Englund, 1989). According to Thomas and Englund (1989), "Education that prepares people for practice in rapidly and dramatically changing work or family contexts must include the development of higher order thinking process and broader concepts of types of problems and situations" (p. 2). As identified in the SCANS Report (1991), and in many educational forums and research, vocational education must recognize the need to develop higher-order thinking skills as a significant goal in vocational education. Vocational educators should be concerned not only with the understanding of concepts, but with the applications of those concepts in particular contexts, problems or situations (Thomas & Englund, 1989).

Higher order thinking was defined by Thomas and Litowitz (1986) as complex levels of intellectual functioning involving mental processes that demand more than simply taking in and storing information. Laster (1985) defined higher order
thinking as purposefully processing information beyond superficially memorizing or recalling it. Quellmalz's (1985) definition of higher order thinking was an attempt to merge the psychology and philosophy perspectives. According to Quellmalz (1985), higher order thinking was the process in which students could: a) identify the task or problem types, b) define and clarify essential elements and terms, c) judge and connect relevant information, d) evaluate the adequacy of information and procedures for drawing conclusions and/or solving problems.

Trends and issues in Home Economics Education identified by national experts (Falcón, 1993) included some related movements within the concept of higher order thinking in the development of the instructional process. The trends were as follows:

- view of Home Economics as a critical science with a curricular emphasis on practical problem solving.
- critical thinking, e.g. practical reasoning and practical problem solving, as the content of home economics.
- movements toward performance based education and the need to test for the many processes taught as well as content taught.

Byrd (1990) emphasized some themes and educational trends that were affecting the future of Home Economics. Some of these themes and trends were identified as: the evolving
global economy would require greater interactions across geographical boundaries; business would increasingly require competent workers who could perform the different roles and tasks; readily available information requires the ability to receive and transmit information in spoken, written, and numeric form; and, rate of change will require individuals with the ability to react positively and productively to the demands imposed by the rapid changes.

Based on these themes and trends, some questions arose. What are the benefits for the future for the development of higher-order thinking skills in the students? Is Home Economics Education developing the higher order thinking skills? If not, how can Home Economics teachers develop these skills? What instructional strategies should be used to develop thinking skills? What is the role of the Home Economics Programs in terms of teacher preparation and curriculum development, in order to develop higher order thinking skills in the students?

"The future depends on high performance work organizations and a highly competent workforce" (SCANS Report, 1991, p.2). The standards for quality vocational Home Economics education programs were based on the assumption that all Home Economics programs prepared students with employability and/or job specific skills, as well as skills which could be used by men and women for the occupation of
homemaking and their dual career roles (The University of Iowa, 1985).

The development of higher order thinking skills in Home Economics students will approach the school of tomorrow described in the SCANS Report (1991). The focus should be on the development of thinking skills, where the students will construct their knowledge for themselves, using cooperative problem solving, where the skills will be learned in context of real problems where the student is the center of the instructional process, and where all the students learn to think.

**Cognitive Abilities**

Bloom, Englehart, Furst, Hill, and Krathwohl (1956) defined the intellectual abilities as those where the individual was able to "find appropriate information and techniques in his [sic] previous experience to bring to bear on new problems and situations" (p. 38). Based on the definition of Bloom, et al. (1956) a category for levels of cognition in the Taxonomy of Educational Objectives was developed (Table 1).

The principal purpose of Bloom's Taxonomy was to facilitate the communication in terms of the cognitive behaviors (Bloom et al., 1956). Miller (1989) pointed out that intellectual abilities and skills as defined by Bloom et al. (1956) provided a point of reference for considering the
types of cognitive abilities. In the Bloom's Taxonomy, the intellectual skills and abilities were composed of the upper four levels: application, analysis, synthesis, and evaluation (Bloom et al., 1956).

Table 1

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<thead>
<tr>
<th>Taxonomy of Educational Objectives - Cognitive Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category</strong></td>
</tr>
<tr>
<td>Knowledge</td>
</tr>
<tr>
<td>Comprehension</td>
</tr>
<tr>
<td>Application</td>
</tr>
<tr>
<td>Analysis</td>
</tr>
<tr>
<td>Synthesis</td>
</tr>
<tr>
<td>Evaluation</td>
</tr>
</tbody>
</table>

Source: Bloom et al., (1956)

Throughout several decades, the cognitive concerns of individuals, especially in the educational field, have been studied. Research has revealed a close relationship between people's thinking process, the nature of knowledge, the meaning associated with events, and level of competence (Thomas & Englund, 1990). Cognitive research also suggested that knowledge structure was organized in a way that
integrates: features of the external world, goals or intentions, actions and domain-knowledge concepts, and principles (Thomas & Englund, 1990).

Sternberg (1985) developed a hierarchy of intelligence where the thinking skills must be viewed as a subset of intelligence functioning. Sternberg (1985) suggested that the understanding and assessing thinking skills required the examination of three aspects of intelligence:

- the mental process and representations that underlie thinking,
- the relative degree of familiarity of the task and situations to which these process and representations are applied, and,
- the real world context to which the process and representations are applied for tasks and situations of varying degrees of familiarity.

Educators (Fedje, 1987; Cano, 1989; Thomas & Englund, 1990; Miller, 1990; Wittington, 1991) recognized the importance to provide instruction that developed the ability of the student to apply thinking skills in everyday life, in the development of the skills of reading, writing and listening, and in a particular profession, trade or role.

**Learning Styles**

Joyce and Weil (cited in Ellis, 1979) identified more than 80 models of teaching from which a teacher could choose.
Ellis (1979) defined models as teaching strategies based on the theories of educators, psychologists, philosophers and others who questioned how individuals learn. Ellis (1979) identified two models that were particularly useful to a teacher who wanted to provide a variety of learning environments for students. The two models were: the inductive thinking model based on Taba's work (1967, cited by Ellis 1979) and the role playing model developed by Shaftel and Shaftel (cited in Ellis, 1979). Ellis (1979) concluded that together, these two models outline strategies for:

a) teaching concepts from the simple to the complex;

b) providing structure or negotiating it with students;

c) selecting topics and materials for study or permitting students to select part or all of them;

d) fostering the development of empathy;

e) encouraging participation in group discussion and activities;

f) helping students formulate and test hypothesis; and

g) enabling students to engage in creative problem-solving and testing alternatives.

Ellis (1979) added that by learning to use the two models, a teacher practices modulating the cognitive level of
a discussion from the factual to the conceptual to the theoretical, served as a facilitator and clarifier of student discussion rather than as a source of information.

Other models provided teachers with strategies to deal with the learning styles of the students, some of these are: Roger's Non Directive Model (1951) where the teacher reflects feelings to help the student solve his/her own problems, and Gordon's Synectics (1961), a model for developing metaphorical thinking in creative problem solving (Ellis, 1979).

Dunn and Dunn (1979) provided evidence that when the teacher taught through methods that complemented the student learning characteristics, students at all levels became motivated and tended to achieved better academically. Therefore, Dunn and Dunn (1979) concluded that it was necessary to be sensitive to the learning characteristics of the students to develop the instructional process according to their needs.

"If the concept of cognitive styles is to prove useful on an educational context, either by contributing to the prediction of success in various disciplines or to the development of appropriate teaching methods, then it will be necessary to show a relationship between cognitive styled dimensions and performance on academic tasks" (William, 1975; p.63)
Statement of the Problem

One of the goals of vocational education is to prepare a student with the levels of proficiency in occupational and academic skills required by the world of work (SCANS Report). Therefore, Carnevale, Gainer, and Schulz (1990) stated that:

"For employers that utilize technical workers, skills of America's emerging labor pool, and the demands of more and more sophisticated technology are on a coalition course. It is ironic that as the workforce becomes more technologically complex, the rising pull of available workers is lacking in many of the simple and most basic skills including reading, problem solving, computation and knowing how to learn" (p.1).

In summary, business and industry are requiring from vocational education students higher levels of thinking skills and the ability to integrate thinking and knowledge in relation to practice (Thomas & Englund, 1989). The question is: Is Vocational Education achieving the goals of preparing students with the skills and abilities to compete in the world of work? If not, what could be some reasons?

According to Dunn, Shea, Evans and MacMurren (1991), substantial research has been conducted concerning the
teaching-learning process, cognition, and psychosocial behavior. The results of the research showed that one of the reasons for the poor performance of students was due to the type of instruction the teachers provided (Dunn et al., 1991). Results of studies indicated that the teacher, rather than the materials or methods, made the difference in the performance of the students (Kuchinkas, 1979).

On the other hand, educators and psychologists have recognized the presence of learning styles in different students' behaviors (William, 1975; Dunn & Dunn, 1979; Ellis, 1979; Fisher & Fisher, 1979; Cano, 1988; Torres, 1993). Students respond to instruction in terms of their learning styles (Dunn, Shea, Evans, & MacMurren, 1991). Kuchinkas (1979) stated that the teacher has a very important role in the development of skills in the students, and the type of instruction provided must respond to the different learning styles of the students.

If vocational educators want to prepare students not only with the entry level skills, but with a longlife education, it is necessary to prepare the students with skills and abilities which will help them to be successful in life. On the other hand, the teachers must be aware of the learning styles and cognitive abilities of the students in order to provide the levels of instruction according to the individual needs of students and the demands of the job.
The skills and abilities the students need have been identified by national reports and legislation (SCANS Report, 1991; Carl D Perkins Act, 1990). Some research has been conducted on cognitive science and learning styles, but few vocational educators have directly focused on the vocational area of study.

There are few investigations about the cognitive levels and/or learning styles of the Puerto Rican students. There is no research in Puerto Rico that investigates the occupational Home Economics students in terms of their cognitive abilities and learning styles. Research on the characteristics of the students in terms of the cognitive abilities and learning styles is needed in order to identify the areas that can be improved in the curriculum development, and instructional process. Also, the knowledge about the cognitive abilities and learning styles of students will greatly enhance the teachers' action to meet the students' needs.

**Purpose of the Study**

The purpose of the study was to determine the cognitive abilities and the learning styles of students enrolled in Home Economics courses in San Juan and Bayamón Regions in the Department of Education in Puerto Rico. The study also sought to relate cognitive abilities to selected students' characteristics, including learning style, and to explain and
predict the Developing Cognitive Abilities Test scores of students enrolled in Home Economics occupational courses.

**Research Objectives**

To accomplish the purpose of the study, the following objectives were developed:

1. Describe the students enrolled in the Home Economics occupational courses on the following variables: age, gender, and cumulative grade point average (GPA).

2. Determine the cognitive abilities (basic, application, and critical thinking) of occupational Home Economics students as measured by the Developing Cognitive Abilities Test (DCAT), Level K.

3. Determine the learning style of occupational Home Economics students as measured by the Group Embedded Figure Test (GEFT).

4. Describe the relationships between cognitive abilities (basic, application, and critical thinking) utilizing DCAT, Level K, and selected variables (age, gender and cumulative GPA).

5. Describe the relationship between learning style as measured by the GEFT and selected variables (age, gender and cumulative GPA).

6. Describe the relationship between cognitive abilities utilizing the DCAT and learning style.
utilizing the GEFT of students enrolled in Home Economics courses.

7. Explain variance in the dependent variable, DCAT scores, through a linear combination of the independent variables.

Limitations of the Study

The nature of this study was descriptive and relational. The study was limited to the students enrolled in occupational Home Economics courses in San Juan and Bayamón, Puerto Rico.

Significance of the study

Vocational educators are concerned with the integration of knowledge and thinking in relation to the performance of vocational students in the work place. The intent of some movements of reform in vocational education is to integrate higher order thinking skills in the curriculum in an effort to develop the thinking processes that facilitate mental reconstruction of stored knowledge and operations involved in the accomplishment of the task to be performed (Scribner, 1985).

The knowledge about the learning style of the students will help the Puerto Rico Department of Education identify appropriate inservice training for teachers for the improvement of the delivery process of vocational education where the students not only understand the context of the
subject matter, but also to develop a process on "how, when, and where" to use the acquired knowledge in better ways (Thomas & Englund, 1989).
CHAPTER II

REVIEW OF LITERATURE

Purpose of the study

The purpose of the study was to describe the cognitive abilities and the learning styles of students enrolled in occupational Home Economics courses in San Juan and Bayamón Regions in Puerto Rico. The study also sought to relate the cognitive abilities with selected students characteristics, and to explain and predict the Developing Cognitive Abilities Test scores of students enrolled in Home Economics occupational courses.

Introduction

Social, political, economic, and technological changes have been occurring in the world. These changes are affecting the family and work directly. The outcomes of these changes require the need for people dedicated themselves to the improvement of the quality of life for individuals and families (Byrd, 1990).

The Lake Placid Conference on Home Economics (1902) established the definition of Home Economics as "...the study of the laws, conditions, principles and ideals which are concerned on the one hand with man's [sic] immediate physical
environment and, on the other hand, with his nature as a social being, and, is a study of the relationship between these two factors". The definition of Home Economics is the foundation of the philosophy of the programs in all the nation and in Puerto Rico. The challenge within the Home Economics profession in the changing environment and the social being must be to find different ways to assess the outcomes and effectiveness of the Home Economics educational programs, and to be aware about the advances in the science of learning to revolutionize the educational process (Byrd, 1990). The overall goal of Home Economics is to improve the quality of life for individuals, families and other groups by helping learners acquire competencies and make decisions related to their physical environment, their own development, the development of others, and their relationship with others (The University of Iowa, 1985).

To reach the Home Economics goals and objectives it is necessary to develop in the students a problem solving approach. Problem solving approach was and will be part of the home economics education (Laster, 1987). The problem solving approach requires a complex cognitive process, skills, and abilities to get the most appropriate solution. Sternberg and Baron (1985) maintained that the ultimate goal of education was to teach students to think critically and independently toward the problem solution. In that process, is the students' ability to understand and use information what makes the
difference in performance? Is the ability to retrieve the information and apply it to solve problems what makes the educational process a success?

Many critics are expressing concern with the ability of vocational students to compete in the global market. This poor performance should be the consequence of providing similar instruction for all students rather than for their individual weaknesses and strengths. The integration of basic academic skills in vocational education, and the improvement of school-to-work transition programs, are innovations that may revolutionize the educational process. The implementation of the aforementioned innovations are the response of the needs identified in vocational education by several studies and observations about the low performance of the vocational students (Champagne, 1986). Champagne (1986) identified that the inability to think and make decisions is one reason for low performance, while the ability to understand the consequences of alternative courses of action is an essential condition for success in employment.

Thomas and Englund (1989) agreed that there is a relationship between thinking process and a high level of competence in practice of an occupation. Cognitive research suggested that knowledge structures which support complex thinking are organized in a way that integrates the external world, goals, action and knowledge domain.
The development of higher order thinking skills in the curriculum of home economics programs requires activities where the students have the ability to define and clarify information, infer-solve problems and draw conclusions (Ennis, 1985).

To be competitive in the work force, Home Economics students and all vocational students must acquire skills in the problem solving approach and competence in the specific occupational tasks (Lankard, 1993). Students will need direct help to develop these skills, and teachers can make a positive difference in the quality of home economics students (Laster, 1987). Also, attention to learning styles is a key factor in motivating classroom performance (Fleming, 1989).

**Occupational Home Economics Education in Puerto Rico**

In the 1920's, the Vocational Area of the Department of Education, under the Home Economics program, developed courses on nutrition, house administration, sewing and industrial sewing called Consumer and Homemaking Education. These courses were developed for elementary and high school girls and adult females. In 1963, the Vocational Education Act was signed. The aforementioned law established the program known as Education for Employment, in addition to the already existing Consumer and Homemaking Education. The Vocational Education Law bounded the states to offer occupational courses for the world of work in the public schools.
The occupational courses in the Home Economics Program have been expanded by agreement with the technological need, work trends and federal legislation. By the year 1995-96, the Occupational Home Economics Program in Puerto Rico enrolled 880 students in the secondary, post-secondary and adults levels in the following courses (Statistic Report, Puerto Rico Department of Education, 1994-95):

- Child care aide/assisting
- Child care and guidance management and services
- Custom apparel/garment seamstress
- Custom tailoring management and service general
- Wedding/specialty consulting
- Food production, management and service/general
- Commercial bakery
- Chef cook
- Food service
- Floral design
- Home decorating
- Cleaning services
- Craft/general

According to the Puerto Rico Occupational Information Coordinating Committee (PROICC, 1991) in the reports on the occupations of major demands for the year 2,000, it was expected that an increase of 24,054 employees are needed in Home Economics areas to fill the demand of the industry. The change required for the future is to update the home economics
knowledge base in the areas of resource management, nutrition, family science, biotechnology, rural revitalization, merchandising/retailing, housing, marketing, and consumer sciences (Page, 1987).

Cognitive Levels of Instruction

Introduction

The SCANS Report (1991) identified thinking skills as one of the three foundations that the worker needs to better achieve high levels of performance in the employment of the present and the future. The report stated that the good jobs will increasingly depend on people who can put knowledge to work.

In the discussion of the major issues for the 90's, Miller (1990) supported that workers for the year 2,000 must be thinkers and problem solvers. He stated that the workers need to access knowledge and make application of information as a routine part of producing. On the other hand, Cheek (1990) added that the workplace is becoming increasingly complicated, and as a result requires more sophisticated preparation and new experiences on which to build the knowledge. Champagne (1986), Cheek (1990), and Lankard (1993) noted that more reasoning skills are required and the need for applied science and mathematics in all areas of vocational education is increasing.
Beyer (1984) believed that the primary reason for poor achievement in thinking skills is that most teachers do not teach these skills. Five major reasons why the educators did not put to better use the time to teach thinking skills were: lack of consensus on which thinking skills teach, lack of knowledge in identifying those cognitive operations that constitute the individual skills they choose to teach, most teachers never provide the kind of instruction that research suggests is more productive in developing thinking skills, often the curriculum suffers from skills overload, and the achievement tests used in many schools inhibit the use of higher order thinking skills (Beyer, 1984).

Definitions of thinking skills

Some educators and researchers argued that the definitions of thinking skills are too vague and appear useless as guides for the development of teaching, curriculum, and evaluation procedures (Ennis, 1985), and that educators often define thinking skills inaccurately (Beyer, 1984). This fact is evident in the research literature, in part because of the different bodies of knowledge defining the higher order thinking (Thomas & Englund, 1989). These perspectives included problem solving, (Laster, 1987); goal-direct action and critical thinking (Way, 1987; Ennis, 1985; Sternberg, 1985). Nevertheless, most educators agreed that thinking skills are
essentially mental techniques or abilities that enable human beings to formulate thoughts, to reason about, or to judge.

Lazear (1992) summarized the key findings in intelligence research. The first finding was that intelligence is not a fixed or static reality. It was thought in the past that the intelligence was set at birth by heredity and could be assessed through quantifiable tests only. This idea of fixed intelligence did not take into account the cultural differences, environment, and socialization factors. Researchers are looking at intelligence as a capability that can be enhanced and amplified. The second finding was that intelligence can be learned and taught. It was found that the intelligence capabilities have a neuro-biological base, and that the mental functioning can be improved at any age. The third finding was that intelligence is a multi-dimensional phenomena that occurs at multiple levels of the brain/mind/body system. Based on this assumption, Gardner (1985) suggested that all persons possess a "multiple intelligence" where there are many ways to know, perceive, learn, and process information. Gardner (1985) identified seven ways of knowing: verbal/linguistic intelligence, logical/mathematical intelligence, visual/spatial intelligence, body/kinesthetic intelligence, musical/rhythmic intelligence, interpersonal intelligence, and intrapersonal intelligence. Gardner (1985) pointed out the fact that one or two intelligences are stronger than the others. Gardner (1985)
concluded that by doing a variety of exercises persons can perform to strengthen and enhance any intelligence skills.

For the purposes of the present research, verbal/linguistic, logical/mathematical, and visual/spatial abilities of students in the study were assessed. The verbal/linguistic ability (Knowledge and Comprehension dimension in Bloom's Taxonomy) was defined as the literal understanding and the appropriate uses of words and phrases. It is involved in any formal or informal conversation, the use of metaphors, similes, analogies, and the proper use of grammar and syntax in speaking and writing (Gardner, 1985; American Testronics, 1990; Lazear, 1992). The logical/mathematical ability (Application dimension in Bloom's Taxonomy) was defined as the functional understanding of arithmetic operations, basic geometric concepts, and the ability to apply mathematical principles in the solution of story problems. The logical mathematical ability requires problem solving or meeting a new challenge. It was often associated with the "scientific thinking", and it was used to find connections or see relationships between seemingly separate and distinct pieces of information (American Testronics, 1990; Lazear, 1992). The visual/spatial ability (Analysis and Synthesis in Bloom's Taxonomy) was measured by the recognition and retention of such characteristics of objects as size, shape, symmetry, pattern, and the ability to estimate what would occur when one or more objects change in
location or position. It also referred as the perceiving from different angles, recognizing spatial relationships, graphic representation, image manipulation, forming mental images, and active imagination (American Testronics, 1990; Lazear, 1992).

According to Champagne (1986) the first step in developing understanding is to specify what a person needs to know to perform successfully. He pointed out that the ability to understand the consequences of an alternative course of action is an essential condition to success in employment. The reasoning capacity requires a person to be able to identify problems, consider and evaluate possibilities, formulate and reach decisions logically, separate fact from opinion, adjust unanticipated situations by applying established rules and facts, work out new ways of handling recurring problems and determine what is needed to accomplish work assignments (Champagne, 1986).

It is generalized within the educational research that the higher levels of Bloom's Taxonomy (analysis, synthesis, and evaluation) are the higher-order thinking skills (Ennis, 1985).

Quellmalz (1985) concluded that students engage in purposeful, extended lines of thought during which they:

- identify the task or problem type,
- define and clarify essential elements and terms,
- judge and connect relevant information,
evaluate the adequacy of information and procedures, for drawing conclusions and/or solving problems.

Quellmalz (1985) identified analyzing, comparing, inferring, interpreting and evaluating as higher order process. He identified, also, process, monitoring reviewing and revising as central metacognitive process where the learner can evaluate and re-check progress. He supported that through the process the students became self-conscious about their thinking and develop self-monitoring problem-solving strategies.

According to Thomas and Litowitz (1986), higher order thinking skills are complex levels of intellectual functioning involving mental process that demand more than simple taking and storing discrete bits of information. Thomas and Englund (1989) stated that mental process included the processing of information as it is influenced by perception and individual dispositions. Mental structures include the forms, organization, arrangements and systems in which knowledge exists in the human mind. The expertise in the use of the mind refers to the possession of high level of skill in identifying and solving problems, resolving situations and performing certain functions.

The SCANS Report (1991) defined thinking skills as the ability to think creatively, to master the decision making process and problem solving approaches, know how to learn and reason. Quellmalz (1985) stated that one goal of higher-order
thinking instruction proposes that students engage in purposeful, extended lines of thought in which they identify and analyze a problem, identify and relate information necessary to address the task, and evaluate the adequacy of conclusions or solutions. The cognitive processes of analysis, comparison, inference, and evaluation seem to be involved in various combinations in reasoning tasks, as do the three metacognitive components—planning, monitoring, and reviewing/revising.

Some analysis and definition in the areas of philosophy, psychology and curriculum theories guide some models for the development of higher order thinking. Philosophy provided definitions for the reasoning skills and criteria for judging when reasoning is done well, psychology also identified reasoning skills and their underlying cognitive process, and sketches a process for how reasoning is used to address purposeful tasks. In education, Bloom's Taxonomy classified types of thinking skills. This classification of Bloom has been the most frequent guide for classifying thinking skills.

Some models in the development of higher order thinking skills are as follows:

Philosophy

Dewey (1933), cited by Quellmalz (1985), defined reflective through as "the careful, persistent examination of an action, proposal, or belief and the analysis of use of knowledge in light of ground
that justify it and its probable consequences." (p 30).

Smith (1953) cited by Quellmalz (1985), defined critical thinking as "what a statement means and whether to accept or reject it" (p. 30).

Ennis (1984), included the "clarifying issues and terms, identifying components of arguments, judging the credibility of evidence, using inductive and deductive reasoning, handling arguments fallacies, and making value judgements." (p.30).

Psychology

Piaget (1970) made a distinction between formal and operational thought. This distinction is used to differentiate among problems requiring logical reasoning.

Sternberg (1983) placed the components of intelligence test into problem solving framework. His model includes skills in knowledge acquisition, performance, and metacognitive, and self monitoring skills. The theory identified analogical, inductive, and deductive reasoning skills required to perform both novel and familiar tasks.

Curriculum

Bloom's Taxonomy (1956) is the most used guide for classifying higher order skills in curriculum

Summary of Bloom's Taxonomy

Through the decades the most important tool for classification of educational objectives has been the hierarchy of Bloom's taxonomy (Bloom et al., 1956). The intention of Blooms' taxonomy was to classify the intended behavior of students which represents the intended outcomes of the educational process. The taxonomy was based on four guiding principles:

- In the use of the taxonomy, the major distinctions were revealed between classes, the distinctions teachers make among students, and in the way teachers teach educational objectives.
- The taxonomy was logically developed and internally consistent.
- The taxonomy was consistent with the current understanding of psychological phenomena.
- The classification was descriptive in which every type of educational goal could be represented neutrally.

Bloom's Taxonomy contained six hierarchy levels for the classification of educational objectives. The six levels were knowledge, comprehension, application, analysis, synthesis,
and evaluation. Bloom defined each level of the hierarchy as follows:

- Knowledge- "includes those behaviors and test situations which emphasize the remembering, either by recognition or recall, of ideas, materia, or phenomena" (p. 62).

- Comprehension- "an understanding of the literal message contained in a communication.

Three types of comprehension behavior are:

translation- which means that an individual can put a communication into other language or into another form of communication;

interpretation- which involves dealing with a communication as a configuration of ideas whose comprehension may require a reordering of the ideas into a new configuration in the mind of the individual; and

extrapolation- that includes the making of estimates or predictions based on understanding of the trends, tendencies, or conditions described in the communication. It will also involve the making of inferences with respect to implications, consequences, corollaries and effects which are in accordance with the conditions described in the communication" (p. 89-90).

- Application- "given a problem new to the student, he (sic) will apply the appropriate abstraction without having to be promoted as to which abstraction is correct or without having to be shown how to use it in that situation" (p. 120).

- Analysis- "emphasizes the breakdown of the material into its constituent parts and detection of the relationships of the parts and of the way they are organized" (p. 144).

- Synthesis- "is the putting together of elements and parts so as to form a whole. This is a process of working with elements, parts, etc., and combining them in such a way as to constitute a pattern structure not clearly there before" (p. 162).
Evaluation— "is defined as the making of judgements about the value,...It involves the use of criteria as well as standards for appraising the extent to which particulars are accurate, effective, economical, or satisfying" (p. 185).

In discussing the levels of the taxonomy, Bloom et. al. (1956) specified that "the whole cognitive domain of the taxonomy is arranged in a hierarchy, that is, each classification within it demands the skills and abilities which are lower in the classification order" (p. 120), Appendix (A) provides a more detailed description of each level.

Validity and reliability of Bloom's Taxonomy

After an exhaustive review of literature, Fain and Bader (1983), Furst (1983), Cano (1988), Miller (1989), Wittington (1991), and Torres (1993) stated that in spite of the issues concerning on the validity and reliability of the Taxonomy presented by some educators (Fain & Bader, 1983) the Bloom's Taxonomy is still the most valid and reliable tool in education for the classification of cognitive behaviors in curriculum development and in evaluation.

Gender variables in thinking skills

Several studies (Halpern, 1986; Page, 1987; Maccoby & Jacklin, 1974) provided evidence that females are more relational in their thinking, more emotional and more process oriented than males. Males tend to be more logical rational
thinkers and view things as right or wrong. Females are more "maybe" oriented tending to hedge before making decisions. Either or thinking can be an obstacle to learning critical thinking skills because it prohibits a variety of solutions from emerging. If it has to be either/or, then all the possibilities in the middle are ruled out. This may mean that males will want less time to explore alternatives. But exploring alternatives is an essential part of critical thinking abilities.

Teaching Implications in the Student Cognitive Ability

Lee (1989) emphasized that the teachers' behavior and attitudes encourage vocational students to develop thinking skills. Way (1987) stated that through cooperative learning group discussions the teacher can develop higher order thinking skills in their students. Olcott and Osborn (1985) pointed out that the activities in the classrooms can be sorted for the development of higher order thinking skills in the following way: 80% cooperative activities, 10% competitive activities and 10% individual activities.

Way (1987) concluded that there are three requirements to help the students make rational decisions about what to do or believe. These are:

- extensive/accessible knowledge— included facts, principles, abstractions, and procedures clustered in big conceptual categories. It
means that the best way to teach critical thinking is when there are real world opportunities to apply knowledge.

- cognitive skills—these include executive or metacognitive and non-executive thinking skills. The executive skills are: planning (recognize and define the nature of the problem, choose process needed to solve it and sequence operation in an overall strategy), representation (decide how to organize and interpret information related to the problem) and self monitoring (recognize achievement, anticipate errors, identify and correct errors when occur, choose strategies when the errors occur, assess appropriateness of outcomes and capitalize on one's personal learning style).

Non executive thinking skills include: classify, compare and contrasting, discrimination between fact and opinion, generating and testing hypotheses, and using inductive and deductive reasoning.

- disposition to think productively and critically—the ability and inclination to try to make ethical and intellectually defensive decisions, to search for multiple meanings, and to look for alternatives.
As in other vocational courses, it is important to develop the climate for the development of higher order thinking skills. Also, as part of the learning experience, the youth organization (Futures Homemakers of America) has the best climate to develop higher order thinking skills in the students (Way, 1987). Way (1987) presented some suggestions that must be used in the learning experience activities: devoting attention to thinking, teaching thinking skills directly, and providing opportunities for interaction through cooperative learning and discussion.

Learning styles

Definitions

Educators and psychologists have recognized the presence of cognitive or learning styles in different forms of behaviors. Schools continue to teach groups of students rather than to individual students within those groups (Dunn, Shea, Evans, & MacMurren, 1991). As a result of research and observations, some dimensions of learning styles have been studied through the educational process, and some definitions have arose. Williams (1975) provided the rationale where he defined learning style as the characteristic way in which persons prefer to conceptualize and organize the stimulus world.

Dunn and Dunn (1979) defined learning style as the way each person learned. Fisher and Fisher (1979) stated that
learning style referred to a pervasive quality in the behavior of an individual, a quality that persisted through the content may change. In addition, Kuchinskas (1979) pointed out that learning style was the way an individual acts, reacts, and adapts to the environment. According to Kuchinskas' (1979) rationale, the action/reaction/adaptation could be mapped to provide insight into an individual's behavior. Flemming (1989) defined learning styles as the cognitive, affective, and psychological traits that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment.

The definition provided by Dunn, Shea, Evans, and MacMurren (1991) was based on the way each learner begins to concentrate, process, and retain new and difficult information. Dunn et al. (1991) stated that the interaction of the learner with the new and difficult information occurred different for everyone. This means that to improve the performance of the students, it is necessary to provide different types of instruction to each student (Dunn et al., 1991; and Sternberg, 1994).

Witkin, Oltman, Raskin, and Karp (1971) stated that learning styles are the characteristics, self consistent modes of functioning which individuals show in their perceptual and intellectual activities. According to Witkin et al. (1971), the learning styles are the manifestations in the cognitive
sphere of still broader dimensions of personal functioning which cut across diverse psychological areas.

Learning Styles Classifications

Studies have been conducted in order to classify learning styles and to identify the strengths and weaknesses of the learner in terms of different educational situations. Fisher (1979) promoted the classification of learning styles as the following:

- the incremental learner—these students proceed in a step by step fashion, systematically adding bits and pieces together to gain larger understanding.

- the intuitive learner—there are leaps in various directions, sudden insights and meaningful and accurate generalizations derived from an unsystematic gathering of information and experience. The quality of their thinking generally exceeds their verbal ability to describe the steps by which conclusions are reached.

- the sensory specialist—relies primarily on one sense for the meaningful formation of ideas, while the other senses are intact and functioning. One sense tends to predominate.
the sensory generalists—uses all or many senses in gathering information and gaining insights.

- the emotionally involved—they function best in a classroom in which the atmosphere carries a high emotional charge.

- the emotionally neutral—the emotional tone is low-keyed and relatively neutral in the classroom.

- explicit structure—the teacher makes explicit a clear, unambiguous structure for learning. Limits and goals are carefully stated, guiding the intellectual tasks to be achieved as well as the behaviors that will be acceptable and unacceptable in the classroom.

- open-ended structure—fairly in an open-ended learning environment.

- eclectic learner—can shift learning styles and function profitably. May find one or another style more beneficial, but can adapt to and benefit from others.

By experimenting with strategies, Dunn and Dunn (1979) found that most methods and/or resources appeared to work with some students, but not with others. Dunn and Dunn (1979) recognized that those students who were successful with a
particular method or set of materials had essentially similar characteristics.

Dunn and Dunn (1979) provided evidence in order to support that what was taught through methods that complemented the student learning characteristics, students became increasingly motivated and achieved better academically. Based on observations, interviews, and experimental studies conducted since 1967, Dunn and Dunn (1979) provided evidence that individuals respond uniquely to their immediate environment, and identified two groups of students:

- Motivated- This type of student is persistent, responsible and needs to be told what they are required to learn, what they may use as resources, how they may demonstrate their acquired knowledge or skill, and where to get help if it is needed. They welcome praise and feedback when the assignment has been completed.

- Unmotivated- This type of student is not persistent and/or the less responsible, requires short assignments or very few objectives, frequent feedback, a great deal of supervision and authentic praise as they are working.

Sternberg (1994), agreed in classifying the learning styles as preferences. He classified thirteen (13) learning
styles under five categories: functions, forms, levels, scope and learning. Sternberg (1994) stated that most of the persons tend toward one style within each category, although these preferences may vary with the task and a specific situation.

One of the most frequently examined dimensions of cognitive styles is that of field dependent and field independent learning (Williams, 1975). Williams (1975) pointed out that this approach has come to be recognized as the ability to select relevant stimuli that are embedded in a larger context. The subject has to resist the interfering effects of the contextual stimuli (Witkin, 1977).

In the area of vocational education, Flemming (1989) studied 2,808 vocational students from Ohio in areas of agriculture, business, home economics, marketing, and trade and industry programs. Flemming (1989) used Kenneth and Rita Dunn's inventory to get a profile typical among vocational students in the following areas:

- emotional behavior- elements of learning styles include motivation, persistence, responsibility, and structure characteristics,
- environmental- preferences for certain levels of sound light and temperature, and for different ways the setting for learning is design.
- sociological- elements that determine preference for solitary or group work.
• physical- elements concerned preferred mods of perception, time of day, and the need for intake and mobility.
• psychological- elements of learning styles that include analytical-global, locus of control, and impulsive-reflective tendencies.

The study revealed the following:
• emotional- vocational students tend to be motivated by external forces, especially peers, and they may need such encouragement to start and persevere in learning.
• environmental- vocational students tend to prefer sound while they work and study, lower lights, warmest temperatures, informal design, limited options and clear and specific rules.
• sociological- vocational students prefer pairs or teams and group activities.
• physical- vocational students prefer tactile learning, kinesthetic learning (manipulation and mobility).
• psychological- vocational students tend to be global in the perceptions and reflective instead of impulsive.

Based on the aforementioned study, Flemming (1989) concluded that every vocational teacher should be apprised of
the differences in learning style among the vocational students in order to flex the way of teaching and reach every student in the classroom.

Studies conducted by Green and Parker (1989) explored the relationship between learning styles and academic-vocational attributes using the Kolb's Learning Style inventory. Kolb (1984) described a learning model that integrates cognitive and socioemotional factors involved in learning. Kolb (1989) based his theory on the rationale that depending on their developed learning style, students may be labeled as: accommodators, divergers, convergers or assimilators.

Accommodators are persons quick to involve themselves in new situations in a trial and error manner. They are also risk takers. The weakness of this style is that the person is unable to make decisions most of the time. Convergers use deductive reasoning and prefer the application of ideas, are unemotional, have preference to work with things rather than with people. The weakness of this style is that the person makes decisions too quickly without the appropriate process of decision making. Assimilators are oriented toward building theoretical models and using inductive reasoning; they have lack of practical applications.

Using Kolb's Learning Theory, Green and Parker (1989) concluded that in the 147 subjects studied from community colleges, student's learning styles seem to be related to vocational and academic attributes. Green and Parker suggested
that personality variables were major determinants of a student choice of an academic major and a subsequent career.

Field Dependent and Field Independent Theory

In studying individual approaches to learning, psychologists have identified several aspects of learning styles. Among those that have been researched, field dependence and field independence appears to be the most significant and which has been studied most extensively (Gannon, 1985). One of the original developers of field-dependent and field-independent cognitive style theory was Witkin (1971) who conducted studies using Rod and Frame Test and the Embedded Figure Test. The theoretical framework of the field-dependent and field-independent theory is based on the individual differences in which people comprehend what they see, feel, hear, and the way they perform tasks. The theory of field dependence and field independence was developed in the laboratory. The earliest work was concerned with how people located the upright in space in a completely darkened room. Another task was developed to determine how people determine the position of the body itself in space. The third task was to notice a simple figure when was embedded in a complex one (Witkin et al., 1971).

Witkin et al., (1971) stated that the differences in performance in these various tasks is the extent to which the person perceives part of a field as discrete from the
surrounding field as a whole, rather than embedded in the field, or the extent to which the organization of the prevailing field determines perception of its components. This mean the extent to which the person perceives analytically. The two ways of performing the tasks are called field-dependent and field-independent. Subjects who perceived the objects in a total organization of the field were classified as field-dependent. Subjects who distinguish a geometrical shape within a complex figure were classified as field-independent.

The terms dependent or independent do not refer to personality or have the connotations associated with being an dependent or independent person, nor that one is better than the other, or more intelligent than the other.

Field Dependent

Field dependent persons include those who are heavily influenced by the surrounding field. "Field dependent people are said to be global thinkers because they like to put things into perspective before focusing on any one aspect of the issue" (p. 68). According to Messick (1969) field dependent persons are often described as people oriented and are said to exhibit a great deal of social sensitivity. As a result, they are often found working in the social sciences, in the humanities, family and child development, home economics, special education, speech pathology and other service
occupations which require them to deal with people directly (Messick, 1969; Frank, 1986). Most like structures and have well developed verbal skills. For field dependent persons, extrinsic rewards such as praise from peers can be important (Gannon, 1985).

Cano (1995) stated that the behavior of field dependent learners are shown by some characteristics as short attention span, no inner control, ask for directions often, are unable to make inferences or interpretations, lack self confidence, have difficulty in organizing themselves, do not express personal opinion, have wide range of abilities, want to know the basic information, are incapable of handle general questions, find difficulties in solve problems, do not assume responsibilities for own actions, and work because teacher tells them to work.

Witkin, Moore, Goodenough and Cox (1977) summarized the characteristics of the field dependent learner as follows:

- Has a global perception;
- Has poor analytical solving;
- Is highly sensitive and attuned to social environment;
- Has highly developed social skills;
- Favors a "spectator approach" to learning;
- Adopts organization to the information to be learned;
- Is extrinsically motivated;
• Is responsive to social reinforcement.

**Field independent**

Field independent learner is the one that is not influenced by the surrounding field. Gannon (1985) described field independent persons as "those who attend to the individual features of what they experience first and then notice the background or surroundings" (p. 69). Independents tend to be less people oriented than dependents and like to work with numbers and objects (Messick, 1969). They have good analytical abilities and are often found working in areas of mathematics, sciences, business and physical education. For them intrinsic rewards such as the satisfaction of doing a job well are as effective as extrinsic ones (Gannon, 1985; Frank, 1986).

Cano (1995) concluded that the field independent learner usually present characteristics as creativity, like to discuss and argue, want to talk a lot, will question and volunteer additional information, want to solve things themselves, do not seek teacher's help, do not particularly like details, prefer not to do things step by step, like to formulate and act on their own ideas, are capable of abstract thinking, and stay on one thing a long period of time, can work by themselves with little supervision, have greater depth of emotions, display greater ability in making interpretations, and are self centered.
Witkin, Moore, Goodenough and Cox (1977) summarized the characteristics of a field-independent learner as follows:

- Good at perceiving discrete parts;
- Good at abstract analytical thought;
- Is individualistic and insensitive to the emotions of others;
- Has poorly developed social skills;
- Favors "inquiry" and independent study;
- Provides their own structure in order to facilitate learning;
- Is intrinsically motivated;
- Is unresponsive to social reinforcement.

Gender as a variable in Learning Style

As reported by Witkin et al. (1971) consistent differences in gender learning styles have been reported in the field-dependent and field-independent dimension. He concluded that boys and men tend to be more field-independent than girls and women in the United States, some western European countries, Japan and Hong Kong. Shipman and Shipman (1985) and Witkin and Goodenough (1981) reported that females generally do not do as well as males on tests of spatial ability. They pointed out that when men and women were compared, women generally are found to be less field-independent than men.
In assessing gender differences in learning styles, Fritz (1992) reported that Witkin's field-dependence/independent style theory predicted that female were more likely to have a social of field dependence style. Fritz's (1992) rationale was that females have preferences that suggest a social orientation and sensitivity to the learning environment.

Teaching Implications in the Students Learning Styles

As cited by Kuchinskhas (1979), in the 1960s, the United States Office of Education sponsored research projects to determine which instructional materials would result in the most effective learning by students. The results of studies indicated that the teacher, rather than the materials or methods, made the most difference. The teacher had a very important role in the instructional development and in the development of skills in the students. If the aforementioned premise was accepted, it was necessary to explore the effects of the cognitive style of the teacher on the activities in the classroom (Kuchinskhas, 1979).

Joyce and Weil (cited in Ellis, 1979) identified more than 80 models of teaching from which a teacher could choose. Ellis (1979) defined models as teaching strategies based on the theories of educators, psychologists, philosophers and others who questioned how individuals learn. Ellis (1979) identified two models that were particularly useful to a teacher who wanted to provide a variety of learning
environments for students. These were the inductive thinking model based on Taba's work (1967) and the role playing model developed by Shaftel and Shaftel (Cited in Ellis, 1979). Ellis (1979) concluded that together the two models outlined strategies for:

a) teaching concepts from the simple to the complex;

b) providing structure or negotiating it with students;

c) selecting topics and materials for study or permitting students to select part or all of them;

d) fostering the development of empathy;

e) encouraging participation in group discussion and activities;

f) helping students formulate and test hypothesis; and

g) enabling students to engage in creative problem-solving and testing alternatives.

Ellis (1979) concluded that by learning to use the two models, a teacher practiced modulating the cognitive level of a discussion from the factual to the conceptual to the theoretical, and served as a facilitator and clarifier of student discussion rather than as a source of information.

Other models provided teachers with strategies to deal with the learning styles of the students. Some were Roger's
Non Directive Model (1951), where the teacher reflects feelings to help the students solve their own problems, and Gordon's Syneectics (Gordon, 1961), a model for developing metaphorical thinking in creative problem solving.

Dunn and Dunn (1979) stated that when the teacher taught through methods that complimented the student learning characteristics, students became motivated and tended to achieve better academically. On the other hand, Sternberg (1995) agreed that students receive higher grades and more favorable evaluation when their styles match with those of their teachers. It is necessary to be sensitive to the learning characteristics of the students to develop the instructional process according to the student needs (Dunn & Dunn, 1979; Sternberg 1995).

**Summary**

Efforts for the improvement of instruction of the Home Economics Program have been implemented in terms of the needs identified in students and the industry. The overall goal of the Home Economics program is to improve the quality of life by teaching students to think critically and independently toward the problem solution. To meet this goal, the challenge within the Home Economics educational programs is to find different ways to assess the outcomes and effectiveness of the delivery process of the Home Economics courses by knowing how the students learn. Several educators and psychologists have
recognized the presence of cognitive and learning styles in
different forms of behavior. The literature revealed that to
accomplish the goal of education it is necessary to be
sensitive to the learning characteristics of the students to
develop the instructional process according to the students'
needs.
CHAPTER III

METHODOLOGY

The purpose of the study was to determine the cognitive ability and the learning styles of students enrolled in Home Economics occupational courses in San Juan, and Bayamón, Puerto Rico. The study also sought to relate cognitive abilities to selected students characteristics, including learning style, and to explain and predict the DCAT scores of students enrolled in Home Economics occupational courses.

Research Objectives

To accomplish the purpose of the study, the following research objectives were formulated:

1. Describe the students enrolled in the Home Economics courses on the following variables: age, gender, and cumulative grade point average (GPA).

2. Determine the cognitive abilities (basic, application, and critical thinking) of Home Economics students as measured by the Developing Cognitive Abilities Test (DCAT), level K.

3. Determine the learning style of Home Economics students as measured by the Group Embedded Figure Test (GEFT).
4. Describe the relationships between cognitive abilities (basic, application and critical thinking) utilizing DCAT and selected variables (age, gender, and GPA).

5. Describe the relationship between learning style as measured by the GEFT and selected variables (age, gender, and GPA).

6. Describe the relationship between cognitive abilities utilizing the DCAT and learning style utilizing the GEFT of students enrolled in Home Economics courses.

7. Explain variance in the dependent variable, DCAT, through a linear combination of the independent variables.

Chapter III will discuss the research design, population and subject selection, instrumentation, data collection, and data analysis.

Research Design

The design of the study was descriptive and correlational in nature (Fraenkel & Wallen, 1990). According to Fraenkel and Wallen (1990) correlational research described the degree to which two or more quantitative variables were related.

Descriptive research techniques were used to describe the cognitive ability and the learning styles of the students. Correlational procedures were used to determine if there were
any relationships between the cognitive ability, the learning styles of the students, and some demographic variables.

Three instruments were utilized to gather the data from the subjects.

**Population and Subjects Selection**

The study was conducted in five vocational schools in San Juan and Bayamón Regions in Puerto Rico where there are occupational Home Economics courses. The schools were selected because these were the schools that offered occupational Home Economics courses in San Juan and Bayamón in the school year 1994-95 (Department of Education Initial Enrollment, Statistical Report, 1994-95). The *target population* was all the students enrolled in occupational Home Economics courses at the high school level in San Juan and Bayamón Educational Regions in Puerto Rico (N=191). Table 2 and Table 3 present a distribution of the population by school and educational regions.

Table 4 presents a distribution of the population by course in Bayamón Region. Table 5 presents a distribution of the population by course in San Juan Region.

A census was used for the study. Instruments for the data collection were administered to all students enrolled in occupational Home Economics courses.
Table 2

**Population: Bayamón Region** (N=48)

<table>
<thead>
<tr>
<th>District</th>
<th>School</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayamón V</td>
<td>Tomás Ongay</td>
<td>25 students</td>
</tr>
<tr>
<td>Toa Baja I</td>
<td>Pedro Albizu</td>
<td>23 students</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>48 students</td>
</tr>
</tbody>
</table>

Table 3

**Population: San Juan Region** (N= 143)

<table>
<thead>
<tr>
<th>District</th>
<th>School</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carolina III</td>
<td>Carlos F. Daniels</td>
<td>80 students</td>
</tr>
<tr>
<td>Rio Piedras III</td>
<td>Miguel Such</td>
<td>23 students</td>
</tr>
<tr>
<td>San Juan I</td>
<td>José C. Barbosa</td>
<td>40 students</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>143 students</td>
</tr>
</tbody>
</table>
Table 4

Population by School: Bayamón Region

| School           | Course               | Enrollment |   |
|------------------|----------------------|------------|
| Tomás Ongay      | Commercial Bakery    | 1          | 6 |
|                  | Child Care           | 0          | 1 |
|                  | Food Production      | 2          | 4 |
|                  | Home Decoration      | 2          | 9 |
| Pedro Albizu     | Cleaning Services    | 12         | 11|
| Total            |                      | 17         | 31|

Instrumentation

For the development of the study, two standardized instruments were used: the Developing Cognitive Abilities Test (DCAT), Level K (Beggs and Mouw, 1989) and the Group Embedded Figure Test (Witkin, Oltman, Raskin, and Karp, 1971). A questionnaire was developed to gather the demographic data.

For the administration of the instruments the teacher received the following materials:

- Developing Cognitive Ability Test (DCAT), Level K
- Group Embedded Figure Test (GEFT)
- Instructions for the administration of the DCAT instrument
Instructions for the administration of the GEFT instrument
Letters for parents permission
Questionnaire to collect the demographic data and the DCAT responses
Folders to divide the instruments and answer sheets per occupational preparation area.

Table 5
Population by School: San Juan Region

<table>
<thead>
<tr>
<th>School</th>
<th>Course</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Carlos F. Daniels</td>
<td>Child Care</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Custom Apparel</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Food Production</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Wedding Consulting</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Floral Design</td>
<td>2</td>
</tr>
<tr>
<td>Miguel Such</td>
<td>Food Production</td>
<td>3</td>
</tr>
<tr>
<td>Jose C. Barbosa</td>
<td>Food Production</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Floral Design</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23</td>
</tr>
</tbody>
</table>
**Developing Cognitive Abilities Test, Level K**

Beggs and Mouw (1989) developed the Developing Cognitive Abilities Test (DCAT) to "asses the likehood of one's capability to succeed at certain tasks in the future" (p.92) (Halpen, cited in Torres, 1993). The instrument indicates the cognitive characteristics of a population. As cited by Torres, (1993) the DCAT is consistent with the five lower cognitive levels of Bloom's taxonomy: knowledge, comprehension, application, analysis, and synthesis. The cognitive abilities of the DCAT were measured by three content areas: verbal, quantitative, and spatial. The knowledge and comprehension categories of Bloom's taxonomy were consistent with the verbal subtest. The application category of Bloom's taxonomy was consistent with the application subtest, and the analysis and synthesis categories were consistent with the critical thinking subtest. The evaluation category was not tested.

The Basic Cognitive Abilities subtest (verbal subtest) measures understanding, use of words and phrases, perception of interrelationships among series of statements by making inference from context or forming conclusions through propositional reasoning about given information (American Testronics, 1990). The Quantitative subtest measures understanding of arithmetic operations, basic geometric concepts, and the ability to apply mathematics principles in the solution of story problems (American Testronics, 1990). The Spatial subtest measures the recognition and retention of
such characteristics of objects as size, shape, symmetry, pattern, the ability to estimate what would occur when one or more objects change in location and position, and the ability to mentally transform objects through imagination of the identification of the parts resulting from dividing and object (American Testronic, 1990). The validity of the DCAT included analyzing curricula, and instructional practices; field testing, and selecting items; norming and weighing; and scaling (Wick, 1990). The reliability of DCAT was establish by the developers for the three cognitive levels (Kuder-Richardson- 20): Basic Cognitive Abilities, .81; Application Abilities, .76; and Critical Thinking Abilities, .75; and overall, .90.

**Group Embedded Figures Tests (GEFT)**

The Group Embedded Figure Test (GEFT) (Oltman, Raskin, & Witkin, 1971) was used to determine the learning styles of the students. The GEFT was administered to the students by the Home Economics teacher. This instrument is considered a standardized instrument and has been used in educational research extensively (Witkin, Oltman, Raskin, & Karp, 1971).

The instrument consists of 18 complex figures, 17 of which were taken from the Embedded Figure Test (EFT). The GEFT contain three sections. The first section contains seven items and is used primarily for practice. The second and third
section contains nine items, each for scoring the instrument. The GEFT required 12 minutes for the administration.

The validity of the GEFT, was established by previous research determining its relationship with the parent test (EFT), Embedded Figures Test, the Rod and Frame Test (RFT), and the Body Adjustment Test (BAT). The correlation coefficients between the GEFT and the EFT ranged from .84 to .90. Correlation coefficients between the GEFT and RFT and BAT are substantial, (.55 and .71 respectively) (Witkin, Oltman, Raskin, & Karp, 1971). The reliability coefficient for the GEFT is .82 (Witkin, Oltman, Raskin, & Karp, 1971).

The reliability of the GEFT was established by correlating parallel forms of the test with identical time limits (Witkin, Oltman, Raskin & Karp, 1971). The correlations were established with the use of the Spearman-Brown prophecy formula. The reliability estimate was .82 for both male and female (Witkin, Oltman, Raskin, & Karp, 1971).

Both instruments were translated into Spanish, and again into English. Content validity was established. A panel of experts was asked to determine whether the items from the English and Spanish versions were the same. The panel of experts ensured that the items were clear, well worded, and understandable to the group being studied. The panel of experts was composed of educational researchers, curriculum technicians, and teachers from the high school and university level.
Data collection

The instruments were administered by the Home Economics teachers. To schedule the administration of the instruments, the researcher met with the principal and the teacher to select the day and the hour most appropriate for administration.

The schedule was as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>Teacher</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carolina III</td>
<td>Carlos F. Daniels</td>
<td>June 3, 1995</td>
</tr>
<tr>
<td>Rio Piedras III</td>
<td>Miguel Such</td>
<td>June 6, 1995</td>
</tr>
<tr>
<td>San Juan I</td>
<td>José C. Barbosa</td>
<td>June 14, 1995</td>
</tr>
<tr>
<td>Toa Baja I</td>
<td>Pedro Albizu</td>
<td>June 15, 1995</td>
</tr>
<tr>
<td>Bayamón III</td>
<td>Tomás Ongay</td>
<td>June 13, 1995</td>
</tr>
</tbody>
</table>

The researcher scheduled with the teacher to collect the data from the students. The learning styles data were collected on the GEFT instrument and the cognitive ability data were collected on the DCAT instrument. Instructions were given to the teachers prior to the administration of the instruments. Procedures for administration of the test as outlined in the Group Embedded Figures Test Manual (Witkin, Oltman, Raskin & Karp, 1971), and the DCAT Directions for Administration: Levels E-L, were followed.

Data analysis

Data were analyzed using the SPSS/PC+ (Statistical Package for the Social Science, Personal Computer version).
Descriptive statistics were used to analyze the data. The procedures used were as follows.

The Developing Cognitive Abilities Test

Basic cognitive ability, application abilities, and critical thinking was measured by the Developing Cognitive Abilities Instrument. The Instrument was divided into three parts; each part had twenty-seven items in each of the three content areas for a total score of eighty-one. The researcher hand scored each part and recorded the scores for each student.

The Group Embedded Figures Test

The Group Embedded Figure Test ranged from 0 to 18. The researcher hand scored the test and recorded the score for each student.

Research Objectives Analyses

The statistical analysis to accomplish each of the research objectives was as follows:

1. Describe the students enrolled in the Home Economics occupational courses on the following variables: age, gender, and grade point average.

To describe students' age, and general grade point average, frequency, percentages, means, standard deviations
and range were used. To describe students' gender, frequency counts and percentages were used.

2. Determine the cognitive abilities (basic, application, and critical thinking) of Home Economics students as measured by the Developing Cognitive Abilities Test (DCAT), level K.

To describe students' cognitive abilities, percentages, means, standard deviations, and ranges were used.

3. Determine the learning style of Home Economics occupational students as measured by the Group Embedded Figure Test (GEFT).

To describe students' learning style, frequency counts, percentages, and range were used.

4. Describe the relationships between cognitive abilities (basic, application and critical thinking) utilizing DCAT and selected variables (age, gender, and grade point average).

To describe the relationship between students' cognitive abilities (basic cognitive abilities, application abilities and critical thinking abilities) their age, and their GPA, Pearson product-moment correlation coefficients were used. To describe the relationship between students' cognitive abilities and their gender, point-biserial correlation coefficients were used. Dummy coding procedures were used for nominal/categorical variables.
5. Describe the relationship between learning style as measured by the GEFT and selected variables (age, gender, and grade point average.

To describe the relationship between students' learning style and their age, and GPA, Pearson product-moment correlation coefficients were used. To describe the relationship between students' learning and gender, point-biserial correlations coefficients were used.

6. Describe the relationship between cognitive abilities utilizing the DCAT and learning style utilizing the GEFT of students enrolled in Home Economics occupational courses.

To describe the relationship between students' cognitive abilities and learning style, Pearson product-moment correlation coefficients were used.

7. Explain variance in the dependent variable, DCAT scores, through a linear combination of the independent variables.

To explain the variance in the dependent variable, DCAT scores, a simultaneous multiple regression was used.

In determining the strength of relationships, descriptors as recommended by Davis (1971) were used.

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.70 or greater</td>
<td>Very Strong Relationship</td>
</tr>
<tr>
<td>.50 to .69</td>
<td>Substantial Relationship</td>
</tr>
<tr>
<td>Coefficient</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>.30 to .49</td>
<td>Moderate Relationship</td>
</tr>
<tr>
<td>.10 to .29</td>
<td>Low Relationship</td>
</tr>
<tr>
<td>.01 to .09</td>
<td>Negligible Relationship</td>
</tr>
</tbody>
</table>

**Summary**

Chapter III contained the research design, population and subject selection, instrumentation, data collection, and data analysis.
CHAPTER IV
FINDINGS

The purpose of the study was to determine the cognitive ability and the learning styles of students enrolled in Home Economics occupational courses in San Juan and Bayamón, Puerto Rico. The study also sought to relate cognitive abilities to selected students' characteristics, including learning styles, and to explain and predict the Developing Cognitive Abilities Test scores of students enrolled in Home Economics occupational courses.

Chapter IV contains the findings of the study. The findings were presented in the following order: 1) students' characteristics; 2) students' cognitive abilities; 3) students' learning style; 4) correlates of students' cognitive abilities; 5) correlates of students' learning style; 6) the relationship between cognitive abilities and learning style of students; 7) and the regression of Developing Cognitive Abilities Test on students characteristics.

Students' Characteristic

Demographic data were gathered on 135 occupational Home Economics students in San Juan and Bayamón educational regions in Puerto Rico. The data were gathered in June 1995.
Demographic data included: gender, age, area of study, grade, physical handicap, and grade point average. A total of 135 students (n= 135) returned the instruments for a response rate of 71%. Table 6 shows the respondents by educational regions and school.

Table 6

Respondents by school and course: (n=135)

<table>
<thead>
<tr>
<th>School</th>
<th>Course</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Tomás Ongay</td>
<td>Commercial Bakery</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Child Care</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Food Production</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Home Decoration</td>
<td>1</td>
</tr>
<tr>
<td>Pedro Albizu</td>
<td>Cleaning Services</td>
<td>12</td>
</tr>
<tr>
<td>Carlos F. Daniels</td>
<td>Child care</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Custom apparel</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Food production</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Wedding consulting</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Floral Design</td>
<td>0</td>
</tr>
<tr>
<td>Miguel Such</td>
<td>Food Production</td>
<td>3</td>
</tr>
<tr>
<td>José C. Barbosa</td>
<td>Food Production</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Floral Design</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>
Gender of Students

Of the 135 students who participated in the study, 23.7 (N=32) percent were male and 76.3 (N=103) percent were female. (Table 7)

Table 7

Gender of Students (n=135)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>32</td>
<td>23.7</td>
<td>23.7</td>
</tr>
<tr>
<td>Female</td>
<td>103</td>
<td>76.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Age of Students (n=135)

The age of the students who participated in the study ranged from 15 to 23 years of age. The mean age of the students was 17.6 years with a standard deviation of 1.43. The mode age of the students was 17 years of age (Table 8).

Occupational Area of Study (n=135)

The students that participated in the study were from the following areas of study: (Table 9) Commercial Bakery (4.4%; n=6); Home Decoration (6.7%; n=9); Custom Apparel (7.4%; n=10); Child Care (11.9%; n=16); Wedding Consultant (5.2%; n=7); Food Production (34.8%; n=47); Floral Design
(12.6%; n=17); and Cleaning Services (17.0%; n=23). Of the students that participated in the study (n=135) it was found that the area of study with the largest proportion was Food Production (34.8%; n=47), and the least student participation was Commercial Bakery (4.4%; n=6).

Table 8
Age of Students (n=135)

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>4</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>16</td>
<td>22</td>
<td>16.3</td>
<td>19.3</td>
</tr>
<tr>
<td>17</td>
<td>44</td>
<td>32.6</td>
<td>51.9</td>
</tr>
<tr>
<td>18</td>
<td>36</td>
<td>26.7</td>
<td>78.5</td>
</tr>
<tr>
<td>19</td>
<td>19</td>
<td>14.1</td>
<td>92.6</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>3.0</td>
<td>95.6</td>
</tr>
<tr>
<td>21</td>
<td>2</td>
<td>1.5</td>
<td>97.0</td>
</tr>
<tr>
<td>22</td>
<td>3</td>
<td>2.2</td>
<td>99.3</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>.7</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Mean = 17.6; Std. Dev. = 1.43; Mode = 17; Range = 15 - 23

Grade Point Average of Students (n=135)

The students that participated in the study ranged in cumulative grade point average (GPA) from .90 to 4.00, on a four (4) point scale. The mean GPA was 2.46 with a standard
deviation of .83 (Table 10).

Table 9

Occupational Area of Study (n=135)

<table>
<thead>
<tr>
<th>Area of Study</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Bakery</td>
<td>6</td>
<td>4.4</td>
<td>4.4</td>
</tr>
<tr>
<td>Home Decoration</td>
<td>9</td>
<td>6.7</td>
<td>11.1</td>
</tr>
<tr>
<td>Custom Apparel</td>
<td>10</td>
<td>7.4</td>
<td>18.5</td>
</tr>
<tr>
<td>Child Care</td>
<td>16</td>
<td>11.9</td>
<td>30.4</td>
</tr>
<tr>
<td>Wedding Consultant</td>
<td>7</td>
<td>5.2</td>
<td>35.6</td>
</tr>
<tr>
<td>Food Production</td>
<td>47</td>
<td>34.8</td>
<td>70.4</td>
</tr>
<tr>
<td>Floral Design</td>
<td>17</td>
<td>12.6</td>
<td>83.0</td>
</tr>
<tr>
<td>Cleaning Services</td>
<td>23</td>
<td>17.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Grade of Students

Four grade levels were identified from the group of students that participated in the study (n=135). It was found that the largest population were from the twelfth grade (60%; n=81). Two students were from the ninth grade (1.5%); twelve students were from the tenth grade (8.9%); thirty-nine students were from the eleventh grade (28.9%); and eighty-one students were from the twelfth grade (60%) (Table 11).
Table 10

Grade Point Average of Students (n = 135)

<table>
<thead>
<tr>
<th>Grade point Average</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.50- 4.00</td>
<td>18</td>
<td>13.3</td>
<td>13.3</td>
</tr>
<tr>
<td>2.50- 3.49</td>
<td>48</td>
<td>35.6</td>
<td>48.9</td>
</tr>
<tr>
<td>1.50- 2.49</td>
<td>58</td>
<td>43.0</td>
<td>91.9</td>
</tr>
<tr>
<td>.90- 1.49</td>
<td>11</td>
<td>8.1</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Mean = 2.45
Std. Dev. = .83
Range = .90 - 4.00

Table 11

Grade of Students (n=135)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ninth</td>
<td>2</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Tenth</td>
<td>12</td>
<td>9.0</td>
<td>10.4</td>
</tr>
<tr>
<td>Eleventh</td>
<td>39</td>
<td>29.1</td>
<td>39.6</td>
</tr>
<tr>
<td>Twelfth</td>
<td>81</td>
<td>60.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Schools of participants

The schools selected for the study were from the San Juan and Bayamón regions that had occupational Home Economics
courses. Five schools participated in the study, three from San Juan and two from Bayamón. Sixty-seven percent of the students were enrolled in schools from the San Juan Educational Region. The schools from the San Juan Region were Carlos F. Daniels, Miguel Such, and José C. Barbosa; the schools from the Bayamón Region were Tomás Ongay and Pedro Albizu Campos (Table 12).

Physically Handicapped Students

The data presented information about the physically handicapped population enrolled in the courses being studied. Seven students had physical handicaps such as: hearings problems, health problems, orthopedic problems, and learning disabilities. Ninety-five percent of the population did not have any identified physical handicapped. (Table 13).
Table 12

**Schools of Participants** (n = 135)

<table>
<thead>
<tr>
<th>Schools</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlos F. Daniels</td>
<td>45</td>
<td>33.3</td>
<td>33.3</td>
</tr>
<tr>
<td>Miguel Such</td>
<td>20</td>
<td>14.8</td>
<td>48.1</td>
</tr>
<tr>
<td>José C. Barbosa</td>
<td>26</td>
<td>19.3</td>
<td>67.4</td>
</tr>
<tr>
<td>Tomás Ongay</td>
<td>21</td>
<td>15.6</td>
<td>83.0</td>
</tr>
<tr>
<td>Pedro Albizu</td>
<td>23</td>
<td>17.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 13

**Handicapped Students** (n = 135)

<table>
<thead>
<tr>
<th>Handicap</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>128</td>
<td>94.8</td>
</tr>
<tr>
<td>Deaf problems</td>
<td>1</td>
<td>.7</td>
</tr>
<tr>
<td>Health problems</td>
<td>1</td>
<td>.7</td>
</tr>
<tr>
<td>Orthopedic problems</td>
<td>1</td>
<td>.7</td>
</tr>
<tr>
<td>Learning disabilities</td>
<td>4</td>
<td>3.0</td>
</tr>
</tbody>
</table>
Students' Cognitive Abilities

To determine the students' cognitive abilities, the Developing Cognitive Abilities Test - Level K (DCAT) was used (Beggs & Mow, 1989). The DCAT provided scores for the occupational Home Economics students on the three levels of cognition (Basic Cognitive Abilities, Application Abilities, and Critical Thinking Abilities). Each one of the three levels of cognition has a maximum raw score of 27.

For this sample, raw scores for the DCAT ranged from 5 to 57 (total possible score = 81). The mean raw score was 33.55 with a standard deviation of 8.76. On the Basic Cognitive Abilities items, the raw scores ranged from 2 to 25 (total possible score = 27); the mean raw score was 16.20, with a standard deviation of 4.80. On the Application Abilities items, the raw scores ranged from 0 to 19 (total possible score = 27); the raw mean score was 8.75, with a standard deviation of 3.19. On the Critical Thinking Abilities items, the raw scores ranged from 0 to 21 (total possible score = 27); the mean raw score was 8.55, with a standard deviation of 3.82 (Table 14).
Table 14

Performance of Students in the DCAT, Level K Test (n = 135)

<table>
<thead>
<tr>
<th>Level of Cognition</th>
<th>Mean</th>
<th>%</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Cognitive Abilities</td>
<td>16.20</td>
<td>60</td>
<td>4.80</td>
<td>2 - 25</td>
</tr>
<tr>
<td>Application Abilities</td>
<td>8.75</td>
<td>34</td>
<td>3.19</td>
<td>0 - 19</td>
</tr>
<tr>
<td>Critical Thinking Abilities</td>
<td>8.56</td>
<td>33</td>
<td>3.82</td>
<td>0 - 21</td>
</tr>
<tr>
<td>Total DCAT score</td>
<td>33.55</td>
<td>41</td>
<td>8.76</td>
<td>5 - 57</td>
</tr>
</tbody>
</table>

Note: Total possible score for each level = 27
      Total score = 81

Cognitive abilities by Gender

Table 15 and 16 shows the cognitive abilities scores by gender. The gender data showed that the total DCAT, Level K raw scores of the females ranged from 5 to 57. The mean score for females was 33.82 with a standard deviation of 9.40. The Basic Cognitive Abilities score showed that females ranged from 2 to 25. The mean score was 16.77 with a standard deviation of 4.97. The Application Abilities scores revealed that females ranged from 0 to 19. The mean was 8.71 with a standard deviation of 3.28. The Critical Thinking Abilities scores ranged from 0 to 21. The mean score was 8.27 with a standard deviation of 3.89 (Table 15). Males data revealed that the raw DCAT, Level K scores ranged from 16 to 43. The mean score for males was 32.82 with a standard deviation of
6.32. The Basic Cognitive Abilities scores revealed that males ranged from 3 to 21. The mean score was 14.34 with a standard deviation of 3.70. The Application Abilities scores showed that males ranged from 4 to 15. The mean score was 8.87 with a standard deviation of 2.93. The Critical Thinking Abilities scores revealed that males ranged from 1 to 17. The mean score was 9.46 with a standard deviation of 6.47 (Table 16).

Table 15

Developing Cognitive Abilities Test by Gender: Females (n=103)

<table>
<thead>
<tr>
<th>Level of Cognition</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Cognitive Abilities</td>
<td>16.77</td>
<td>4.97</td>
<td>2 - 25</td>
</tr>
<tr>
<td>Application Abilities</td>
<td>8.71</td>
<td>3.28</td>
<td>0 - 19</td>
</tr>
<tr>
<td>Critical Thinking Abilities</td>
<td>8.27</td>
<td>3.89</td>
<td>0 - 21</td>
</tr>
<tr>
<td>Total DCAT score</td>
<td>33.82</td>
<td>9.40</td>
<td>5 - 57</td>
</tr>
</tbody>
</table>

Note: Total possible score for each level = 27

Cognitive Abilities by Grade Point Average

The GPA data showed that the total DCAT, Level K raw scores of students between the range of 3.50 to 4.00 GPA ranged from 31 to 57 with a mean score of 41.27 and a standard deviation of 8.05. Students between the range of 2.50 to 3.49 GPA ranged from 5 to 47 with a mean score of 34.14 and a
standard deviation of 7.97. Students between the range of 1.50 to 2.49 GPA ranged from 6 to 47 with a mean score of 31.36 and a standard deviation of 7.74. Students between the range of .90 to 1.49 GPA ranged from 11 to 47 with a mean score of 29.9 and a standard deviation of 11.22. (Table 17).

Table 16

Developing Cognitive Abilities Test by Gender: Males (n=32)

<table>
<thead>
<tr>
<th>Level of Cognition</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Cognitive Abilities</td>
<td>14.34</td>
<td>3.70</td>
<td>3 - 21</td>
</tr>
<tr>
<td>Application Abilities</td>
<td>8.87</td>
<td>2.93</td>
<td>4 - 15</td>
</tr>
<tr>
<td>Critical Thinking Abilities</td>
<td>9.46</td>
<td>3.47</td>
<td>1 - 17</td>
</tr>
<tr>
<td>Total DCAT score</td>
<td>32.68</td>
<td>6.32</td>
<td>16 - 43</td>
</tr>
</tbody>
</table>

Note: Total possible score for each level= 27

Students' Learning Styles

The instrument used to gather data on the learning styles of the students enrolled in occupational Home Economics courses was the Group Embedded Figure Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971). Witkin et al. (1971) stated that people may have either field dependent or field independent learning styles. The national mean score was 11.4 and was set to divided between dependent learning style or
independent learning style. Cano (1993) identified students whose raw scores were between 10 to 14 as neutral in their learning style.

Table 17
Cognitive Abilities by Grade Point Average of Students (n=135)

<table>
<thead>
<tr>
<th>GPA</th>
<th>DCAT Score</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Range</td>
<td></td>
</tr>
<tr>
<td>3.50 - 4.00</td>
<td>41.27</td>
<td>8.05</td>
<td>31 - 57</td>
<td></td>
</tr>
<tr>
<td>2.50 - 3.49</td>
<td>34.14</td>
<td>7.97</td>
<td>5 - 47</td>
<td></td>
</tr>
<tr>
<td>1.50 - 2.49</td>
<td>31.36</td>
<td>7.74</td>
<td>6 - 47</td>
<td></td>
</tr>
<tr>
<td>.90 - 1.49</td>
<td>29.90</td>
<td>11.22</td>
<td>11 - 47</td>
<td></td>
</tr>
</tbody>
</table>

Note: Total possible score = 81

The results of the GEFT scores shows that 82.9% of the students have field dependent learning styles, 7.5% of the students have a field independent learning style, while 9.6% (n=11) of the students were neutral in their learning style. The raw scores ranged from 0 to 18 (total possible score = 18). The mean raw GEFT score was 6.0 with a Std. dev. of 4.45 (Table 18).

Learning Style by Gender

The gender data revealed that the raw GEFT scores of the
females ranged from 0 to 17. The data indicate that 86% of the females (n=89) learned in a field dependent style, while 5% of the females (n=5) learned in a field independent style, 9% of the females (n=9) were neutral in their learning style. The mean score for females was 5.72 with a standard deviation of 4.11 (Table 18). Data revealed that the raw GEFT scores for males ranged from 0 to 18. The data indicated that 78.5% of the males (n=23) learned in a field dependent style, while 16% of the males (n=5) learned in a field independent style, 15.5% of the males (n=4) were neutral in their learning style. The mean score for males was 6.9 with a standard deviation of 5.36 (Table 18).

Table 18

Learning Style by Gender (n = 135)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Field-Dependence</th>
<th>Neutrals</th>
<th>Field-Independence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq.</td>
<td>%</td>
<td>Freq.</td>
</tr>
<tr>
<td>Females</td>
<td>89</td>
<td>86.0</td>
<td>9</td>
</tr>
<tr>
<td>Males</td>
<td>23</td>
<td>78.5</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>112</td>
<td>82.9</td>
<td>13</td>
</tr>
</tbody>
</table>

Total mean: 6.0; Std. Dev.: 4.45
Females:
Mean = 5.7
Std. Dev. = 4.11
Range = 0 - 17
Males:
Mean = 6.9
Std. Dev = 5.36
Range = 0 - 18
Learning Style by Grade Point Average

The data analysis revealed that students' GPAs ranged from .90 to 4.00, in a 4.00 scale. Of the students with a GPA in the range of 3.50 to 4.00 (n=18), 83.0% (n=15) learned with a field dependent style, 6% (n=1) learned with a field independent style, while 11% (n=2) of the students were neutral in their learning style. Of the students with a GPA in the range of 2.50 to 3.49 (n=48), 85% (n=41) learned with a field dependent style, 5% (n=2) learned with a field independent style, while 10% (n=5) were neutral in their learning style. Of the students with a GPA in the range of 1.50 to 2.49 (n=58), 79% (n=46) learned with a field dependent style, 10.5% (n=6) learned with a field independent style, while 10.5% (n=6) were neutral in their learning style. Of the students with a GPA in the range of .90 to 1.49 (n=11), 82% (n=9) learned with a field dependent style, while 18% (n=2) learned with a field independent style (Table 19).

Correlates of Students' Cognitive Abilities

Students Characteristics

To describe the relationship between the occupational Home Economics students (n = 135) cognitive abilities (Basic Cognitive abilities, Application Abilities, Critical Thinking) as measured by the DCAT and interval variables: age, and GPA, Pearson product-moment correlation coefficient were used. Point Biserial correlations coefficients ($r_{pb}$) were used to
describe the relationship between students' cognitive abilities and gender (nominal and categorical data). To compute point biserial correlations coefficients, gender was Dummy coded. Table 20 presented the correlation coefficients between students' scores on Cognitive Abilities (Basic, Application, and Critical Thinking) and students' characteristics (gender, age, and GPA).

Table 19

Learning Style by Grade Point Average (n = 135)

<table>
<thead>
<tr>
<th>GPA</th>
<th>Field-Dependent</th>
<th>Neutral</th>
<th>Field-Independent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq.</td>
<td>%</td>
<td>Freq.</td>
</tr>
<tr>
<td>3.50-4.00</td>
<td>15</td>
<td>83.0</td>
<td>2</td>
</tr>
<tr>
<td>2.50-3.49</td>
<td>41</td>
<td>85.0</td>
<td>5</td>
</tr>
<tr>
<td>1.50-2.49</td>
<td>46</td>
<td>79.0</td>
<td>6</td>
</tr>
<tr>
<td>.90-1.49</td>
<td>9</td>
<td>82.0</td>
<td>0</td>
</tr>
</tbody>
</table>

4.00-3.50 - Mean = 5.05, Std. Dev. = 4.41; 3.49-2.50 - Mean = 5.37, Std. Dev. = 3.91; 2.49-1.50 - Mean = 6.56, Std. Dev. = 4.79; 1.49- .90 - Mean = 7.36, Std. Dev. = 4.65.

Basic Cognitive Abilities

There was a positive low relationship ($r_{pb} = .29$) between students' gender and Basic Cognitive Abilities. The relationship between students' age and Basic Cognitive Abilities was negative and negligible ($r = .01$). There was a
negative moderate relationship \((r = -0.41)\) between students' GPA and Basic Cognitive Abilities (Table 20).

Table 20

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cognitive Abilities</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic</td>
<td>Application</td>
<td>Critical Thinking</td>
<td>Overall</td>
</tr>
<tr>
<td>Gender(^a)</td>
<td>.29</td>
<td>-.01</td>
<td>-.11</td>
<td>-.11</td>
</tr>
<tr>
<td>Age</td>
<td>-.01</td>
<td>-.02</td>
<td>-.22</td>
<td>-.12</td>
</tr>
<tr>
<td>GPA</td>
<td>-.41</td>
<td>-.19</td>
<td>-.04</td>
<td>-.34</td>
</tr>
</tbody>
</table>

Note: Coefficients reported as Pearson Product Moment Correlations
Note \(^a\)=Point-biserial Correlations; Female = 0, Male = 1

Application Abilities

The relationship between students' gender and Application Cognitive Abilities was negative and negligible \((r_{pb} = -0.01)\). There was a negative and low relationship \((r = -0.02)\) between age of students and Application Cognitive Abilities. The relationship between the GPA and the Application Cognitive Abilities was negative and low \((r = -0.19)\) (Table 20).

Critical Thinking Abilities

Table 20 showed a negative low correlation \((r_{pb} = -0.11)\) between gender and Critical Thinking Abilities. The
relationship between age and Critical Thinking Abilities was negative and low ($r=-.22$). The relationship between GPA score and Critical Thinking Abilities is negative and negligible ($r=-.04$).

**Correlates of Students' Learning Style**

*Students' Characteristics*

To describe the relationships between the occupational Home Economics students ($n=135$) learning styles as measured by the GEFT and interval variables: age and GPA, Pearson product-moment correlation was used. Point Biserial correlations coefficients ($r_{pb}$) were used to describe the relationships between students' GEFT scores and gender (nominal and categorical data). To compute point biserial correlation coefficients, gender was Dummy coded. Table 21 presented the correlation coefficients between students' learning styles and students' characteristics (gender, age, and GPA).

The relationships between students' gender and GEFT was negative and low ($r_{pb}=-.13$). The relationship between age of students and GEFT scores was negative and low ($r=-.23$). The relationship between GEFT scores and the GPA of students was positive but low ($r=.15$) (Table 21)
Table 21

Relationship Between GEFT Scores and Students Characteristic
(n = 135)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>GEFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-.13</td>
</tr>
<tr>
<td>Age</td>
<td>-.23</td>
</tr>
<tr>
<td>GPA</td>
<td>.15</td>
</tr>
</tbody>
</table>

Note: Coefficients reported as Pearson Product Moment Correlations
Note *a*=Point-biserial Correlations; Female = 0, Male = 1

Relationship Between Cognitive Abilities and Learning Style of Students

Table 22 describes the relationship between cognitive abilities of students and GEFT scores. A negligible relationship (r = .01) existed between Basic Cognitive Abilities score and GEFT score. A negative negligible relationship existed between Application Abilities and GEFT scores (r = -.03). A positive moderate relationship (r = .43) existed between Critical Thinking Abilities and GEFT scores.
Table 22

Relationship Between Cognitive Abilities and Learning Style of Students (n=135)

<table>
<thead>
<tr>
<th>Level of Cognition</th>
<th>GEFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Cognitive Abilities</td>
<td>.01</td>
</tr>
<tr>
<td>Application Abilities</td>
<td>-.03</td>
</tr>
<tr>
<td>Critical Thinking Abilities</td>
<td>.43</td>
</tr>
<tr>
<td>Overall</td>
<td>.19</td>
</tr>
</tbody>
</table>

Regression of Developing Cognitive Abilities Test on Students Characteristics

Table 23 shows the results of the regression analysis procedure. For this research, a simultaneous strategy was used. According to Warmbod (1993) a simultaneous strategy is most appropriate when there is no logical or theoretical basis for considering any independent variables prior to any other variables. All independent variables were treated simultaneously and entered into the equation in a single step.

Multiple Regression analysis was used to determine the proportion of variance in Cognitive Abilities Test that could be explained by a linear relationship of independent variables: (GPA, Age, Learning Styles, and Gender). Gender was
Dummy coded as either female or male. The table 23 shows that the multiple coefficient of correlation (Multiple R) was R=.42 and was interpreted as a positive moderate correlation.

The $R^2$, also known as the coefficient of determination, is the estimated proportion of variance in the dependent variable (DCAT scores) accounted by the linear combination of selected independent variables (GPA, Age, Learning Styles, and Gender). Eighteen percent of the DCAT scores was explained by the selected independent variables. An adjusted $R^2$ was calculated (.15) in attempt to correct the optimistic bias of the sample $R^2$. Table 23 also revealed that, from four independent variables, only two were significant. These variables were Grade Point Average (GPA) of the students' and Learning Styles, as measured by the GEFT test.
Table 23

Regression of Developing Cognitive Abilities Test (DCAT) on Students Characteristics (n = 135) (Simultaneous Entry)

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>R²</th>
<th>b_k</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>.42</td>
<td>.18</td>
<td>-4.13</td>
<td>-4.68</td>
<td>.00*</td>
</tr>
<tr>
<td>GPA</td>
<td></td>
<td></td>
<td>-4.13</td>
<td>-4.68</td>
<td>.00*</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>-1.49</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>Learning Styles</td>
<td></td>
<td></td>
<td>.33</td>
<td>2.05</td>
<td>.04*</td>
</tr>
<tr>
<td>Genderᵃ</td>
<td></td>
<td></td>
<td>.24</td>
<td>.14</td>
<td>.89</td>
</tr>
<tr>
<td>(Constant)</td>
<td></td>
<td></td>
<td>54.95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adjusted R² = .15
For Model: F = 7.04; p < .05
a: Female = 0; Male = 1
* p < .05

Summary

Chapter IV contained the findings of this study. The findings were presented in the following order: 1) students' characteristics; 2) students' cognitive abilities; 3) students' learning style; 4) correlates of students' cognitive abilities; 5) correlates of students' learning style; 6) the relationship between cognitive abilities and learning style of students; 7) and the regression of Developing Cognitive Abilities Test on students characteristics.
CHAPTER V
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Purpose of the study
The purpose of the study was to determine the cognitive abilities and the learning styles of students enrolled in Home Economics courses in San Juan and Bayamón Regions in the Department of Education in Puerto Rico. The study also sought to relate cognitive abilities to selected students' characteristics, including learning style, and to explain and predict the Developing Cognitive Abilities Test scores of students enrolled in occupational Home Economics courses.

Problem Statement
Business and industry are requiring from vocational education students higher levels of thinking skills and the ability to integrate thinking and knowledge in relation to practice. One of the goals of the vocational education is to prepare a students with the levels of proficiency in occupational and academic skills required by the world of work (SCANS Report, 1991).

Kuchinkas (1979) stated that the teacher has a very important role in the development of skills in the students, and the type of instruction provided must respond to the
different learning styles of the students.

If vocational educators want to prepare students not only with the entry level skills, but with a longlife education, it is necessary to prepare the students with skills and abilities which will help them to be successful in life. On the other hand, the teachers must be aware of the learning styles and cognitive abilities of the students in order to provide the levels of instruction according to the individual needs of students and the demands of the job.

There are few investigations about the cognitive levels and/ or learning styles of the Puerto Rican students. There is no research in Puerto Rico that investigates the occupational Home Economics students in terms of their cognitive abilities and learning styles. Research on the characteristics of the students in terms of the cognitive ability and learning styles is needed in order to identify the areas that can be improved in, curriculum development, and teacher preparation. Also, the knowledge about the cognitive abilities and learning styles of students will greatly enhance the teacher meeting the students' needs.

Research Objectives

To accomplish the purpose of the study, the following objectives were developed:

1. Describe the students enrolled in the Home Economics occupational courses on the following variables:
age, gender, and cumulative GPA.

2. Determine the cognitive abilities (basic, application, and critical thinking) of occupational Home Economics students as measured by the Developing Cognitive Abilities Test (DCAT), Level K.

3. Determine the learning style of occupational Home Economics students as measured by the Group Embedded Figure Test (GEFT).

4. Describe the relationships between cognitive abilities (basic, application, and critical thinking) utilizing DCAT, Level K, and selected variables (age, gender and cumulative GPA).

5. Describe the relationship between learning style as measured by the GEFT and selected variables (age, gender and cumulative GPA).

6. Describe the relationship between cognitive abilities utilizing the DCAT and learning style utilizing the GEFT of students enrolled in Home Economics courses.

7. Explain variance in the dependent variable, DCAT scores, through a linear combination of the independent variables.

Methodology

Research Design

The design of the study was descriptive and correlational
in nature. The dependent variable was the Developing Cognitive Abilities Test scores, and the major independent variables were students learning style and some demographic variables as: gender, age and grade point average of the students.

Descriptive research techniques were used to describe the cognitive ability and the learning styles of the students. Correlational procedures were used to determine if there were any relationships between the cognitive ability, the learning styles of the students, and some demographic variables.

**Instrumentation**

Three instruments were used to gather the data from the subjects: The Developing Cognitive Abilities Test (DCAT), Level K (Beggs and Mouw, 1989) was used to indicates the cognitive characteristics of a population. The cognitive abilities of the DCAT were measured by three content areas: verbal, quantitative, and spatial. The Group Embedded Figure Test (Witkin, Oltman, Raskin, and Karp, 1971) was used to determine the preferred learning styles of the students, either field dependent or field independent. The third instrument gathered demographic data.

A content validity for both instruments was established for by a panel of experts. The panel of experts ensured that the items on the test were clear, well worded, and understandable to the group being studied.
Data Collection and Analysis

The data collection process in the schools was conducted by administering the instrument to the students during the class session. The teacher of the course administered the instruments to the students after instruction was received from the researcher on how to administer the instruments.

Data were analyzed using the SPSS/pc+ (Statistical Package for the Social Science, Personal Computer version). Descriptive statistics were used to analyze the data. Davis (1971) descriptors were used to describe the measures of association.

Population and Subjects Selection

The study was conducted in five vocational schools in San Juan and Bayamón Regions in Puerto Rico with occupational Home Economics courses in school year 1994-95. The target population was all the students enrolled in occupational Home Economics courses at the high school level in San Juan and Bayamón Educational Regions in Puerto Rico (N=191). A total of 135 students answered the instruments. Of this population 32 (24%) were males and 103 (76%) were females. The ages of the students ranged from 15 to 23 years old. The grade point average of the students ranged from .90 to 4.00. The students were enrolled in grades 9 to 12 in the following courses: Commercial Bakery, Home Decoration, Custom Apparel, Child Care, Wedding Specialty Consulting, Food Production, Floral
Design, and Cleaning Services.

Summary and Discussion of Findings

Students Characteristics

Demographic data were gathered on 135 occupational Home Economics students in San Juan and Bayamón educational regions in Puerto Rico on June, 1995.

Of the 135 students who participated in the study, 23.7% (n=32) were males and 76.3% (n=103) were female. The age of the students who participated in the study ranged from 15 to 23 years of age. The mean age of the students was 17.6 years with a standard deviation of 1.43. The mode age of the students was 17 years old.

Of the students that participated in the study (n=135) it was found that the area of study with the largest population was Food Production (34.8%; n=47), and the smallest population was Commercial Bakery (4.4%; n=6).

The students that participated in the study ranged in cumulative grade point averages from .90 to 4.00. The mean GPA was 2.46 with a standard deviation of .83.

Four grades were identified from the group of students that participated in the study (n=135). It was found that the largest proportion were from the twelfth grade (60%; n=81).

The schools selected for the study were from the San Juan and Bayamón regions that had occupational Home Economics courses. Five schools participated in the study, three from
San Juan and two from Bayamón. More than the 60 percent (67.4%) of the students were enrolled in schools from the San Juan Educational Region.

Seven students had physical handicap conditions. Ninety-five percent of the population did not have any physical handicapped.

**Students' Cognitive Abilities**

The DCAT provided scores for the occupational Home Economics students on the three levels of cognition (Basic Cognitive Abilities, Application Abilities, and Critical Thinking Abilities). The raw scores for the DCAT ranged from 5 to 57. On the Basic Cognitive Abilities items, the raw scores ranged from 2 to 25, the mean raw score was 16.20, with a standard deviation of 4.80. On the Application Abilities items, the raw scores ranged from 0 to 19, the raw mean score was 8.75, with a standard deviation of 3.19. On the Critical Thinking Abilities items, the raw scores ranged from 0 to 21, the mean raw score was 8.55, with a standard deviation of 3.82.

**Cognitive Abilities by Gender**

The gender data showed that the total DCAT, Level K raw scores of the females ranged from 5 to 57. The mean score for females was 33.82 with a standard deviation of 9.40. The Basic Cognitive Abilities scores showed that females ranged from 2
to 25. The mean score was 16.77 with a standard deviation of 4.97. The Application Abilities scores revealed that females ranged from 0 to 19. The mean was 8.71 with a standard deviation of 3.28. The Critical Thinking Abilities scores ranged from 0 to 21. The mean score was 8.27 with a standard deviation of 3.89.

Males data revealed that the raw DCAT, Level K scores ranged from 16 to 43. The mean score for males was 32.82 with a standard deviation of 6.32. The Basic Cognitive Abilities scores revealed that males ranged from 3 to 21. The mean score was 14.34 with a standard deviation of 3.70. The Application Abilities scores showed that males ranged from 4 to 15. The mean scored 8.87 with a standard deviation of 2.93. The Critical Thinking Abilities scores revealed that males ranged from 1 to 17. The mean score was 9.46 with a standard deviation of 6.47.

Cognitive Abilities by Grade Point Average

The GPA data showed that the total DCAT, Level K raw scores of students between the range of 3.50 to 4.00 GPA ranged from 31 to 57 with a mean score of 41.27 and a standard deviation of 8.05. Students between the range of 2.50 to 3.49 GPA ranged from 5 to 47 with a mean score of 34.14 and a standard deviation of 7.97. Students between the range of 1.50 to 2.49 GPA ranged from 6 to 47 with a mean score of 31.36 and a standard deviation of 7.74. Students between the range of
.90 to 1.49 GPA ranged from 11 to 47 with a mean score of 29.9 and a standard deviation of 11.22.

**Students' Learning Style**

The instrument used to gather data to measure the learning styles of the students enrolled in occupational Home Economics courses was the Group Embedded Figure Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971). The national mean score was 11.4 and was set to divided between dependent learning style or independent learning style. Cano (1993) identified students whose raw scores were between 10 to 14 as neutral in their learning style.

The results of the GEFT scores shows that 82% of the students have field dependent learning styles, 8% of the students have a field independent learning style, while 9% (n=11) of the students were neutral in their learning style. The raw scores ranged from 0 to 18 (total possible score = 18). The mean raw GEFT score was 6.0 with a standard deviation of 4.45.

**Learning Style by Gender**

The gender data revealed that the raw GEFT scores of the females ranged from 0 to 17. The data indicated that 86% of the females (n=103) learned in a field dependent style, while 5% of the females learned in a field independent style, 9% of the females were neutral in their learning style. The mean
score for females was 5.72 with a standard deviation of 4.11. Data revealed that the raw GEFT scores for males ranged from 0 to 18. The data indicated that 78.5% of the males (n=32) learned in a field dependent style, while 16% of the males learned in a field independent style, 15.5% of the males were neutral in their learning style. The mean score for males was 6.9 with a standard deviation of 5.36.

**Learning Style by Grade Point Average**

The data analysis revealed that students' GPAs ranged from .90 to 4.00, in a 4.00 scale. Of the students with a GPA in the range of 3.50 to 4.00 (n=18), 83.0% learned with a field dependent style, 6% learned with a field independent style, while 11% of the students were neutral in their learning style. Of the students with a GPA in the range of 2.50 to 3.49 (n=48), 85% learned with a field dependent style, 5% learned with a field independent style, while 10% were neutral in their learning style. Of the students with a GPA in the range of 1.50 to 2.49 (n=58), 79% learned with a field dependent style, 10.5% learned with a field independent style, while 10.5% were neutral in their learning style. Of the students with a GPA in the range of .90 to 1.49 (n=11), 82% learned with a field dependent style, while 18% learned with a field independent style.
Correlates of Students' Cognitive Abilities

Basic Cognitive Abilities

Correlation coefficients were calculated between students' Basic Cognitive Abilities scores and personal characteristics. There was a positive and low relationship ($r_{pb} = .29$) between students' gender and Basic Cognitive Abilities. The relationship between students' age and Basic Cognitive Abilities was negative and negligible ($r = .01$). There was a negative moderate relationship ($r = -.41$) between students' GPA and Basic Cognitive Abilities.

Application Abilities

Correlation coefficients were calculated between students' Application Abilities and personal characteristics. The relationship between students' gender and Application Cognitive Abilities was negative and negligible ($r_{pb} = -.01$). There was a negative and low relationship ($r = -.02$) between age of students and Application Cognitive Abilities. The relationship between the GPA and the Application Cognitive Abilities was negative and low ($r = -.19$).

Critical Thinking Abilities

Correlation coefficients were calculated between students' Critical Thinking Abilities and personal characteristics. There was a negative and low correlation ($r_{pb} = -.11$) between gender and Critical Thinking Abilities. The relationship between age and Critical Thinking Abilities was negative and low ($r = -.22$). The relationship between GPA score
and Critical Thinking Abilities was negative and negligible ($r = -.04$).

**Correlates of Students' Learning Style**

**Students Characteristics**

Correlation coefficients were calculated to describe the relationships between students' learning styles measured by the GEFT and personal characteristics. The relationship between students' gender and GEFT was negative and low ($r_{pb} = -.13$). The relationship between age of students and GEFT scores was negative and low ($r = -.23$). The relationship between GEFT scores and the GPA of students was positive but low ($r = .15$).

**Relationship Between Cognitive Abilities and Learning Styles of Students**

The relationship between cognitive abilities of students and GEFT were computed by Pearson product-moment correlation coefficients ($r$). A negligible relationship ($r = .01$) existed between Basic Cognitive Abilities scores and GEFT score. A negative and negligible relationship existed between Application Abilities and GEFT scores. A positive and moderate relationship ($r = .43$) existed between Critical Thinking Abilities and GEFT scores.
Regression of Developing Cognitive Ability Test on Students Characteristics

Multiple Regression analysis was used to determine the proportion of variance in Cognitive Abilities Test that could be explained by a linear relationship of independent variables (GPA, Age, Learning Style, and Gender). A multiple coefficient correlation (Multiple R) was R= .42 and was interpreted as a positive moderate correlation. From four independent variables, two were significant. Eighteen percent of the DCAT scores was explained by the selected independent variables. An adjusted $R^2$ was calculated (.15) in attempt to correct the optimistic bias of the sample $R^2$.

Conclusions, Implications, and Recommendations

Based upon the review of literature and the findings related to the research objectives, several conclusions, implications, and recommendations applicable to the participants in this study were reached.

Objective

Determine the cognitive abilities (basic, application, and critical thinking) of occupational Home Economics students as measured by the Developing Cognitive Abilities Test (DCAT), Level K.

Conclusion

The results of the DCAT scores revealed that occupational
Home Economics students scored greater on Basic Cognitive Abilities subtest which included knowledge and comprehension skills (mean=16.2), than in Application (mean=8.8) and Critical Thinking Abilities (mean=8.6). Students' performance was low in Application Abilities, and in Critical Thinking Abilities. This mean that Home Economics students lack of Application and Critical Thinking Abilities. Some researchers (Fedje, 1987; Thomas & Englund, 1989; and Lazear, 1992) concluded that the cognitive ability is not fixed or static and that there are a wide variety of exercises, and experiences that can strengthen and enhance cognitive abilities of students in the classroom. The results of the DCAT scores also revealed that students' basic cognitive abilities (verbal abilities) are high (mean = 16.2). Gardener (1992) defined verbal abilities as the literal understanding and the appropriate uses of words and phrases. It is involved in any formal or informal conversation, the use of metaphors, similes, analogies, and the proper use of grammar and syntax in speaking and writing. Fedje (1987) pointed out that the skills of listening, reading and writing can develop higher order thinking skills such as interpretation, integration, inferring, analyzing, and composing.

**Implication**

While students scored lower in Application Abilities and Critical Thinking Abilities would imply that the curriculum for the Home Economics courses does not have enough
experiences or exercises in the problem-solving approach that can be performed to strengthen and enhance the application and critical thinking cognitive skills (analysis and synthesis). Several researchers concluded that the more extensively teachers used problem-solving approach, the higher the students were in academic aptitude and general knowledge in the subject matter.

**Recommendation**

The present Home Economics curriculum must be reviewed to include exercises and experiences in problem solving-approach to enhance the higher order thinking capabilities of Home Economics education learners. It was shown in the study that the students have greater need for instructional intervention in critical thinking skills and application skills. Also, the teachers need information on the specific teaching methods that the students need to become higher level thinkers. Those methods should include group discussions, demonstrations, experiments which would use higher level thought process, case studies, field trips, independent studies, role plays, cooperative activities, competitive activities and testing at the higher cognitive levels. Home Economics occupational teachers should receive in-service training and workshops by supervisors from the regional and central level of the Department of Education in Puerto Rico on the following topics: Characteristics of the Home Economics students in terms of cognitive abilities, Research findings; Importance in
the development of the cognitive abilities in the students, benefits for the industry and the life; Improving cognitive abilities, what techniques to use, how to use them, where to use them; Which kind of instruction is more effective in developing thinking skills, What type of tests must be used to enhance, and evaluate the higher order thinking skills in students.

Objective  

Determine the learning style of occupational Home Economics students as measured by the Group Embedded Figure Test (GEFT).

Conclusion

Of the students enrolled in Home Economics occupational courses 82% were field dependent learners, 11% were field independent learners, while 9.6 were neutrals. Several studies have found that dependent learners usually select people oriented occupations such as home economics, social studies, and family and child development (Frank, 1986; Gannon, 1985). Cano (1995) found that some persons have some characteristics that do not match exactly with field dependent or field independent learning style. These persons can change easily from one learning style to the other depending in the situation.

Home economics students, as field dependent learners, have some characteristics that are related with this style of learning such as: global perception, poor analytical problem
solving, highly developed social skills, adapts organization of information to be learned, are extrinsically motivated, and are responsive to social reinforcement. Also, field dependent persons have well developed verbal skills.

Implication

Home Economics students as field dependent learners would imply that they lack analytical and problem solving skills. The SCANS Report (1991) concluded that traditional jobs were changing and future jobs required employees to be thinkers and problem solvers. Home Economic students may be deficient in skills needed for future employment.

Recommendation

Teachers must become knowledgeable about learning styles of students and the characteristics of each one of the learning styles: dependent or independent, to determine the most appropriate way to develop the instructional process according to the students needs. Teachers should be appraised of learning styles of students to flex teaching methods and reach every student in the classroom. Seminars and workshops must be developed by supervisors from the regional and central level of the Department of Education to identify the teaching methods and strategies that fulfill the weakest areas and enhance and strengthen areas related to the preferred learning style. Career counselors could also use learning styles information in selecting a counseling approach for students. Counselors may use the learning styles of students as an
additional resource to guide students to select occupations where they can be successful.

Students must become knowledgeable about their learning style. This knowledge can provide student with general academic and vocational direction toward areas of study. Field dependent students are often described as people oriented persons, and as a result, they tend to select people oriented occupations, field independent students are often described as good in analytical abilities, as a result, they tend to select areas related with mathematics or sciences. The students can use the knowledge about the learning style as an additional resource to select the area of studies.

**Objective**

Describe the relationships between cognitive abilities (basic, application, and critical thinking) utilizing DCAT, Level K, and selected variables (age, gender and cumulative GPA).

**Conclusion**

Females scored greater than males in the Basic Cognitive Abilities subtest, while males scored greater than females in Critical Thinking Abilities subtest. Several studies (Halpen, 1986; Maccoby & Jacklin, 1974) tend to agree that females score greater in verbal abilities than males, while males score greater in quantitative and spatial abilities.

**Implication**

While females as a group scored greater than males in
basic Cognitive Abilities, it would imply that males were in greater need for improvement on Basic Cognitive Abilities, while females have a greater capacity for improvement in those skills. Both males and females have the greatest need for cognitive development in Application and Critical Thinking Abilities through the instructional process.

**Recommendation**

Teachers must become knowledgeable about cognitive abilities of students and the weaknesses and strengths of each one of the cognitive skills, to determine the most appropriate way to develop the instructional process according to the students needs. Teachers should be appraised of the cognitive abilities of students to vary teaching methods and reach every student in the classroom. Seminars and workshops must be developed to identify variety of teaching methods and strategies to fulfil weak areas and enhance and strengthen areas related to the cognitive abilities of students.

**Objective**

Describe the relationship between learning style as measured by the GEFT and selected variables (age, gender and cumulative GPA).

**Conclusion**

The results of the correlation between GEFT test scores and gender showed that males scored greater than females, although both group's means scores indicated they were field dependent. Consistent differences in gender learning styles
have been reported in the field dependent-field independent studies (Witkin et al., 1971; Shipman & Shipman, 1985; and Fritz, 1992), where males tend to be more independent learners and females tend to be more dependent learners.

Implication

While there was no difference between the learning styles of males and females, it would imply that males and females in the group studied are similar in their learning styles.

Recommendation

It is therefore recommended that the educational process concerning learning styles be based on individual differences of students, not on gender differences.

Conclusion

The mean grade point average of occupational Home Economics students was 2.45. Students who scored greater on the GEFT test, had a lower GPA. Although some studies tried to associate field dependent and field independent learners with intelligence (Goodenought & Karp, 1961), Witkin (1976) argued that, based on several studies, the field dependent and field independent dimension appeared unrelated to overall academic achievement.

Implication

While students who scored greater on GEFT test had a low GPA, this would imply that there was no relationship between the GEFT test and academic achievement.
Recommendation

Because extensive observations and research verified significant improvement in both students' achievement and motivation when learning and teaching styles are matched, it is therefore recommended to match instructional resources with identified students' characteristics to improve students' achievement.

Objective

Describe the relationship between cognitive abilities utilizing the DCAT and learning style utilizing the GEFT of students enrolled in Home Economics courses.

Conclusion

It was found that a positive moderate relationship existed between the Critical Thinking Abilities subtest and Learning Style of Students. Students who scored greater on the Critical Thinking Abilities subtest scored greater on the GEFT test.

Implication

While students who scored greater on the Critical Thinking Abilities subtest also scored greater in GEFT test, then students with a greater capacity for improvement in critical thinking skills tend to be more field independent in their learning style. Messick (1969) described field independent as people that have good analytical abilities.
Recommendation

Teachers should be appraised of the cognitive abilities, and learning styles of students to reach for different ways of teaching and reach every student in the classroom. Seminars and workshops must be developed by the Department of Education at the regional and central level in order to identify teaching methods and strategies that can fulfill the weakest areas and enhance and strengthen areas related to the cognitive abilities, and learning styles of students.

Objective

Explain variance in the dependent variables, DCAT scores, through a linear combination of the independent variables.

Conclusion

The independent variables age, GPA, Learning Styles, and gender explained 18% of the cognitive abilities of students.

Implication

While 18% of the variance was explained by the independent variables there is an 82% of the dependent variable that was not explained by the present study.

Recommendation

There are other factors that can explain and predict the cognitive abilities of the students. Further research is needed to find what other factors can explain and predict the cognitive abilities of the students.
Recommendation for Further Research

According to the findings of the study, some recommendations were reached for further research:

1. Research should investigate the methodology of the Home Economics teacher and how this methodology matches with the findings of the present study. With the results, the present modes or strategies can be expanded or eliminated if they are not respondent to developing higher order thinking skills.

2. Research should investigate the relationship between learning styles of students and performance in Home Economics occupations.

3. Research should investigate the relationship between the cognitive ability and the performance in the Home Economics occupations.

4. Research should investigate the effects of using problem solving approach in the learning experiences on cognitive abilities of the Home Economics occupational students.

5. Research should investigate the effects of using abstract though in the learning experience on learning style of the occupational Home Economics students.

6. The present study should be replicated on a bigger sample of Home Economics students.

7. The present study should be replicated in other vocational programs.

8. Research should investigate the relationship between the
learning styles and the development of the cognitive ability in the early childhood.
APPENDIX A

Description of Bloom's Taxonomy of

Educational Objectives
DESCRIPTION OF BLOOM'S TAXONOMY

I. KNOWLEDGE LEVEL

A. Consists of memorizing or identifying facts. It is a student's "file" of information that can be recalled or brought to mind later. It provides the basis for greater understanding (Chamberlain and Kelly, 1981).

B. The knowledge level itself ranges from specific, concrete facts, or information to more complex and abstract theory. The taxonomy level of knowledge is divided into the following sub-levels (Hunkins, 1972):

1. Knowledge of Specifics - the recall of specific, separate bits of information. This type of question provides the student with a data base.

   a. Knowledge of terminology - definitions

   b. Knowledge of specific facts - includes dates, events, persons, places, etc

2. Knowledge of Ways and Means of Dealing with Specifics - knowledge of the ways of organizing, studying, judging, and criticizing. Does not require the student to be able to understand or utilize the concept; only requires an awareness of the concept.

   a. Knowledge of conventions - awareness of
accepted ways of dealing with types of information or situations. Example: "What is the correct form for a business letter?"

b. Knowledge of trends and sequences - questions student's knowledge of various phenomena in relation to the dimension of time. The emphasis is not on student understanding of the trend, but only that they recognize it exists. Example: "What were the events that led up to World War II?"

c. Knowledge of classifications and categories - emphasis is placed upon the students remembering certain groupings of information. They are not required to do anything with the categories; they are only asked to recall from memory certain classifications. Example: "What are the four basic food groups, and which foods are contained in each?"

d. Knowledge of criteria - emphasis is on awareness of criteria developed. Identification or listing of criteria is requested; not an understanding of the basis for establishment of criteria.

e. Knowledge of methodology - this dimension is only concerned with the student's awareness
of several methods or processes, not his/her ability to apply them to actual situations. Example: If a teacher wishes to individualize instruction, the first step should be to:

(1) Select materials.
(2) Consider his/her own competencies.
(3) Diagnose the abilities, needs, and interests of the students in class.
(4) Get permission from the principal.

f. Knowledge of the universals and abstractions in a field - deals with knowledge of principles and generalizations and knowledge of theories and structures. Questions at this level are asking only for an awareness of various abstractions. Example: "What is the basic structure of the discipline of economics, as presented in class?"

INTELLECTUAL SKILLS AND ABILITIES

Refers to the organized modes of operation and generalized techniques for handling and dealing with materials and problems. The abilities and skills objectives emphasize the mental processes of organizing and reorganizing material to achieve a particular purpose.

II. COMPREHENSION LEVEL

A. This level focuses on the meaning and intent of the material. It involves the ability to understand the
literal meaning of the subject matter. The comprehension level has been divided into three sublevels (Hunkins, 1972).

1. Translation - focuses on the student's ability to translate or paraphrase information from one to another. Knowledge is required, but the emphasis is on using this knowledge to understand material. Translation could involve:
   a. repeating what the author said, using the learner's own words.
   b. translation of a foreign language into English.
   c. translation of material from technical terms into layman's terms.

2. Interpretation - the emphasis is on grasping the basic ideas or general meaning of the material. a. The learner must be able to translate each major part of the material so that it becomes meaningful.
   b. The learner must then rearrange or reorder the material to determine significant and non-significant portions.
   c. The learner must finally be able to relate the information (fact, generalization, definition, skill, etc.) to new situations.

3. Extrapolation - extends the ability to
translate and interpret by student's expanding the information to determine implications, consequences, effects, etc., based on the original communication.

III. APPLICATION LEVEL

A. Education should be preparation for life. Application questions are designed to give students practice in the transfer of training; applying what has been learned to other situations and learning tasks.

B. There are three main characteristics of questions in the application category (Sanders, 1966).

1. They deal with knowledge which has explanatory or problem-solving power - the kind of knowledge transferable to many situations.

2. They deal with whole ideas and skills, rather than solely with parts.

3. They include a minimum of directions or instructions; part of the challenge lies in the student being able to determine the appropriate problem-solving process to use.

C. Evidence shows that once the ability to make application is developed, it is likely to be one of the more permanent acquisitions in learning (Bloom et al., 1981).

IV. ANALYSIS LEVEL

A. Analysis may be regarded as a further step in the
"comprehension" of an idea, product, or document. It requires the student to "see" the underlying ideas, devices, and workings of a document or communication (Bloom et al., 1981).

B. While analysis is slower and more difficult than the comprehension process, it is very important to use where deeper understanding is required before decisions are reached and problems are attacked (Bloom et. al., 1981).

C. It is likely that once analytical abilities are developed in a number of fields of knowledge, they can be applied to new problems in a creative way (Bloom et al., 1981).

D. Analyzing includes: (1) separating relevant material from trivia; (2) distinguishing facts from hypotheses; and (3) differentiating between objective data and value judgement (Chamberlain and Kelly, 1981).

E. Bloom et al. (1956) divided the analysis level into three sub-levels:

1. Analysis of Elements - the student is expected to break down the material into its constituent parts, then identify and classify those parts.

2. Analysis of Relationships - differentiate between various relationships among the elements and determine their connection and interaction.

3. Analysis of Organizational Principles - the student is able to determine the author's purpose,
point of view, attitude, or general conception of a field, in order to better comprehend the meaning of the material.

V. SYNTHESIS LEVEL

A. Synthesis questions encourage students to think creatively and make original conclusions. It is the ability to put parts and elements together in a form new to the student (Chamberlain and Kelly, 1981).

B. This is the category in the cognitive domain which most clearly provides for creative behavior on the part of the learner; this work is still expected to be within the limits set by particular problem theories or methods.

C. Bloom et al. (1956) have divided the synthesis level into three sub-levels; these levels are distinguished on the basis of the product developed through the synthesis process:

1. Production of a Unique Communication - the student originates a product that produces ideas, feelings, and experiences that are uniquely his/hers; the interpretation should represent the student's individual thinking and personality.

2. Production of a Plan - requires the student to produce a plan or solution to a particular situation.

3. Derivation of a Set of Abstract Relations -
requires students to create or derive some type of statement to explain or classify data or a situation. The student can formulate a concept or generalization from the analysis of data.

D. Sanders (1966) has identified various strengths and weaknesses of synthesis questions:

1. Strengths of Synthesis Questions
   a. Allows students great freedom in seeking solutions.
   b. The question has many possible approaches to achieve the answer; the student must understand that the teacher does not have a definite answer in mind.
   c. The solution requires a product.

2. Weaknesses of Synthesis Questions
   a. Asks questions that call for mental creativity, but often may have no correlation with course objectives.
   b. There is the possibility of forming questions that are totally beyond the competence of the student.
   c. It is difficult to evaluate the answers fairly.
   d. It is often difficult to provide conditions favorable for creative work.
VI. EVALUATION LEVEL

A. Evaluation questions are those requiring the student to make a judgement about something, using some criteria or standard for making the judgement (Clegg, 1967).

B. Bloom makes the point that evaluation is not an activity done after all the other levels of intellectual skills have been used. To some degree, evaluation can be considered a "floating" category, in that it can be used at each level of intellectual activity (Hunkins, 1972).

C. Unfortunately, too often only the knowledge level in the cognitive domain is emphasized and evaluated. Students are taught facts and specifics and are then asked to repeat them in various ways (Chamberlain and Kelly, 1981).

D. Bloom et al. (1956) have divided the evaluation level into two sub-levels:

1. Evaluation in Terms of Internal Evidence - requires the student to analyze data or conclusions from standpoints such as logical accuracy, consistency, and other internal criteria.

2. Evaluation in Terms of External Criteria - focus is on having students apply known criteria to judge various situations or conditions that he/she encounters or develops.

APPENDIX B

Letter for Permission of Parents
Junio de 1995

Estimado(a) padre (madre):

Próximamente se ofrecerán unos exámenes a los estudiantes que están matriculados en los cursos ocupacionales de Economía Doméstica. Estos exámenes están dirigidos a determinar el estilo y habilidad de aprendizaje de los estudiantes. La información que se recoja podrá ser utilizada para mejorar el currículo y proveer adiestramiento a los maestros para que éstos adapten sus estilos de enseñanza de acuerdo con las necesidades de los alumnos.

Solicítamos su autorización para que su hijo participe en este estudio. Toda información será usada únicamente para fines de investigación y de ninguna manera afectará el promedio de su hijo (a) en la clase.

Favor señalar si autoriza o no, firmar boleto adjunto y devolver al maestro (a).
Gracias anticipadas por su colaboración.

María I. Martín
Investigadora

______________________________________________________________

AUTORIZACION PARA ESTUDIO DE INVESTIGACION

_ ___  Autorizo _No autorizo

a mi hijo (a) ____________________________ a participar en el estudio de investigación.

Firma del padre, madre o encargado
APPENDIX C

Letter to Students
Junio de 1995

Estimado(a) estudiante,

Como estudiante matriculado en escuela superior debes haber experimentado muchos estilos de enseñanza de parte de tus maestros (as). No es secreto que cada maestro (a) tiene su propio estilo. Sin embargo, a tí se te ha hecho más fácil aprender con unos estilos de enseñanza que con otros. Esto es así porque tu estilo de aprendizaje tiene unas preferencias.

Estamos interesados en identificar el estilo de aprendizaje de los estudiantes que estudian cursos ocupacionales de Economía Doméstica. El Programa de Economía Doméstica podrá usar los datos grupales que se recojan para adaptar el currículo y proveer adiestramiento a los maestros de manera que éstos adapten su estilo de enseñanza al estilo de aprendizaje de los estudiantes. En adición, nos interesa determinar las características y habilidades de aprendizaje de nuestros estudiantes.

Tu escuela ha sido seleccionada para participar en este estudio. Tu participación es invaluable para poder mejorar la educación en Puerto Rico. Es por esta razón que solicitamos tu colaboración para completar las pruebas que te ofrecerá tu maestra.

Gracias por tu cooperación,

María I. Martín
Investigadora
APPENDIX D

Answered Sheet for the DCAT, and to Collect the Demographic Data
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<th>APELLIDO PATRINO</th>
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<th>FECHA DE ADM</th>
<th>DIAIS DEMOGRAFICOS</th>
<th>CODIGO DEL INSTRUMENTO</th>
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127
Appendix E

Instruction Sheet for the

Developing Abilities Cognitive Test
Instrucciones para administrar la Prueba para medir la habilidad cognoscitiva del estudiante

El tiempo total de la prueba es de 60 minutos que se dividen de la siguiente manera:

<table>
<thead>
<tr>
<th>PARTE</th>
<th>TIEMPO LÍMITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal</td>
<td>15 minutos</td>
</tr>
<tr>
<td>Cuantitativa</td>
<td>25 minutos</td>
</tr>
<tr>
<td>Espacial</td>
<td>20 minutos</td>
</tr>
</tbody>
</table>

Durante la administración de la prueba para medir conocimientos y destrezas de los estudiantes se debe asegurar que las condiciones en la administración sean adecuadas. Esto ayudará al logro de un mayor rendimiento de los estudiantes, y por ende, la confiabilidad de los resultados. Se debe mantener la seguridad de todo el proceso para evitar situaciones como la pérdida de los pruebas u hojas de contestaciones.

Antes del comienzo de la prueba se debe asegurar que los estudiantes tengan lo siguiente:

- lápiz # 2
- Prueba
- Hoja de contestaciones

La prueba de Habilidad Cognoscitiva consta de 81 preguntas de selección múltiple con cuatro alternativas para escoger y tendrá una duración de 60 minutos. Durante la duración de la prueba no se deberá comer ni beber.

En la HOJA DE CONTESTACIONES se completará la siguiente información y se procederá a ennegrecer las burbujas que corresponden:

- Donde dice PROMEDIO se ennegrecerá el círculo que corresponda al promedio académico que tiene hasta ahora en su escuela superior.
- Donde dice ESCOLARIDAD se escribirá el número de años de escuela que ha cursado el estudiante.
- Se escribirá el número de Seguro Social donde corresponde.
• El estudiante no escribirá el nombre.

• En fecha de administración escribirán la fecha del día de la prueba.

• En los datos demográficos se indicará si es M para masculino y F para femenino.

• En el espacio que dice impedimentos se usará la siguiente clave:

  01 Problemas de audición
  02 Sordera
  03 Problemas de visión
  05 Problemas del habla y lenguaje
  06 Problemas de salud
  07 Problemas ortopédicos
  08 Problemas de aprendizaje
  09 Disturbios emocionales
  10 Impedimentos Múltiples
  11 Retardo mental educable
  00 Ninguno

• Para completar el espacio Código del instrumento, refiérase a la hoja que identifica el curso, el distrito y la escuela.

Cuando se esté contestando la prueba se debe asegurar que se ennegrezca bien la letra que corresponde a la contestación.

Está prohibido copiarse, arrancar páginas, copiar textos y usar calculadoras, libros, libretas, etc.
Instructions for the administration of the Developing Cognitive Ability Test

The total time for the test is 60 minutes, that are divided in the following way:

<table>
<thead>
<tr>
<th>PART</th>
<th>TIME LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERBAL</td>
<td>15 minutes</td>
</tr>
<tr>
<td>QUANTITATIVE</td>
<td>25 minutes</td>
</tr>
<tr>
<td>SPATIAL</td>
<td>20 minutes</td>
</tr>
</tbody>
</table>

During the administration of the test the teacher must be sure that the conditions will be adequate. This will help in the success for a major output from the students and the reliability of the results. The teacher should maintain the security in the process to avoid the lost of tests or answer sheets.

Before the test, the teacher must be sure that the students have:

- Pencil # 2
- Test
- Answer sheet

The Developing Cognitive Ability Test consist of 81 multiple selection items with four alternatives to choose. The test have the duration of 60 minutes. During the test, the student will not be allow to eat or drink.

In the ANSWER SHEET, the student will fill out the following information, and will proceed to fill out the bubbles that correspond to the letter.

- the student will fill out the space provided for the actual GPA
- Grade- the student will fill out the number of years in school
- Social Security of the student will be filled out in the space provided for this.
- the student will not write the name.
- the student will fill today's date
- the student will write M for male and F for female
• in the space provided for handicapped it will be used the following code:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>01</td>
<td>deaf problems</td>
</tr>
<tr>
<td>02</td>
<td>deaf</td>
</tr>
<tr>
<td>03</td>
<td>vision problems</td>
</tr>
<tr>
<td>05</td>
<td>language problems</td>
</tr>
<tr>
<td>06</td>
<td>health problems</td>
</tr>
<tr>
<td>07</td>
<td>orthopedic problems</td>
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<td>08</td>
<td>learning disabilities</td>
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<td>09</td>
<td>emotional disturbances</td>
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<td>multiple disabilities</td>
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<tr>
<td>11</td>
<td>RME</td>
</tr>
<tr>
<td>00</td>
<td>none</td>
</tr>
</tbody>
</table>

• to fill out the Instrument Code space, refer to the sheet that identified the course, District, and School.

When the student is answering the test, the teacher must check if the student is filling the bubble completely with the pencil.

Is not permitted to cheat, to extract sheet, copy texts, or use calculators, books or notebooks.
Appendix F

Instruction Sheet for the Group Embedded Figure Test
Instrucciones al maestro:

Distribuya los folletos de prueba y los lápices. Tan pronto los estudiantes completen la información de la primera página se procederá a que los estudiantes lean las instrucciones y completen los ejercicios de práctica. Luego de revisar los folletos para asegurar que los estudiantes entendieron las instrucciones, se procederá a que completen las tres secciones.

El tiempo total de la prueba es de 12 minutos que se dividen de la siguiente manera:

- Primera sección - 2 minutos
- Segunda sección - 5 minutos
- Tercera sección - 5 minutos
Instructions for the administration of the
Group Embedded Figure Test

Instructions to the teacher:

The booklets and the pencils must be distribute. The students will fill out the information from the first page. Then the students must read the instructions and complete the practice exercises.

The teacher will give instructions to complete the three sections of the test. The total time for the test is 12 minutes that are divided in the following way:

<table>
<thead>
<tr>
<th>Section</th>
<th>Time</th>
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</thead>
<tbody>
<tr>
<td>First section</td>
<td>2 min</td>
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<tr>
<td>Second section</td>
<td>5 min</td>
</tr>
<tr>
<td>Third section</td>
<td>5 min</td>
</tr>
<tr>
<td>Total</td>
<td>12 min</td>
</tr>
</tbody>
</table>
APPENDIX G

Occupational and Instrument Code
CODIGO DE LA OCUPACION

| Servicios de Saneamiento               | 20-0605 |
| Repostería Comercial                  | 12-0501 |
| Provisión de Comidas para ocasiones especiales | 20-0405 |
| Producción, administración y servicio de comidas | 20-0401 |
| Cuidado del niño                       | 20-0201 |
| Coord. de actividades para ocasiones especiales | 20-0306 |
| Floristería                             | 20-0501 |

CODIGO DEL INSTRUMENTO

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<tr>
<td>San Juan I</td>
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<tr>
<td>Bayamón V</td>
<td>004</td>
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<tr>
<td>Corozal</td>
<td>005</td>
</tr>
<tr>
<td>Toa Baja II</td>
<td>006</td>
</tr>
<tr>
<td>Escuela</td>
<td>Código</td>
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<tr>
<td>Carlos F. Daniels</td>
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<tr>
<td>Miguel Such</td>
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<tr>
<td>Pedro Albizu Campos</td>
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</table>
APPENDIX H

Panel of Experts
PANEL OF EXPERTS

The following people from the Department of Education in Puerto Rico, the Universidad de Puerto Rico, and Colegio Universitario del Este served on the Panel of Experts:

Adalberto Santa, Educational Researcher at the Department of Education, Vocational Planning Office

Ibis Forestier, Educational Researcher at the Department of Education, Vocational Planning Office, and translator

Julia Pérez Poll, Curriculum Technician at the Department of Education, and Spanish teacher at the Miguel Such Vocational School

Orlando Berdecía, Educational Researcher in charge of the Evaluation Unit in the Technological Education Program, Vocational Planning Office, and Graduate Student in Educational Administration at the University of Puerto Rico

Milagros Aguirre, Educational Researcher at the Department of Education in charge of Standards and Measurements Unit in the Technological Education Program, Vocational Planning Office

Arellys Marrero Rodríguez, English teacher at the Miguel Such Vocational School

Wilfredo Vega, English teacher at the Colegio Universitario del Este

Alfredo Ortíz, Sub director of the Planning Area at the Department of Education

Lourdes Rivera, Educational Researcher and Translator
APPENDIX I

Location of Vocational Institutions by

Municipality and Educational Regions
LOCATION OF VOCATIONAL INSTITUTIONS BY MUNICIPALITY AND EDUCATIONAL REGIONS

Symbols:

* Technological Institutes (2)
△ Area Vocational Schools (2)
❖ High Schools with Vocational Education Department (11)
○ Specialized Schools (6)
● Special Vocational Centers (7)
◆ Academic High Schools (104)
❖ Vocational Technical Schools (2)
❖ Vocational High Schools (9)

Bound
Educational Region Boundary
APPENDIX J

Organizational Chart

Programs of Technological Education

Puerto Rico
References


145


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Center for Education: University of Minnesota.


Torres, R. M. (1993). The cognitive ability and learning style of students enrolled in the college of agriculture at The Ohio State University. Unpublished doctoral dissertation, The Ohio State University, Columbus.


