
Manuel Velazquez Jr.
Andrews University

Follow this and additional works at: http://digitalcommons.andrews.edu/dissertations
Part of the Curriculum and Instruction Commons, and the Elementary and Middle and Secondary Education Administration Commons

Recommended Citation
Thank you for your interest in the Andrews University Digital Library of Dissertations and Theses.

*Please honor the copyright of this document by not duplicating or distributing additional copies in any form without the author’s express written permission. Thanks for your cooperation.*
INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or “target” for pages apparently lacking from the document photographed is “Missing Page(s)”. If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.

2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of “sectioning” the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.

4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.
Velazquez, Manuel, Jr.

A STUDY OF CURRICULAR AND SPATIAL CHARACTERISTICS OF SELECTED PUBLIC AND PRIVATE SECONDARY SCHOOL FACILITIES CONSTRUCTED FROM 1967 THROUGH 1976 IN PUERTO RICO

Andrews University

Ed.D. 1977

University Microfilms International

300 N. Zeeb Road, Ann Arbor, MI 48106

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark ✓.

1. Glossy photographs or pages
2. Colored illustrations, paper or print ✓
3. Photographs with dark background
4. Illustrations are poor copy
5. Pages with black marks, not original copy
6. Print shows through as there is text on both sides of page
7. Indistinct, broken or small print on several pages ✓
8. Print exceeds margin requirements
9. Tightly bound copy with print lost in spine
10. Computer printout pages with indistinct print
11. Page(s) ___________ lacking when material received, and not available from school or author.
12. Page(s) __184___ seem to be missing in numbering only as text follows.
13. Two pages numbered ___________. Text follows.
14. Curling and wrinkled pages
15. Other ____________________________________________
Andrews University
School of Graduate Studies

A STUDY OF CURRICULAR AND SPATIAL CHARACTERISTICS
OF SELECTED PUBLIC AND PRIVATE SECONDARY SCHOOL
FACILITIES CONSTRUCTED FROM 1967 THROUGH 1976
IN PUERTO RICO

A Dissertation
Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

by
Manuel Velazquez, Jr.
July 1977
ABSTRACT

A STUDY OF CURRICULAR AND SPATIAL CHARACTERISTICS OF SELECTED PUBLIC AND PRIVATE SECONDARY SCHOOL FACILITIES CONSTRUCTED FROM 1967 THROUGH 1976 IN PUERTO RICO

by

Manuel Velazquez, Jr.

Chairperson: Edward A. Streeter
ABSTRACT OF GRADUATE STUDENT RESEARCH

Dissertation

Andrews University
Department of Education

Title: A STUDY OF CURRICULAR AND SPATIAL CHARACTERISTICS OF SELECTED PUBLIC AND PRIVATE SECONDARY SCHOOL FACILITIES CONSTRUCTED FROM 1967 THROUGH 1976 IN PUERTO RICO

Name of researcher: Manuel Velazquez, Jr.

Name and title of faculty advisor: Edward A. Streeter, Ed.D.

Date completed: July 1977

Problem

The purpose of this study was to evaluate the spatial allocation for curricular purposes and the special features of each of the twenty-seven public and private secondary schools built in Puerto Rico during the years 1967-1976. The problem was: Were these schools being constructed in accordance with the desired curriculum; was the curriculum an outgrowth of the resulting physical structures, or were the curriculum and the planning of the structures unrelated?
Method

The spaces within the building were grouped into three major categories: (a) classrooms and laboratories; (b) special facilities; and (c) operation and services facilities. In order to obtain data regarding these three categories a questionnaire was sent and completed, and a personal visitation was made for inspection of each school building. Blueprints and specifications were secured from architectural firms, the Department of Education, or private organizations. Personal interviews were conducted with superintendents, principals, teachers, and architects for each structure.

Findings

It was noted that variations in the school plants such as the inclusion or exclusion of music, home economics, art, and industrial arts classrooms and science laboratories, had an effect on the curriculum. Where these facilities were provided a more intensive program in the course areas was evident. Schools in the study did not vary greatly in the provision for basic courses where general classrooms could be used, but they did vary in the provision for courses where special facilities were required.

The questionnaire and interviews revealed that considerable plant planning was done with the curriculum in mind. In the case of each school in the study,
educational specifications had been established and presented to the architect for his guidance.

The majority of the schools were rectangular in shape and were designed to house fifteen hundred or fewer students. A small percentage of the schools included teachers' offices and workrooms, student resource study spaces, and seminar spaces.

Conclusions

Features that were incorporated in selected secondary public and private schools which facilitated the curriculum were: small and large instructional spaces, provisions for educational television, language laboratories, individual study carrels, walls of modular units, ramps and inclines replacing steps, classrooms that could be easily darkened, projection screens, and teachers' workrooms.

The major portion of the comments made by the principals and teachers pertained to the flexibility of the school plant and the allocation of space for the educational program. A structure designed without adequate educational planning could be a hindrance rather than a benefit to the teachers and students. An important factor to be remembered in the construction of school plants is that the curriculum should give direction in planning for the present and the future.
A STUDY OF CURRICULAR AND SPATIAL CHARACTERISTICS
OF SELECTED PUBLIC AND PRIVATE SECONDARY SCHOOL
FACILITIES CONSTRUCTED FROM 1967 THROUGH 1976
IN PUERTO RICO

A dissertation presented
in partial fulfillment of the requirements
for the degree
Doctor of Education

by
Manuel Velazquez, Jr.

APPROVAL BY THE COMMITTEE:

Chairperson: Edward A. Streeter
Date approved: July 14, 1977

Committee Member: Bernard M. Lall

Committee Member: Virgil L. Bartlett

Committee Member: Walter B. Douglas

Committee Member: Douglas K. Brown

Dean, School of Graduate Studies
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Illustration</th>
<th>xii</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>xiii</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>xv</td>
</tr>
</tbody>
</table>

### Chapter

#### I. INTRODUCTION . . . . . . . . . . . . . . . . . . . . . . . . . . 1

- General Statement ........................................ 1
- The Problem ............................................. 5
- The Purpose ............................................. 5
- Basic Assumptions ....................................... 6
- Questions Answered ....................................... 6
- Delimitations of the Study .............................. 7
- Significance of the Study .............................. 7
- General Design of the Study ........................... 12
- Organization of the Study ............................. 13
- Definition of Terms .................................... 14

#### II. THE RELATED LITERATURE . . . . . . . . . . . . . . . . . . . . . 17

- Introduction ........................................... 17
- Historical Overview of Educational Planning ........... 18
  - Spanish Colony ...................................... 18
  - American Occupation ................................ 18
  - Advances Between 1946 and 1960 ...................... 19
  - Contemporary Planning Issues ....................... 22
- Need for School Building Programs and Importance of Educational Planning ......................... 23
  - Resource-Personnel Role in Educational Planning . . 27
    - Board of Trustees .................................. 30
    - Superintendent .................................... 31
    - Educational Consultants ........................... 32
    - Principal and Staff ................................ 33
    - Architect ......................................... 34
    - Students .......................................... 35
    - The Community .................................... 36
- Changes in School-building Design .................... 38
  - Trends Toward Functional Design ..................... 39
  - Flexibility ......................................... 40
  - Adaptability ....................................... 41

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
| Expansion ................................................. | 42 |
| Special Learning Spaces .............................. | 43 |
| Designs for Laboratory Learning .................... | 44 |
| Environments for Special Education .................. | 44 |
| Problems in the Adaptation of New .................. | 44 |
| Structures to Curricular Changes .................... | 44 |
| Future of Curricular Programs in ................... | 49 |
| School Structures Planned Today .................... | 49 |
| Related Studies ......................................... | 53 |
| Lamka Study .............................................. | 53 |
| Cochran Study ............................................ | 53 |
| Dolence Study ............................................ | 54 |

### III. PROCEDURES FOR THE STUDY ...................... 56

Type of Research ........................................ 56
Description of the Population and Sample ............ 57
Instrument ................................................. 59
Selection of the Panel of Experts ..................... 60
Collection of the Data .................................. 62
Tabulation and Analysis of the Data ................... 64

### IV. PRESENTATION AND ANALYSIS OF DATA FROM THE PUBLIC SCHOOL SYSTEM .......... 65

General Description ..................................... 65
Principals' Responses to Structure Characteristics ... 71
Teachers' Responses to Specific Structural Characteristics . 78
Interior Building Characteristics ..................... 81
Special Characteristics .................................. 81
Allocation of Space for Specific Curricular Programs ... 87

### V. PRESENTATION AND ANALYSIS OF DATA FROM THE PRIVATE SCHOOLS ............. 90

General Description ..................................... 90
Principals' Responses to Structure Characteristics ... 96
Teachers' Responses to Specific Structural Characteristics ... 102
Interior Structural Characteristics ................... 104
Special Characteristics .................................. 108
Allocation of Space for Specific Curricular Programs ... 110

### VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS ......................... 113

Summary .................................................. 113
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusions</td>
<td>116</td>
</tr>
<tr>
<td>Recommendations</td>
<td>122</td>
</tr>
<tr>
<td>APPENDIXES</td>
<td>124</td>
</tr>
<tr>
<td>APPENDIX A</td>
<td>125</td>
</tr>
<tr>
<td>Letter to Secretary of Education in Puerto Rico</td>
<td>126</td>
</tr>
<tr>
<td>APPENDIX B</td>
<td>128</td>
</tr>
<tr>
<td>Letter Authorizing Study</td>
<td>129</td>
</tr>
<tr>
<td>APPENDIX C</td>
<td>131</td>
</tr>
<tr>
<td>Lists of Superintendents</td>
<td>132</td>
</tr>
<tr>
<td>APPENDIX D</td>
<td>134</td>
</tr>
<tr>
<td>Sample of Letter to Superintendents from Auxiliary Secretary of Education</td>
<td>135</td>
</tr>
<tr>
<td>APPENDIX E</td>
<td>137</td>
</tr>
<tr>
<td>Letter to the School Principals</td>
<td>138</td>
</tr>
<tr>
<td>APPENDIX F</td>
<td>140</td>
</tr>
<tr>
<td>Panel of Experts</td>
<td>141</td>
</tr>
<tr>
<td>APPENDIX G</td>
<td>143</td>
</tr>
<tr>
<td>Letter to the Panel of Experts</td>
<td>144</td>
</tr>
<tr>
<td>APPENDIX H</td>
<td>146</td>
</tr>
<tr>
<td>Geographical Location of the Selected Secondary Public and Private Schools</td>
<td>147</td>
</tr>
<tr>
<td>APPENDIX I</td>
<td>148</td>
</tr>
<tr>
<td>List of the Architects</td>
<td>149</td>
</tr>
<tr>
<td>APPENDIX J</td>
<td>150</td>
</tr>
<tr>
<td>Description of the School Plants</td>
<td>151</td>
</tr>
<tr>
<td>APPENDIX K</td>
<td>178</td>
</tr>
<tr>
<td>Instrument Used in Collecting Data</td>
<td>179</td>
</tr>
</tbody>
</table>
ILLUSTRATION

Figure 1. Personnel Role in Educational Planning--A Team Effort

28
LIST OF TABLES

1. Public and Private Schools Utilized in the Study ............... 8
2. Cost of Classrooms by Year ........................................ 9
3. Enrollment by Grades of Public and Private Schools .............. 11
5. Types of Floor Plans and Number of Floor Levels Constructed in Public Schools ........................................ 67
6. Interior and Exterior Flexibility of Secondary Public Schools ....... 68
7. Designed Capacity of Secondary Public Schools ..................... 70
8. Responses of Principals to Structure Characteristics Included in Secondary Public Schools ......................... 72
9. Responses of Teachers to Specific Structural Characteristics in Secondary Public Schools ......................... 79
10. Interior Building Characteristics of Secondary Public Schools ....... 82
11. Special Characteristics Included in Secondary Public Schools ....... 86
12. Allocation of Space for Specific Curricular Programs in Secondary Public Schools ........................................ 89
13. Shapes of Structures and Classrooms of Secondary Private Schools .......... 91
14. Types of Floor Plans and Number of Floor Levels Constructed in Private Schools ........................................ 92
15. Interior and Exterior Flexibility of Secondary Private Schools ....... 93
16. Designed Capacity of Secondary Private Schools .................... 95
17. Responses of Principals to Structure Characteristics Included in Secondary Private Schools ......................... 97
18. Responses of Teachers to Specific Structural Characteristics in Secondary Private Schools ......................... 103

xiii

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
19. Interior Structural Characteristics of Secondary Private Schools .............. 106
20. Special Characteristics Included in Secondary Private Schools .............. 109
21. Allocation of Space for Specific Curricular Programs in Secondary Private Schools .............. 111

xiv

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
ACKNOWLEDGEMENTS

The interest and cooperation of a number of people have been of great assistance in the development of this study. A particular expression of gratitude is extended to the writer's major adviser, Dr. Edward A. Streeter, for accepting the writer as his advisee and for his continued assistance, support, encouragement and patience, not only in the preparation of this dissertation, but throughout the course of study and the total experience of the doctoral program.

The writer wishes to extend sincere appreciation to Dr. Bernard Lall, Dr. Virgil Bartlett, and Dr. Walter Douglas, for their help, careful criticism, and counsel at all stages of the study.

Special thanks are due to Miss Marta Barros Loubriel, Mr. Edgard Belen, and Mrs. Yolanda Suarez, Department of Education officials; school superintendents, principals, teachers, and architects who provided the information and assistance to this study. The efforts of Mrs. Nora Guild, Mrs. Verna Streeter, who spent many hours editing the rough manuscript, and Mrs. Carmen Holland, who typed the final draft will long be remembered.

This study could not have been attempted nor
completed without continual encouragement and understanding of the writer's wife, Rosaura, and without the patience of his son, Angel, with his part-time father. Their love and understanding is deeply appreciated.
CHAPTER I

INTRODUCTION

General Statement

The people of Puerto Rico consider education an important factor in their democratic lifestyle. Their faith in education is illustrated by the fact that the Department of Education, when compared with other government agencies, has a larger budget (one-third of the commonwealth budget), a greater number of employees, and a greater degree of complexity. The Department of Education deals directly or indirectly with the majority of the 3.1 million inhabitants. Not only are the benefits of physical facilities received from the Department but also, in varying degrees, benefits are received from its radio and television facilities, its libraries, and its community educational programs (Informe Anual, 1973-74, p. 5).

In 1940 the government of Puerto Rico decided on a radical change in its economical and social climates when it emerged from an agrarian to an industrialized society. At that time reforms were adopted in an attempt to streamline the educational system to the new dynamic spirit. Between 1940 and 1960 the process of change
accelerated. More schools were built, more teachers appointed, and more children enrolled in the schools during these two decades than in the previous forty years. The 3.1 million people living on the island and part of the 1.5 million Puerto Ricans in the United States who expect to return to their homeland demand a school curriculum and facilities in keeping with their economic and social progress. Thus, careful planning in the construction of new schools is necessary (Public Education in Puerto Rico, 1968, p. 3).

The improvement of facilities for current educational programs, while allowing for changes in teaching methods, is one of the greatest challenges that affects schools, stated Eatough (1969, p. 10). Buildings should be designed for a modern school system. At the same time the needs of the emerging programs, teaching techniques, and administrative organizations of the present and the future should be satisfied. This may be accomplished to a great extent by providing flexible instructional spaces that are adaptable to a variety of uses. Planners should allow for teaching in large and small groups without overlooking the importance of individual instruction (Eatough, 1969, p. 10).

It is difficult to overlook the importance of the school plant as a vital factor in the educational process. A sound educational program requires a qualified teaching staff, the use of a carefully planned curriculum, and an
adequate school plant. Hayes, in his study of space allocation in secondary schools of Washington, stated:

It is axiomatic to say that the school plant is one of the most important factors in the process of formal education. How well the school serves the community and helps to advance the democratic way of the nation as a whole depends on three aspects that are interdependent, namely, the teacher, the curriculum, and the school plant. It is evident that the school plant dictates the curriculum to a large degree. Space allocation within the building influences the instructional process. Adequate space is one of the necessary factors to permit the implementation of instructional methods. (Hayes, 1954, p. 2)

Since the school plant is influential in the improvement of learning, it should be constructed with the student, the teacher, and the curriculum in mind; otherwise an inadequate program may result.

In some aspects, Castaldi's view contrasted the foregoing statement for he wrote:

If educationally effective school buildings are to be planned in the future, educators must explore and develop school planning in an entirely new dimension—curriculum development. To be sure, curriculum development is neither new nor unfamiliar to educators. Before an architect designs a school building, the local school officials should acquaint him with specific information related to the curriculum, the actual experiences that pupils undergo under the guidance of the school. (Castaldi, 1969, p. 14)

Directing attention to the studying of curriculum and its relationship to school plant construction, Boles stated:

Studying curriculum is essential to any kind of school construction as it consists of a process of describing the predetermined experiences to be had by boys and girls within school facilities. Without this, the unique curriculum needs of a particular school community may be ignored and a building constructed that is educationally obsolete before it is occupied. Furthermore, the necessity for curriculum-development to planning new facilities may be a strong motivating
force for staff members who otherwise fail to sense the urgency for curriculum study. (Boles, 1965, p. 19)

The public school districts and the private school organizations should strive to build schools with enough flexibility and adaptability so that they may be altered for the demand of new programs. Many new innovations in education are now being implemented and others are being planned. These include greater use of instructional television, of electronic teaching devices, of computer-assisted instruction, more adaptation of the physical plant to the needs of handicapped children, and increased coordination between subject areas (Dolence, 1970, p. 2).

Education is an important and necessary part of the future of Puerto Rico. The challenge to the school is to carry on that educational process which is deemed most viable. Of practical necessity, this should be done in existing as well as new facilities; both should permit educational equality for the known methods of today and the unknown of tomorrow, indicated Harvey (1967, p. 26). To achieve this in existing plants with their restrictive physical conditions becomes increasingly important, necessary, and, at the same time, more difficult. No single, all-encompassing solution presents itself to this problem, for today's new schools inevitably will be tomorrow's outdated facilities. New ideas on meeting the challenges of
upgrading these schools, therefore, may not be out of place (Harvey, 1967, p. 27).

The Problem

The importance of education is recognized in Puerto Rico as in other parts of the world. The Department of Education for the Commonwealth of Puerto Rico and the private organizations operating schools on the island have accelerated the construction of school buildings in order to improve the quality of education. The basic problem was: Were these schools being constructed in accordance with the desired curriculum; was the curriculum an outgrowth of the resulting physical structures, or were the curriculum and the planning of the structures unrelated? An examination of this problem in school construction is vital to the future development of the best possible facilities with a view to providing improved instruction.

The Purpose

The purpose of this investigation is to evaluate the spatial allocation for curricular purposes in twenty-seven selected public and private secondary schools constructed during the decade from 1967 through 1976 in Puerto Rico. A second aspect of the study is to analyze special innovative features and to discover whether these features are established prior to the development of the building or are an outgrowth of the new facility.
The space allocated for each structure is compared with the Puerto Rican governmental standards. It is hoped that recommendations of strengths and weaknesses of the facilities as they are assessed after occupancy will be of use in the construction of similar facilities in the future.

**Basic Assumptions**

It is assumed that the instrument of evaluation utilized in this study rendered accurate information. It is also assumed that the public and private schools evaluated represent in adequate form the present situations and structural trends in secondary schools in Puerto Rico.

It is further assumed that this research can provide valuable information that could help school planners in Puerto Rico to provide more functional buildings. It is assumed that an awareness of special features that have been practiced will stimulate further experimentation.

**Questions Answered**

Some of the questions raised in this study are:

1. What trends are discernible in public and private secondary school building practices in Puerto Rico?
2. Is adequate space allocated for the present and future curricular programs?
3. What are the special innovative features
incorporated in the secondary schools constructed in the last decade?

4. What recommendations were secured from principals and teachers for the construction of similar facilities in the future?

Delimitations of the Study

This study was limited to a selected group of eighteen public and nine private secondary schools built during the decade from January 1, 1967 through December 31, 1976. It was limited to those schools, public and private (table 1), for which specifications, architectural drawings, and plans could be obtained. An additional limiting factor was accreditation. Only private schools fully or provisionally accredited by the Department of Education of Puerto Rico were examined in the study.

Only areas that had spatial allocations for curricular purposes and special innovative features in each building were investigated. No attempt was made to analyze the building materials, economics, or costs.

Significance of the Study

Each year, in order to meet the needs of a fast-growing school population in Puerto Rico and to improve existing services, the Department of Education is responsible for a large, physical-plant construction program.
<table>
<thead>
<tr>
<th>Name of the School</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Jose Campeche High School</td>
<td>San Lorenzo</td>
</tr>
<tr>
<td>2. Villa Carolina V High School</td>
<td>Carolina</td>
</tr>
<tr>
<td>3. Dr. Gonzalez High School</td>
<td>Aguada</td>
</tr>
<tr>
<td>4. Pedro Falu High School</td>
<td>Rio Grande</td>
</tr>
<tr>
<td>5. Florencio Santiago High School</td>
<td>Coamo</td>
</tr>
<tr>
<td>6. Miguel A. Munoz High School</td>
<td>Cayey</td>
</tr>
<tr>
<td>7. Rossy Valley Secondary School</td>
<td>Ceiba</td>
</tr>
<tr>
<td>8. Ramon Power &amp; Girald High School</td>
<td>Las Piedras</td>
</tr>
<tr>
<td>9. Blanca Malaret High School</td>
<td>Sabana Grande</td>
</tr>
<tr>
<td>10. Valle Arriba Heights Secondary</td>
<td>Carolina</td>
</tr>
<tr>
<td>11. Rio Piedras Heights Secondary</td>
<td>Rio Piedras C</td>
</tr>
<tr>
<td>12. Yauco High School</td>
<td>Yauco</td>
</tr>
<tr>
<td>13. Cacique Agueybana High School</td>
<td>Bayamon</td>
</tr>
<tr>
<td>14. University Gardens High School</td>
<td>Rio Piedras A</td>
</tr>
<tr>
<td>15. Jose de Diego High School</td>
<td>Mayaguez</td>
</tr>
<tr>
<td>16. Morovis Secondary School</td>
<td>Morovis</td>
</tr>
<tr>
<td>17. Manuela Toro High School</td>
<td>Caguas</td>
</tr>
<tr>
<td>18. Rafael Lopez Landron High School</td>
<td>Guayama</td>
</tr>
<tr>
<td>19. Academia Adv. del Oeste</td>
<td>Mayaguez</td>
</tr>
<tr>
<td>20. Academia Maria Reina</td>
<td>Rio Piedras</td>
</tr>
<tr>
<td>21. Colegio de la Salle</td>
<td>Bayamon</td>
</tr>
<tr>
<td>22. Academia Wesleyana</td>
<td>Guaynabo</td>
</tr>
<tr>
<td>24. Colegio Lourdes</td>
<td>Hato Rey</td>
</tr>
<tr>
<td>26. Colegio Marista &quot;El Salvador&quot;</td>
<td>Manati</td>
</tr>
<tr>
<td>27. Colegio Bautista</td>
<td>Carolina</td>
</tr>
</tbody>
</table>


*Public High Schools  **Private High Schools

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
(Table 2 shows the expenditure for school construction in the last decade.) The change from an agrarian to an emerging industrialized society and the demands of technical and professional occupations complicates the problem of housing an increasing school population (Plan de Desarrollo Educativo en Puerto Rico, 1975, p. 118).

TABLE 2
COST OF CLASSROOMS BY YEAR

<table>
<thead>
<tr>
<th>Year</th>
<th>Classrooms Constructed</th>
<th>Cost in Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>1,390 *</td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>1,023 $13,262,608</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>821 12,091,473</td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>517 7,375,399</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>840 16,146,512</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>1,386 27,258,444</td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>754 15,375,667</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>1,429 77,569,185</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>765 39,950,064</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

(Division Plant Plannification, September 9, 1976, Department of Education, Puerto Rico).

As a result of these demands, educational programs underwent great changes. These changes require facilities which are different from any previously provided ones. It is therefore vital for school planners to examine the scope and nature of possible changes and
to evaluate critically the implications of possible changes in all aspects of the school program. If this exploration is freely and fully initiated, the planning of a building must include such concepts as the flexibility of the structure, internal and external expansibility of spaces, convertibility and interchangeability of facilities, and avoidance of hindrance to changes in arrangement and assignment of building spaces or site areas.

The school structures of today should accommodate the current curricular needs and activities and should also include structural features that can meet urgent needs of the future (Cameron, 1967, pp. 46-47).

At the time of this study the public school system in Puerto Rico was operated by the State, and private schools were subsidized by parochial or private organizations. The Department of Education and the private organizations were responsible for facilities and an educational program for 807,013 students, of which 713,166 were from the public sector. Table 3 shows a breakdown of the enrollment by grades for both public and private schools in Puerto Rico. The total expenditure for new construction, for both public and private schools, is shown in table 2. This multi-million-dollar building program presented challenges to educators, architects, bonding companies, contractors, and supply companies to provide functional facilities commensurate to the investment of funds (Informe Anual, 1975, p. 8).
TABLE 3
ENROLLMENT BY GRADES OF PUBLIC AND PRIVATE SCHOOLS

<table>
<thead>
<tr>
<th>Type of School</th>
<th>Public</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior High School (grades 10-12)</td>
<td>111,568</td>
<td>12,577</td>
</tr>
<tr>
<td>Junior High School (grades 7-12)</td>
<td>167,986</td>
<td>18,646</td>
</tr>
<tr>
<td>Elementary School (grades 1-6)</td>
<td>409,490</td>
<td>48,511</td>
</tr>
<tr>
<td>Kindergarten (grade K)</td>
<td>18,896</td>
<td>8,857</td>
</tr>
<tr>
<td>Special Groups</td>
<td>5,226</td>
<td>5,256</td>
</tr>
<tr>
<td></td>
<td>713,166</td>
<td>93,847</td>
</tr>
</tbody>
</table>

(Informe Anual, 1975, pp. 6, 7).

In the United States, Lamka (1965), Cochran (1966), and Dolence (1970) conducted studies in which they provided information pertaining to school buildings. However, only limited information was available on elementary, junior high, or secondary schools in Puerto Rico. These findings should serve future consultative work for the public and private schools in Puerto Rico which undertake major building programs.

The increasing need for, and the lack of, information pertaining to public and private school construction in Puerto Rico suggests the desirability of an analysis of the secondary schools constructed during the decade of 1967 to 1976. This information should help to facilitate future school-plant planning in a developing
country and should aid architectural firms, contractors, private organizations, the Department of Education, and others interested in school-plant planning.

**General Design of the Study**

All public and fully or provisionally accredited private secondary schools selected for this study were constructed in the decade 1967 to 1976. The list of these schools was secured from Francisco Girona, Director of the Educational Planning and Development Office, and Architect Luis Arias, Director of the Design and Planning Department of the Authority of Public Buildings.

The necessary blueprints and specifications were obtained from the Department of Education, school districts, or architects. For the purpose of inspection a personal visit was made to each of the selected schools in Puerto Rico. Personal interviews were conducted from December 13-31, 1976 and from March 14 through April 11, 1977, with each superintendent who had newly constructed schools in his district. The principal and six teachers of each selected school were also interviewed. In addition they were also requested to complete the questionnaire.

The information from the specifications, blueprints, personal interviews and questionnaires was tabulated. Percentages were analyzed to determine the various building features that were incorporated into structures.
From the analysis of data, conclusions and recommendations were drawn for consideration in future school-building construction.

Organization of the Study

This study is divided into six chapters. The general statement, the problem, the purpose, the limitations of the study, the significance, general design, and organization of the study, and definitions of terms are included in chapter I.

An examination of the literature relating to the study is presented in chapter II in an attempt to determine trends which are significant in school-plant planning.

Chapter III presents the research procedures of the study. It includes the type of research, a description of the population and sample, the instrument, the selection of the panel of experts, and collection, tabulation, and analysis of the data.

An analysis of the allocation of spatial and curricular characteristics within selected secondary schools is found in chapters IV and V. Chapter IV is concerned with the public schools and chapter V with private schools.

A summary of the findings in the study and recommendations for future planners are presented in chapter VI.
Definition of Terms

Allocation of space—refers to the space assigned for a specific purpose (Cochran, 1965, p. 7).

Architectural specifications—are written supplements to and explanations of architectural drawings, covering the general condition of construction and the workmanship to be expected from the contractor (Dolence, 1970, p. 7).

Cluster design—is a plan utilizing a series of rooms connected by corridors. It usually consists of classrooms grouped in clusters of three to six which surround a central court. Each cluster is a self-contained unit with teachers' workrooms and storage space.

Core design—is a plan which consolidates the spaces of the building within a rectangular, single-story block. The classrooms are constructed back-to-back with a utility core between the rooms.

Educational program—is the entire offering of the school, including the out-of-class activities and the arrangement of sequence of subjects and activities (Streeter, 1975, p. 10).

Educational specifications—are the written descriptions attempting to interpret the educational program and/or other factors having a bearing on the type of school-plant facilities needed in order to form a base for the architectural design (Good, ed. 1969, p. 419).
Expansibility— is the term used to refer to the possibility for enlargement of the building and site to meet educational needs. Building expansibility is usually achieved through open-end construction and provisions for future enlargement of lighting, ventilation, and plumbing systems (Leu, 1962, p. 95).

Flexibility— is a characteristic of school design which facilitates change in the use of the plant.

Modernization— is a process whereby an existing school building is brought up to date structurally and educationally. In the process spaces within a school building may be reshaped, certain parts of the structure or service equipment may be restored to their original state or improved, interior or exterior surfaces may be replaced or recovered, and modern service equipment may be installed (Streeter, 1975, p. 11).

Planning process— is the procedure utilized to collect the necessary information for developing written educational specifications.

Physical facilities— is the combination of the school plant, furniture, and equipment. It may also include the school site.

School— is a building which houses pupils and is constructed for the purpose of providing educational opportunities for these students. The terms school, school building, and school plant are synonymous in this study.
Secondary school— in this study is a school, public or private, which houses grades ten, eleven, and twelve and is accredited by the Department of Education in Puerto Rico (Public Education in Puerto Rico, 1968, p. 1).

Square-foot area— is the sum of the square feet of all floors within the building perimeter. Covered areas outside the building are not included in the total square footage of the building (NCSC, 1964, p. 18).

Utilization— is the term used to describe the degree to which a room or building is used, or the actual amount of use compared with the total possible amount of use of such a unit (Dolence, 1970, p. 9).

Chapter II presents the review of the related literature. Emphasis is placed on those concepts relative to the curricular and spatial characteristics of secondary private and public schools.
CHAPTER II

THE RELATED LITERATURE

Introduction

Literature regarding school-plant planning and the development of educational specifications for school construction points out that the traditional rectangular school with large corridors is being replaced by a new type of structure. The new type of structure is functional, without wastage of space, and is equipped for the new techniques of teaching and learning (Council of Educational Facility Planners [CEFP], 1976, p. C-23).

The literature concerned with school-plant planning and construction in the United States expresses many aspects of the culture and heritage. The efforts to assemble information about physical facilities for schools began early in the nineteenth century. In an effort to find the solution to the educational needs, and due to the magnitude and complexity of the problem, various people should be involved in the planning (American Association of School Administrators [AASA], 1960, p. 97). In order to study the adequacy of facilities for instructional purposes of both public and private school systems an historical overview is pertinent.
Historical Overview of Educational Planning

Spanish colony

A system of free graded public schools such as is found in the United States was unknown prior to the occupation of Puerto Rico by the Americans in 1898. "Spain herself had never had such a system, thus it could not be expected she could permit such an institution to exist in one of her colonies" (Cartagena, 1960, p. 68).

Osuna (1949) indicated that free graded schools supported by public or private charity funds were first introduced in Puerto Rico by the Spanish government in 1865. These funds were to pay for "supplies, equipment, teachers salaries and houses, and for rental of school buildings" (p. 54). Students of various ages were grouped together without any apparent system or organized stage of learning. The students were supposed to pay a fee except for those "whose parents had to prove their state of poverty before the children were admitted to the school." No funds were provided for school buildings (Osuna, 1949, p. 180).

During the Spanish domination no credence of the relationship of curriculum and the planning of schools could be found.

American occupation

After the American occupation in 1920, Miller, as commissioner of Education, presented the following report
concerning the school plant:

The most conspicuous feature of the schools of the Spanish regime which impressed Americans most unfavorably was the total absence of school buildings and the most complete lack of proper equipment. (1920, p. 544)

From the time the first schools were organized under the military government in 1899 to the close of the school year 1918-19, a total of approximately $2,600,000, was spent by the government to build schools (Miller, 1920, p. 539).

Prior to World War I little relationship between curriculum and facilities planning could be seen. After World War I school-building construction was limited. Thousands of students studied in double sessions and were housed in old, unsanitary, and inadequate buildings (Castaldi, 1962, p. 5).

Advances between 1946 and 1960

Castaldi (1962) indicated that:

After World War II, educational executives, teachers, pupils and custodians began to voice their needs and wishes when new schools were contemplated. Armed with such information, architects were able to create efficient and exciting schools. (p. 5)

But true educational creativity was lacking. Too much attention was focused on details, while too little was given to broad aspects of the educative process. Since that period more school construction took place than in any other previous period in American educational history (Engelhardt, 1956, p. 30). According to
Engelhardt (1956), some of the school plants were very satisfactory in terms of serving existing educational needs. On the other hand some construction was an expensive duplication of the mistakes of the past (p. 30).

The 1950's, according to Holmes (1961), featured different building types without any particular type dominating school plant construction. The major trend was one of designing school plants to fit the needs of each community. The physically decentralized plan seemed to have not been popular during this period, yet in some localities the trend toward compactness, with the loft plan coming into use as a school plant type. "No matter what the final form of the building, there was very little thought given to planning educational facilities (pp. 130-32).

The CEFP (1976) stated that:

During the 1950's, school construction was a multibillion dollar effort and school design reflected an interest in accommodating more movement, activity and experiential learning. Box-like structures gave way to clusters, finger and campus plans. New materials--glass, concrete and steel--appropriate furnishings, and recreational and athletics facilities became standard school features. (p. A-4)

Since 1960, schools have been affected by generalized social ferment and an accelerated rate of change. Diversity of design is obvious, with new building systems, complex equipment, carpeting, air conditioning, moveable walls as a few of the innovative features. These innovations are the result not only of technical capabilities...
but also of a rather "pervasive change in the perception of how learning happens." "Spaces and furnishing promote the informal, colorful, and comfortable. These schools exemplify concern for the needs and preferences of the users" (CEFP, 1976, p. E-4, 5).

The years of the sixties began with a team approach to school-plant planning, joining the talents and technical skills of various school personnel for the common purpose of producing better schools. Yet many school districts never attempted cooperative facility planning in spite of its value (Castaldi, 1969, p. 5).

Teamwork alone doesn't do the job. A complement of administrators, faculty members, board members, professional educational consultants, representative citizens, students, and the architect will not produce an effective planning team unless the fundamentals of both functional and conceptual planning are employed. (Castaldi, 1962, p. 13)

In contrast with the plans of the 1950's were the building plans of the sixties which were developed by numerous school architects who used circles and ellipses as the basis of instructional units offering the widest variety of shapes and sizes. These school plants had elements of special and unique design that were expected to provide effective areas for hearing, for seeing, and for developing complete rapport between teachers and students. The sixties presented many schools with features which permitted the combination of rooms for large pupil grouping and new instructional methods (American School Board Journal [ASBJ], 1965, p. 40).
Contemporary planning issues

The new spirit of American education is one of innovation and experimentation. For while critical problems steadily press on the schools, fresh ideas in plant planning beckon educators toward higher ground. The use of teacher's aides, programmed learning, instructional television, filmed courses, and nongrading, and the encouragement of creativity, improved professional training, and better evaluation techniques are trends of the seventies (Educational Facilities Laboratories [EFL], 1971, p. 9).

In keeping with the recognized concept that the school program is not static but in constant change, the trend in school plants is to design according to the changing educational philosophies, objectives, and activities in order to avoid buildings which quickly become obsolete. As was pointed out in EFL (1971):

The shape and atmosphere of the school is changing drastically under such approach. The new words which educators use to express their need for space are words like "open", "flexible", "functional", etc. Educators have pointed out how innovative approaches such as non-grading, televised instruction of filmed courses are handicapped by facilities that prevent students and teachers from the full use of technology. (p. 15)

Provisions have been made for the rearrangement of the interior and exterior features of the school plants. Trends in teaching devices are being studied in an effort to incorporate into building facilities new instructional aids (EFL, 1971, p. 15).
Educational-facilities planners in the mid-1970s are "coping with a complex of new issues and needs: declining enrollments and disposing of unnecessary buildings, intelligently using energy and other environmental resources"; providing for more forms of career education, extending the use of school as a community resource, modernizing existing facilities, designing to avoid vandalism, providing flexibility which will allow response to future unknown needs, and designing for the physically or mentally handicapped, and so forth (CEFP, 1976, p. A-5). The relatively unexplored field of environmental psychology and its implications for educational facilities have not yet been fully disclosed. The history of school-plant planning and construction, until recent years, has demonstrated a lack of concern of the relationship of building design and curricular programs (CEFP, 1976, p. A-5).

Need for School Building Programs and Importance of Educational Planning

The Puerto Rican Department of Education 1975-76 report showed that the average number of pupils per classroom was thirty-four, with an approximate total of 900,000 students. The country needed hundreds of classrooms to alleviate the overcrowded conditions. One-fourth of the students were attending school in provisional buildings or schools with structural defects, and 20 per-
cent had to attend half-day sessions. The same report indicated that 1,624 additional classrooms were needed in the public school system in order to lower the classroom per capita to the desired ration of twenty-six students per room (Informe Anual, 1975-76, pp. 72-73, 101-8). In the same period $39,950,064 was spent on new school-house construction (see table 3). This pointed to an urgent need of planning school buildings to house secondary-education programs of the present and those of the future (Informe Anual, 1975-76, pp. 72-73). Bloom (1965) stated:

Good school buildings don't just happen. They are the result of careful planning involving the school community. Planning a school must always be a joint effort, drawing out the best ideas from each group involved in the new structure. (p. 9)

Planning school plants to house the secondary educational program of "today and the unknown of the future is one of the most critical problems confronted by American communities" (National Council on School Construction [NCSC], 1964, p. 1).

The schools planned and constructed will have a definite influence for the decades to follow. "Those structures may limit or encourage the program and the curricular changes, depending on the individuals engaged in planning and designing school buildings" (CEFP, 1976, p. M-3). It has become an important matter that school structures be functional in order to accommodate current and future curricular programs. Careful and thoughtful
educational planning, as well as good architectural
designing, is essential if completed structures are to be
a benefit rather than a hindrance to the teachers and
students who will use them (Buchan, 1971, p. 11).

The need for planning the classroom, commons,
laboratories, auditoriums, and other facilities in the
building is significant. Tonigan (1966) indicated:

Not only are more classrooms needed, but also bigger
parking lots, a greater variety of physical and
recreational spaces, and more counseling facilities.
Every school which extends its program to meet the
expanding requirements of our great society finds it
necessary to engage in modernization adaptation, and
rehabilitation of older structures simultaneously
with the new building program. (p. 68)

According to Engelhardt (1956), prior to 1910
many of the secondary schools built were planned in terms
of a curriculum which was college preparatory. Few other
needs beyond this were considered in plant planning.
Since that time new emphases emerged in secondary educa-
tional programs. One aspect for building schools which
received considerable attention was the provision for
constant change in educational services (p. 20).

As parents enrolled their children in school,
school-housing needs were felt. Multiple use of class-
rooms, half-day and staggered sessions, disturbed conges-
tion, and discipline problems staged a crisis. When
planning a school plant, information of student popula-
tion and educational changes are needed (Mac Donnell, 1957,
p. 15). Conner (1967) indicated that:
Tomorrow's school will be a school for the young and the old, the gifted and the handicapped, the academically talented and the young with mechanical aptitude. Tomorrow's school will be a center of community life for adults as well as children, perhaps incorporating, in addition to educational facilities, a community health clinic, a public library, a community meeting place, and recreational facilities. (p. 40)

The facilitation of an ongoing, dynamic, educational program is the main purpose of school building. Many other reasons, while of considerable importance, are either complementary or incidental to this major purpose. Educational planning, as related to school construction, is done to make the school plant functional in terms of the educational process. Inadequate planning, which resulted in nonfunctional facilities, is poor economy (Dolence, 1970, p. 19). "Educational planning offers at least a partial answer to the problem of necessary progress. It is a means of ameliorating the difficulties in foreseeing the future" (Kratz, 1972, p. 27). It attempts to discover and take appropriate risks. It prevents difficulty and crisis and anticipates needs and problems.

The plant planner who plans is prepared for what is to come (Kratz, 1972, p. 28). In 1967 Gilliland reported:

It must be said that we are only beginning to understand the meaning of "functional design." School buildings actually built to facilitate an ongoing, dynamic philosophy of education are of such rarity as to make one question the functional value of a philosophy of education. The school architect who has a sense of actual possibilities of building construction as a means of promoting the idea that the school has a distinctive role to perform in transforming the life of the community is very difficult to locate. (p. 39)
That a school plant be designed to be functional is of prime importance in order to accommodate actual and future curricular programs. Boles (1965) stated that:

If a school facility is to be functional, the site, all elements of the building itself, and all of the equipment and furnishing within must "operate, work, be used." Just as obviously, all school facilities function to some degree, but it should be the concern of the persons charged with the responsibility for planning facilities to see that all elements of a facility are so planned that they operate, work, and are used to the maximum both now and in the future. (p. 241)

According to Henrrick (1956) some "buildings had not been designed to fit the educational activities that were taking place within them" (p. 68). This is an issue in the evaluation of existing school plants, in which attention is given to planning of new facilities or in modernizing existing schools (p. 86).

All of these challenges produce the necessity for constantly updating the school-planning process and for improving, through careful selection, the education and training of the educational planner. "Effective educational planning is an elusive process. It is essential, that a vision of the future be included as a decision-making element in educational planning" (CEFP, 1976, p. A-5).

Resource-Personnel Role in Educational Planning

School planning is an endeavor that requires teamwork (see figure 1). The number of professional,
Fig. 1. Personnel role in educational planning--a team effort. (Adapted from CEFP, 1976, p. A-6)
technical, and lay people involved and "the extent of their cooperative consideration of problems frequently determined the difference between planning success or failure" (Mac Donnell, 1957, p. 76).

"Effective school-facility planning cannot be accomplished in isolation," stated the CEFP (1976, p. B-2).

Quality is best measured in terms of responsiveness to the needs of the total community, not in terms of an absolute, extrinsic standard. These conditions do not, of course, simplify the planning process, and yet, however complex educational facility planning is, various sources of assistance are available to the decision-makers. (CEFP, 1976, p. B-2)

In 1962 Ovard wrote:

School planning is an endeavor that requires the carefully directed and co-ordinated teamwork of various groups, each within its concerns. A number of professional, technical, and lay people should be involved. The extent of their cooperative consideration of problems encountered will frequently determine the difference in functional or nonfunctional facilities. (p. 27)

Two years later Williams (1964) indicated that "Before final completion of a structure, it will be built by three groups: educators, architects, and skilled craftsmen" (p. 309). These statements show that good school buildings are the result of careful planning that involve administrators, consultants, personnel, students, and citizens. Planning a school building should be a joint effort of the group involved (Bloom, 1965, p. 36).
Board of Trustees

The Board has the responsibility of evaluating the plans. Although they are the primary planning agents, they are not the only ones. Policies established by the Board make it possible for administrators to organize a viable planning process. "They can set the stage and maintain the climate necessary for creative planning, or they stifle attempts at comprehensive and intelligent study" (CEFP, 1976, p. B-2).

Planning is necessary for ordered activity. It is the responsibility of the governing board to see that such planning is done in a manner consistent with the school district's needs and resources. Thrasher (1973) believed that the board role in educational planning is to:

1. Authorize the project;
2. Employ educational consultant;
3. Hire the best qualified architect;
4. Participate in the planning process;
5. Be officially responsible for plans;
6. Give final approval for plans and projects.

(p. 16)

The school board should attempt to assess correctly the readiness of parents and other citizens to accept new ideas and procedures (Ovard, 1966, p. 27). When the administrator brings proposals for educational planning to the school board it could give much assistance by analyzing the proposals and by interpreting the community's attitudes. One of the Board's main functions is to discern and interpret properly the community's
educational objectives (Ware, 1962, p. 9).

Superintendent

The school superintendent is the central person in planning new buildings. He is the chief executive of the school district. He is responsible for studying and planning for the future and initiating school-building surveys with his staff or outside consultants. After completion of surveys, the superintendent makes proposals to the Board of Education recommending the adoption of a comprehensive school-building program (CEFP, 1976, p. B-2). Upon approval of the program, he takes appropriate measures to implement it.

The superintendent of a large school system does not have sufficient time to take an active part in the planning of school plants because of the complexity of his job. Often he is not qualified either by training or experience. However, even under these circumstances the superintendent "should know the basic facts about educational planning and development, or delegate the actual planning to competent persons trained in specific areas of school plant planning" (Silverthorn, 1965, pp. 19-20). Thrasher (1973) suggested that the superintendent in educational planning should be responsible for:

1. Studying and planning projects;
2. Developing program overview;
3. Presenting proposal to board of trustees;
4. Fiscal budgeting finances. (p. 12)
Educational consultants

The CEFP (1976) defined the educational consultants as "Those persons who specialize in various aspects of planning from curriculum to finance and who understand how to implement and coordinate an effective planning process" (p. B-4). The educational consultant is a unique specialist who is utilized in planning school structures. His role is to advise administrators and boards with respect to the educational aspects of the building program. In spite of his technical knowledge in regard to school plants; he is not an authority in the architectural and engineering aspects of planning school structures (Meckley, 1972, p. 87). Many hours are devoted by boards, administrators, and educators to the educational plant-planning process with little consultation or guidance from qualified planning or designing specialists (Herrick, 1956, p. 14).

Educational consultants are essential to the school system if the board or personnel lack the time or experience to deal with such problems. The consultant is valued as a recognized authority in the specialized field of education. The major functions of the educational consultant in school planning are to

1. Advise in the planning of buildings for health and safety;
2. Direct or assist in school surveys;
3. Examine educational specifications for school facilities;
4. Appraise the total program's efficiency;
5. Coordinate the contributions of the individuals and committees involved in planning. (Mac Donnell, 1957, p. 82)

The consultant has the advantage of technical knowledge gained over the years concerning materials that worked well in other schools, details of planning that were found to work, and experience with significant problems in planning that were of major concern in the designing of schools. Also, the consultant can express the requirements in phraseology and diagrams that have greater meaning to the architect.

Principal and staff

The principal and staff are important personnel in the process of planning educational facilities. Experienced in their daily activities with building structures they are able to make suggestions and recommendations that help them do their work in a more effective way.

A school's instructional staff utilizes existing facilities on an almost daily basis. The immediacy of this involvement makes the teaching faculty an excellent planning resource. Instructors can assist in the development of an educational program and its translation into a facility plan. They should have an opportunity to discuss with the chief planner and the architect various aspects of building and site design during preparation of educational specifications. They should also have an opportunity to review schematic, preliminary, and final plans. In order to enhance their awareness of design possibilities, the instructional staff should have opportunities to visit other facilities and study what is being done elsewhere. (CEFP, 1976, p. B-2)

Planning the specialized facilities for a new
secondary-school structure requires the development of organized procedures. Periods of investigation are devoted to planning the future programs and to the discovery of workable ideas for implementation. "These planning periods are more significant if the teachers involved are given the opportunity to participate in decision making" (Baggs, 1959, p. 32). Cooperative educational planning for school construction could result in better school structures.

Architect

The architect's job is to translate the educational program into design concepts which are developed in the building plans and specifications. He could function in an advisory capacity during district-wide surveys, site selections, and educational-planning phases. He is responsible for the supervision of construction (CEFP, 1976, p. B-3).

The architect's work is divided into four phases:

1. Schematic design phase: The gathering of ideas from the other resource personnel and statistical data. Some of the problems considered are site location and topography, funds available, mechanical equipment, proposed student enrollment, educational philosophy, grade level of students, etc.


It is recommended that only those architects be
employed who possess the necessary technical competence to translate good educational specifications into the necessary teaching and learning spaces. The CEFP (1976) provided the following criteria that should be considered when selecting an architect:

1. Registration and professional reputation
2. Experience
3. Staff and facilities
4. Methods of operation
5. Interest in the project
6. Quality of work
7. References
8. The fee. (p. D-4)

Students

The role that students play in the planning process for new school buildings has generally been overlooked. The CEFP (1976) stated that

Until recently, students have been an underutilized resource in spite of the fact that they constitute the largest user group. They should have the same access to the planning process as the instructional staff. Their preferences and needs should be attended too. It is, after all, for them that the school exists. (p. B-2)

Students of senior high-school age may participate directly on the planning team. It is in order to have representatives from student government or designated students chosen to participate along with the other personnel resources. It is necessary that "the students involved understand the total planning process and the part that they are expected to play in it" (Thrasher, 1973, p. 29).
Student life in and around school buildings can be enhanced or impeded just as the cognitive learning effort can be slowed down by inadequate facilities. Student representatives on the planning team can make a contribution in pinpointing student needs that merit consideration for student-activites areas of the school. The areas for student government, after-school functions, and adjunct physical-recreation areas should reflect some of the thinking of the student population. (Thrasher, 1973, p. 29)

Students form a direct link with the community.

The attitude toward the school and its activities is transmitted from student to adult.

Excitement, understanding, and enthusiasm for planning a new facility could be communicated from students to people in the community if the student group was involved in the planning process of a new school facility. (Thrasher, 1973, p. 30)

Thrasher (1973) suggested that students in educational planning should:

1. Participate on the planning team;
2. Provide information on special student needs;
3. Assist in program formulation for activities areas;
4. Reflect student views of needs to the community.
(p. 31)

The community

Citizen participation is recognized as a valuable contribution to educational-facility planning. Community residents should understand the need for new school facilities. "It is only through such understanding that they can be in a logical position to support a building program both psychologically and emotionally" (CEFP, 1976, p. B-3).

The community sets the tone for education,
especially in the formulation of goals and objectives.

The hopes and aspirations for educational opportunity held by the citizens of a school district for their children and for themselves ultimately determine the direction of education in the district. (Thrasher, 1973, p. 26)

Thrasher (1973) also stated that

Citizen groups should be organized to participate in the planning effort. It is imperative at the outset that such citizen groups understand the whole planning process and recognize that planning is done by describing the curriculum or program to be housed. (p. 26)

This involvement leads to knowledge, concern, understanding, and support. "Utilizing citizens in the planning process is a way of insuring financial support and that the school operate fully as a community resource" (CEFP, 1976, p. B-3).

When the school is placed in proper perspective and educational planning is based on team effort and broad educational concepts; then all the physical areas, educational programs, and facilities will fall into an educational pattern in which teacher and students can function with compatibility (Castaldi, 1962, p. 5).

"Good buildings are not the product of change," assured Bloom. They are the result of careful planning involving the board, administrators, students, and community. In summarizing Thrasher (1973) said that in educational planning a well-informed community can

1. Assist in establishing the school's broad purposes;
2. Understand the need for new school plant;
3. Be aware of the time table for planning and construction;

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Changes in School-Building Design

The school environment affects attitudes and behaviors. "The character, appearance, and physical arrangement of the classroom conveys distinct messages to the users about activities and responses which are expected and appropriate" (CEFP, 1976, p. G-2). According to CEFP one example of the relationship of the educational program, learning environments, and the users can be found in the difference between open classrooms and traditional ones (1976, p. G-2).

Classrooms designed for open learning often feature separate learning centers for the exploration of science, mathematics, social studies, home economics, industrial arts, language, physical education, and so forth. "Variety, informality, movement and the availability of learning resources are some of its characteristics. The open facility arrangement facilitated student activity, exploration and interaction" (CEFP, 1976, p. G-2).

A traditional classroom in which desks are arranged in rows for students facing the teacher's desk has a different function: "the traditional arrangement facilitates student listening and sedentary work. The
teacher is the focus of attention and can direct and supervise student work with ease" (CEFP, 1976, p. G-2).

Educational programs and spaces which clearly differentiate between types of learning activities and which require specialized environments are more common in secondary schools.

Trends toward functional design

The movement toward functional design gained impetus during the early part of the twentieth century. "School buildings need not to be a given style, shape or structure," stated Hansson (1962, p. 36). The buildings designed during the first part of the century reflected rigidity in pattern, but Cooper (1965) indicated that the trends which appeared in the sixties reflected larger sites, flexible spaces, carpeted classrooms, students' carrels, air conditioning, and odd-shaped spaces (p. 34). The new trend was toward the open-ended school plant which was designed to be more versatile in accommodating a changing curriculum. This provided for more experimentation in instructional methods and for greater use of teaching materials and equipment. Traditional classrooms have been gradually replaced by diversified instructional spaces designed as seminar rooms, research areas, and learning laboratories (Cooper, 1962, p. 38).

Leu (1965) indicated that as educational programs broadened and pupils and teachers used a greater range of
equipment and materials, the need arose for larger rooms, increased storage, and furniture and equipment that were easily movable. Obsolete units were replaced by built-in equipment. Teacher planning areas, social or common areas for students, and independent study carrels were designed in the new plants (p. 5). There were new varieties of roof forms, classrooms, and teaching stations without walls. This transition that took place was the adaptation to a changing instructional program (Cooper, 1965, p. 36).

Flexibility

In 1960 a report of the organization Educational Facilities Laboratories stated: "The arrangement of spaces within the school is important in determining how successfully the school works as well as how economical it is in its use of space." The report emphasized consideration for traffic patterns, acoustics, and lighting, indicating that these, as well as space allocation, were factors which contributed to the success of the student who had to use the environment for learning. The report pointed to flexibility as a vital element in a school plant if the building is to permit adjustments to changes in the curriculum through the years. The element of flexibility or lack of it either permits or stifles change in the curriculum. The movement was from the traditional, rigid classrooms to more flexible instructional
areas. As the EFL (1960) report said:

Many schools are now being designed to provide instructional spaces of varying size—from individual study spaces to the small, round-the-table, seminar space, to lecture-discussion rooms that double, triple or even quadruple the standard classroom. But the desire now expressed by a number of schools to achieve malleable space that can be shaped at once and at will must await the development of a retractable partition which will give acoustical privacy. (p. 33)

This element of flexibility, when utilized in building construction, facilitates a more extended use of the facility. During the sixties, changes took place in the curriculum. Some schools were emphasizing this quality of flexibility in their construction. Different shapes of schools were being utilized in an effort to be flexible and to improve the quality of instruction. One example was the arrangement of three classrooms grouped in trapezoidal form which enabled better teaching. With retracting walls the thirty-student classrooms could easily become a ninety-pupil lecture theater. Other school systems were still struggling with the problem and many administrators accepted the fact that if the needs of the students were to be served—and the well-designed school program was to serve the needs of the educational program—then flexibility should be built into the plant (Elliot, 1972, pp. 75-78).

Adaptability

According to School Planning Guide 1964 the use of the school buildings by the community for purposes
other than day-school instruction was growing. This trend will doubtless continue. The SPG (1964) stated that

Thus, multiple use of the school buildings required that adaptability be built into construction plans. Persons involved in school plant planning should be familiar with sources of information which would permit them to be acquainted with changes in services and functions which take place. (p. 8)

Provisions were being made to open for public use certain areas of a school building, such as cafeteria, gymnasium or play areas, while closing others. Efficiency of function in such cases "warranted planning for the use of zoned heating and air conditioning, and the proper location of toilet and lavatory facilities, drinking fountains and access routes" (p. 8). In the expectation of evening use by adults, adequate equipment, storage facilities, and lighting was included in the plans.

The use of the structure, or portions of it, by school-age children during after-school hours, on weekends, and during summer months had similar implications for planning (SPG, 1964, p. 9).

Expansion

Future expansion is under consideration by educational planners. The implications for adequacy of sites is "obvious where likelihood of expansion in the future is a probability. Building expansion is not to take place at the expense of play areas and outdoor physical education and athletic space" (SPG, 1964, p. 9).
In 1964 SPG stated:

The total design of a structure should be such as to permit expansion without interfering with the beauty and usefulness of the building. Preliminary plans should specify where and how additions could be made. Adequate planning for expansion included consideration of capacity of the structure, and the proper location of various service facilities and heating and ventilating equipment. (p. 10)

Probable needs for the enlargement of a particular department should be considered at the time original plans are drawn by the architect. It is desirable to anticipate such possibilities for industrial arts, science, home economics, social science, and other specialized offerings. In all cases, the addition should be in reasonable proximity to the related instructional stations (SPG, 1964, p. 11).

Special learning spaces

The involvement of the faculty is essential in the development of plans for spaces where experiential learning will occur and where special activities such as fine arts, dramatics, music, science, and so forth take place. "Special equipment is needed and requires particular attention to insure that the students receive what they need" (CEFP, 1976, p. G-9).

The frequency with which audio-visual equipment is used in the classroom varies directly with its availability and ease of use, said the CEFP (1976, G-7). The provision of a projection screen and adequate outlets in each classroom allows frequent and convenient use of

Designs for laboratory learning

The design for new schools places emphasis on the concept of laboratory learning situations. School-plant designers agree that the laboratory space in all academic areas represents one of the more significant changes from the self-contained classroom areas. Clusters of average-size classrooms are planned around large rooms and laboratory areas (Williams, 1964, p. 291).

Environments for special education

According to the CEFP (1976), all students have the right of access to the mainstream of education and to the process of learning alongside their peers (p. G-4).

Educators and architects should keep pace with and anticipate the conceptual and practical trends in special education. Careful planning is required to eliminate architectural barriers such as steps, curbs, grating, walkways, narrow doors, small toilet stalls, and drinking fountains and light switches which are out of reach. (CEFP, 1976, p. G-4)

Problems in the Adaptation of New Structures to Curricular Changes

The construction of a new school for a traditional curriculum does not pose as many problems and challenges as are found in the designing of school buildings for new types of curriculum. Engelhardt (1956) said: "To state that curriculum trends have profound implications upon building planning and construction is to express an
obvious truism" (p. 40). Contemporary plant planning has become as complicated as the curriculum problem itself. Some schools have been forced to limit their educational program because many of the structures could not be remodeled to provide space and facilities. In such cases the school has to adjust its program to the buildings instead of to the needs of the learners (Dolence, 1970, p. 29).

According to Leu (1965), the most important trend in planning modern educational facilities is the modification of techniques in planning. In the past, school buildings were constructed with little attention to changing trends in curriculum. Upon completion of the buildings attempts were made to accommodate the existing and future curriculum into the building design. Many schools built in the early sixties became educationally obsolete because of the planning methods (p. 96).

Changing philosophies of education, curriculum innovations such as team teaching, individualization of instruction, and use of television and electronic equipment evolved changes in building design. Gores (1972) indicated that "more often than not, plans were not provided for special equipment, space, and staff required in educational programs for the student" (p. 16).

A few decades ago educational administrators generally were not able to foresee the educational program in operation, and the same problem still exists as
administrators look to the future. Not being able to see the future changes in the instructional areas, they were unable to plan adequately in their building designs; therefore, the designs were not flexible and became obsolete when they no longer met the needs of the educational program. Other problems developed when educational administrators failed to provide adequate descriptions of the learning experiences in the school plant, serious problems arose when architects had to prepare technical specifications of the building while assuming the kind of educational program to be served (Dolence, 1970, p. 30).

School districts in America have been challenged with the problem of modernizing or replacing obsolete school structures. Planning for renovation of or additions to buildings has generally required more careful attention than that required for the initial planning (Tonigan, 1966, p. 67). Lack of time for educational planning has frequently confronted administrators when adapting buildings to curricular changes. Leu (1965) stated that most buildings have undergone structural changes, resulting in facilities that are below the educational adequacy of a well-planned building (p. 57).

According to Tonigan (1966) the imaginative outlook of many plant officials has frequently made space available for curricular innovations which otherwise would have been impossible (p. 68). Tonigan (1966) said that
If a structure needs physical changes, these changes should not be cast aside as unimportant in relationship to new construction. Rehabilitation of new buildings should be as important as their initial construction if mistakes have been made or if changes in curricular programs could not be anticipated. (p. 68)

There is no panacea for all of the problems which "beset the school district about the adaptation of new buildings to curricular change, but much can be learned from experience of personnel who have successfully completed such projects."

Leu (1965) wrote that in the consideration of making structural changes in a building that is still relatively new, careful planning should be followed, just as if the structure were being constructed for the first time (p. 69). Even with careful planning in renovation, many buildings constructed in the past do not have flexibility or the adaptability needed to make modifications. One of the problems which has not been solved by administrators as they attempt to adapt a building to new curriculum changes is the cost involved. Changes made after construction become much more expensive (Leu, 1965, p. 69).

Ovard (1962) said: "The expansibility factor should be incorporated in the original design of a school building" (p. 46). In addition, selecting sites without regard for possible shifts in community development or purchasing sites that are too small restrict the functions of the building before its completion (AASA, 1967, p. 56).
In some modernization programs when sites have not been adequate for horizontal expansion, vertical expansion was considered. This was often difficult because prior planning failed to include this possibility.

Some schools become inadequate when the administrator leaves the district because the schools are not flexible enough to house the successor's programs. School administrators must build structures that can accommodate the new teaching techniques as well as the old. The school structure itself invites curriculum change. As the curriculum changes, so does the functional quality of the building. Strong leadership by school-planning administrators is the real key to the solution of problems involving the modernization of structures to accommodate curricular changes (School Management, 1965, p. 81).

Consultants and educational-plant planners who have had to cope with the problem of planning school facilities capable of being changed to meet the demands of changing educational programs have yet to come forward with a way in which the future can be forecast with infallibility (Dolence, 1970, p. 33). Herrick (1956) summarized a few generally accepted points which are valuable when trying to plan for the unforeseeable. He said:

One of the most important things to do is to be certain that the probability of change is not only realized but freely acknowledged. It is well for school program planners to speculate freely about the scope and nature of possible changes, and to
examine critically the plant implications of all reasonable possible future changes in each and every aspect of the school program. If this exploration is freely and fully carried out, the building planning is most likely to take into account every possibility of insuring flexibility of structure, internal and external expansibility of spaces, convertibility and interchangeability of facilities, and avoidance of hinderances to changes in arrangement and assignment of building spaces or site areas. (p. 234)

Whatever educational changes emerge in the future, school-plant facilities will have to contain much more flexibility than has been customary. No more rigid specialization than is absolutely necessary should be built into the structure of new school-plant facilities. In the future it will be necessary that the structures be amendable to change at will and at once (Herrick, 1956, p. 235).

The change in school-plant planning and design is the result of a concern of educators and architects that early school buildings were not planned to meet the needs of the school community who work in them. The educational planners have been challenged to provide facilities to accommodate new organizational patterns, new methods of instruction, and media of communication. This challenge must be met.

**Future of Curricular Programs In School Structures Planned Today**

In order to meet the modern curriculum trends which emphasize the current youth problems, home
integration, school integration, and communities, the administrator must see that the secondary-school buildings are designed and constructed on a functional basis (School Management, 1961, p. 74). It is necessary to plan in terms of utility so that the school facilities fill the constantly changing curriculum. In contrast to the traditional building, the modern secondary school must be designed as a place for living. Engelhardt (1956) indicated that the traditional classroom will continue to be displayed by functional units in which pupils and teachers may plan and carry out an integrated and meaningful curriculum (p. 50). The content and organization of the curriculum should be under constant study so that building designs can be modified and made flexible to meet these changes.

Leu (1965) commented regarding the factors in design of school buildings in the future. He said:

It can be said with certainty that tomorrow's educational planners will be primarily curriculum specialists, with new school construction serving as prime mover to the improvement of educational programs and the expansion of educational services. This curriculum-centered planning has already resulted in flexibility and expansibility being two of the most common characteristics of recent school building. (p. 96)

Williams (1964) reinforced the concept when he stated:

Foremost in the thinking of educators regarding the type of secondary school that should be built is that it be comprehensive in type. A typical secondary school in the future must offer a comprehensive educational program to all types and varieties of adolescents within its attendance area. (p. 287)

Wiles (1964) said that those who use buildings...
with uniform classrooms will definitely be limited in their educational programs. This limitation becomes apparent when the various-sized classes of the newer curricula attempt to adapt their numbers and activities to uniform-sized rooms. In the modern facilities, rooms for analysis groups, specialized education classrooms, studios, and laboratories will be small. Cultural heritage courses will be held in large halls equipped for lectures and mass-media programs. Libraries and shops will be large. Areas where individuals work with teaching machines to perfect basic skills will be divided into small work cubicles (p. 305).

A report from the EFL (1967) predicted that there will be increased use of partition walls which can be easily removed. Large room areas, portable school-room equipment, and modular design will also make for greater flexibility in the future. The best way to obtain versatile space in the future is to make the interior of the buildings as impermanent as possible (p. 2).

Educators and architects have stated that school structures should be designated for change. The designers should plan interior spaces that could be rearranged quickly and economically as the need arises for different types of activities. The structure should be flexible and expandable so that new space can be added without disturbing the structure of the existing building and without costly remodeling of its interior (CEFP, 1976, pp. M-4-6).
In any building program of the future, school administrators can be more cognizant of building requirements if they will observe the factors that influence curriculum change. Education is experiencing revolution, and curriculum is at the center of this revolution, said Fish (1965, pp. 49-51). The purposes of education relate to the factors that facilitate or hinder curriculum change. Each school should plan a democratic and representative structure for the people's involvement and for consideration of ideas for school improvement. Ideas should be encouraged from all sources and each idea should receive consideration as to its suitability for the planning of new school structures (Fish, 1965, p. 50).

If constant change and improvement characterize the secondary-school curriculum of the future, it follows that the facilities must be planned in terms never before deemed necessary. Both the content and the organization of the curriculum should be under constant study so that building designs can be modified and made flexible to meet these changes (Dolence, 1970, p. 40).

In summary, the important factor in the construction of school buildings is that they are to house the curriculum of the future. A prerequisite to educational planning of the future is the realization that planning of schools to adapt any curriculum is a continuous process.
Related Studies

Lamka study

In 1965, the Lamka study of allocation of space in junior-high-school buildings revealed that the basic variations in school plants, such as inclusion or exclusion of shops, speech and dramatics classrooms, and mechanical drawing classrooms, have a definite effect on the curriculum. Where these facilities are provided a more extensive program in these course areas is provided. Schools in the study did not vary greatly in the provision for basic courses where general classrooms could be used, but they did vary in the provision of special courses where special facilities were required.

In every school in the study, educational specifications were established and presented to the architect for his guidance. With the exception of the personnel of two schools, all those interviewed expressed a high degree of satisfaction with the school facility and with the program being offered within the facility.

Cochran study

Cochran (1966) devised a model for estimating elementary-school construction costs using an analysis of the components found in elementary-school buildings in Arkansas.

Over one hundred items of information taken from the construction documents for fifty-six relatively new
elementary-school buildings were key-punched on IBM cards, sorted, tabulated and placed in frequency distribution tables according to the cost group under investigation.

The IBM 7040 computer and a "tricor" program were used to compute a correlation matrix and series of regression equations from selected variables in the study. An F test on the difference between RSQ of the full model regression equation and each of the restricted equations revealed that six variables were significant contributors at .01 level to the prediction of the per square foot initial cost of an elementary-school building.

The general recommendations for elementary schools based on information gathered are:

1. A state-wide system of inventory and accounting of school facilities should be implemented.
2. School officials should choose an architect carefully before embarking on a building program.
3. Compactness of design, building size, and other economies of construction should be used by school officials in a building project.

Dolence Study

Dolence (1970) found in his study that the majority of the schools were designed to house one thousand or fewer pupils and were rectangular in design as opposed to circular or hexagonal. The buildings in 88 percent of the cases were air-conditioned.
The majority of the buildings had related disciplines clustered in areas. However, a very small percentage included teachers office suites, pupil resource-study space, seminar space, and library materials area unique to the discipline within the area. The instructional-materials center in the majority of the schools was centrally located for easy pupil and staff access. A majority of the respondents cited the need for additional storage space.
CHAPTER III

PROCEDURES FOR THE STUDY

The major purpose of this study is to evaluate the spatial allocations for curricular purposes in twenty-seven selected public and private secondary schools constructed in Puerto Rico in the decade from 1967 through 1976. A secondary purpose is to analyze any unique innovative features of each structure and to discover whether the curricular pattern was established prior to the educational specifications and the construction of the buildings, or whether the curricular pattern was established as a result of the physical structure and its possible limitations.

This chapter presents the type of research, the description of the population and sample, the instrument, and panel of experts utilized; and outlines the methodology of the collection, the tabulation, and the analysis of the data.

Type of Research

This study utilizes a descriptive method which examines the plant planning of twenty-seven selected secondary schools in Puerto Rico. According to Isaac (1975) the descriptive method is to "describe systemati-
cally the facts and characteristics of a given population or area of interest, factually and accurately" (p. 14).

Some of the types of studies for which descriptive research is designed are questionnaire and interview studies, public-opinion surveys, and fact-findings. In a more detailed explanation Isaac (1975) stated:

Descriptive research is used in the literal sense of describing situations or events. It is the accumulation of a data base that is solely descriptive—it does not necessarily seek to explain relationships, test hypotheses, make predictions, or get at meanings and implications, although research aimed at these more powerful purposes may incorporate descriptive methods. Research authorities, however, are not in agreement on what constitutes "descriptive research" and often broaden the term to include all forms of research except historical and experimental. In this broader context, the term survey studies is often used to cover the examples listed above. (p. 18)

Descriptive research in this literal sense meets the objectives of this study. The purpose is to describe existing phenomena and to attempt to identify the degree of congruence of opinion held by the various groups of respondents concerning the spatial and curricular characteristics of the secondary schools.

Description of the Population and Sample

According to the 1975 Statistical Report the number of schools was as follows:

1. Public
   a. Senior high schools (grades 10-12) 82
   b. Senior and junior high schools (grades 7-12) 27
c. Senior, junior, and elementary
schools (grades 1-12) 3

total 112

2. Private

a. Senior high schools (grades 10-12) 6

b. Senior and junior high schools (grades 7-12) 16

c. Senior, junior, and elementary
schools (grades 1-12) 46

total 68

These secondary schools were spread through eighty-two school districts. The districts were grouped into six school regions: San Juan, Ponce, Mayaguez, Arecibo, Gaguas, and Humacao. Each region was composed of an average of thirteen school districts (Statistical Report, 1975, pp. 59-61).

The twenty-seven selected public and private schools utilized for this study consisted of the secondary plants which were designed and constructed in the decade 1967 through 1976. The list of the schools was secured from the directors of the public and private sectors (see table 1). The selection of the school structures was based on the following criteria:

1. Private schools which were accredited fully or provisionally by the Department of Education of Puerto Rico and all public schools (Reglamento Acreditacion Escuelas Puerto Rico, 1972, pp. 2-3).
2. School buildings which were occupied between January 1, 1967 and December 31, 1976, whose specifications, architectural drawings, and plans were obtainable. This information was obtained from various sources since the schools in Puerto Rico were constructed in various ways: by the Public Works Department, Public Building Authority, by the school districts, or by independent contractors, and in the private sector by their organization or independent contractors (Public Education in Puerto Rico, 1968, p. 69).

Based on the selection criteria of the 112 public and 68 private schools (see pp. 57-58), eighteen public and nine private schools qualified; these constituted the population. These schools were scattered throughout the six geographical regions of Puerto Rico.

Instrument

To study the characteristics involved and the unique nature of the selected secondary schools in Puerto Rico, an instrument was designed based on the Evaluative Criteria by National Study of Secondary School Evaluation (1969) and the instrument used by Dolence (1970) in his study of secondary schools in Arkansas. The instrument was divided in three major areas (see appendix K):

I. General building characteristics
II. Interior characteristics

A. Classrooms and laboratories
   1. general classrooms
   2. arts and crafts rooms
   3. science rooms and laboratories
   4. music and dramatics rooms
   5. home economics room
   6. business education rooms
   7. industrial arts rooms and laboratories

B. Special facilities
   1. language laboratories
   2. divisible auditorium or cafetorium
   3. individual study carrels
   4. seminar rooms
   5. educational television

III. Features pertaining to operation and service facilities

A. Adaptability to teaching methods and changes in the curriculum

B. Use of visual aids

C. Departments and facilities within the building

D. Storage facilities

Selection of the Panel of Experts

A panel of experts was utilized to determine the appropriateness of the instrument used to evaluate the
curricular and spatial characteristics of the new secondary public and private schools. The panel of experts was selected as follows (see appendix F):

I. Two sub-section directors. These directors are responsible for school-plant planning in the Planning and Development Office of the Department of Education.

II. Four school principals. These principals were randomly selected, two from the public and two from the private schools.

III. An architect and an engineer. The president of the College of Architects, Engineers, and Surveyors of Puerto Rico was requested to select both professionals.

IV. Four secondary-school teachers. Each one of the four principals of Section II selected one teacher.

A letter was sent to each panel member requesting his/her assistance (see appendix G). Enclosed with the letter was the proposed instrument and a returned self-addressed envelope. Each panel member was asked to react to the instrument and to forward his/her comments.

An examination of the reactions revealed that the panel agreed with the basic concepts presented in the instrument. In no instance was the panel in disagreement with the rationale of the instrument which consisted of the three major areas (see pp. 59-60). The narrative
responses intended to support or improve the proposed instrument were incorporated into the final instrument. Some of these responses are quoted below. In order to maintain the privacy of the selected panel of experts, the respondents are not identified.

It would be said that you have done a good job and the questionnaire is excellent.

Your approach to plant planning is excellent. I think this questionnaire should be helpful to our school system.

I read your questionnaire and after careful study I should say good luck. I think you are right on target. This is a topic of special interest to me.

Thank you for sharing with me your instrument. I have reviewed it and find the content in general to be excellent.

It appears to me that you have a good approach.

Congratulations on a fine instrument, excellent opportunity for principals, teachers, and other personnel to share ideas.

Collection of the Data

The researcher sent a letter to Dr. Ramon A. Cruz, Secretary of Education, Puerto Rico, stating the desire to undertake the proposed research and to request permission to conduct the study. Upon receiving permission the researcher visited Puerto Rico from December 13 - 31, 1976, and interviewed directors, superintendents, and architects of the Department of Education, Public Buildings Authority, and other agencies involved in school-facility planning.

On January 28, 1977 (see appendix D), the
researcher received from the Secretary of Education copies of the letters he had sent to the superintendents and principals. In his letter, the Secretary requested their support in this study. Between January 31 and February 23, 1977, questionnaires were sent to principals of the twenty-seven selected public and private schools.

The principals were requested to distribute the questionnaire to the head teachers in the following areas: languages, science, arts and crafts, social science, physical education, and industrial arts. Principals and teachers were asked to complete the questionnaires concerning the new structures and to identify specific building strengths and weaknesses.

From March 14 to April 11, 1977, the twenty-seven selected schools were visited. The general purpose of the study was explained to principals and teachers. The questionnaires were completed and collected. One hundred percent of the principals and 98 percent of the teachers from the public schools, and 96 percent of the principals and 100 percent of the teachers from the private schools completed the questionnaire. Personal interviews were conducted with the superintendents, principals, and teachers of the selected secondary schools (see appendix K).

The data and literature required for this investigation were obtained from the researcher's personal library and files and his advisor's library and files;
the Educational Planning and Development Office and Public Buildings Authority in Puerto Rico; and the James White Library at Andrews University.

**Tabulation and Analysis of Data**

The data taken from the specifications, blueprints, returned questionnaires, and personal visitation check sheets were tabulated. Percentages were calculated for each item according to the ratings given by superintendents, principals, and teachers.

The data received from the responding superintendents, principals, and teachers were grouped into the three major divisions as previously outlined. Tables were prepared to show the respective responses. These percentages were analyzed to determine the various building features that were incorporated in the selected secondary-school buildings in Puerto Rico during the decade from 1967 through 1976.

When data were received that did not lend themselves to tabulation, an individualized description and analysis were made. The presentation and analysis of the data of the selected public secondary schools is reported in chapter IV and of the selected private secondary schools in chapter V.
CHAPTER IV
PRESENTATION AND ANALYSIS OF DATA FROM THE
PUBLIC SCHOOL SYSTEM

The purpose of this chapter is to present a
description and analysis of the data obtained from the
selected public secondary schools represented in this
study. The presentation of the data represents informa­
tion gathered from the administration of a questionnaire,
personal visitation, and opinions as expressed by princi­
pals, teachers, architects, and superintendents of the
public secondary school structures constructed since 1967.
Each school official and architect was contacted by
letter, telephone, and personal visitation.

Schools representing the six geographic regions
of Puerto Rico were included in the study. Appendix H
shows the location of the schools. These school build­
ings provided 720 classrooms with a designed capacity for
21,148 students.

General Description

One hundred percent of the schools studied were
of concrete construction with an acceptable site accord­
ing to recommended standards. The majority of the
schools were of the rectangular shape. Fifty percent
have year-round programs while the other 50 percent continued with the traditional program.

The data in table 4 show that 92 percent of the principals work in rectangular-shaped structures. Structures of both hexagonal and circular shape were each reported by 2 percent of the principals. Classrooms of rectangular designs were reported by 94 percent of the respondents. Circular and hexagonal shapes were not represented.

Table 4

SHAPES OF STRUCTURES AND CLASSROOMS
OF PUBLIC SECONDARY SCHOOLS

<table>
<thead>
<tr>
<th>Design</th>
<th>Structures</th>
<th>Classrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circular</td>
<td>2*</td>
<td>0*</td>
</tr>
<tr>
<td>Rectangular</td>
<td>92</td>
<td>94</td>
</tr>
<tr>
<td>Hexagonal</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.

Table 5 lists the types of floor plans and the levels of the buildings included in this study. A series-of-fingers was the type of floor plan reported by 28 percent of the principals. Enclosed-campus was the style of 42 percent of the buildings. Respondents listed open-campus-type floor plan in 30 percent of the
schools surveyed. Fifty-six percent of the structures were three-story buildings, while 38 percent of the cases were two-story buildings. Only 6 percent of the buildings were single story in height.

TABLE 5

TYPES OF FLOOR PLANS AND NUMBER OF FLOOR LEVELS CONSTRUCTED IN PUBLIC SCHOOLS

<table>
<thead>
<tr>
<th>Floor-Plan Arrangements and Building Levels</th>
<th>Floor Plans</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series-of-pods</td>
<td>0*</td>
<td></td>
</tr>
<tr>
<td>Series-of-fingers</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Open-campus</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Enclosed-campus</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>One level</td>
<td></td>
<td>6*</td>
</tr>
<tr>
<td>Two levels</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Three levels</td>
<td></td>
<td>56</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.

In the opinion of 34 percent of the respondents, the school structure's design was such that future additions could be constructed. Six percent of the principals listed future additions as impractical. Forty-four percent of the respondents indicated that the design of the building would create some difficulty for future additions, while 16 percent felt that future additions would be difficult and costly (see table 6).

Table 6 also reveals the adaptability of the
public secondary schools studied in Puerto Rico for interior change. Thirty-eight percent of the respondents indicated that the school-building floor plans were such that future changes could be made very easily. The opinion that the design of the floor plan would create some difficulty for future interior change was expressed by 34 percent of the principals. Twenty-two percent of the respondents felt that future interior change would be difficult and costly. Six percent expressed the opinion that interior change would be impractical.

**TABLE 6**

**INTERIOR AND EXTERIOR FLEXIBILITY OF SECONDARY PUBLIC SCHOOLS**

<table>
<thead>
<tr>
<th>Degree of Difficulty</th>
<th>Interior</th>
<th>Exterior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very easy</td>
<td>38*</td>
<td>34*</td>
</tr>
<tr>
<td>Some difficulty</td>
<td>34</td>
<td>44</td>
</tr>
<tr>
<td>Difficult and costly</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Impractical</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.

Table 6 indicates that school-plant planners should consider carefully the scope and nature of possible changes and examine the implications of possible future changes in every aspect of the school program. The planning of structures should include the flexibility
and internal and external expansibilities of spaces. The school structures should be built with structural features included that would permit the greatest possible extent of adaptability for future needs. The respondents in 62 percent of the schools surveyed indicated that at least some difficulty would be encountered if interior changes were made. Since the majority of the structures in this study were less than five years old, it appears that insufficient educational planning for the present and the future curricular programs may result because the facilities are not easily adaptable to change. That some difficulty would be encountered if additions to the exterior structure were made was indicated by 66 percent of the principals. Ideally, a well-planned school plant should be capable of modifications in many forms. Each structure should be planned for horizontal and vertical expansion. School-plant planners are in general agreement that a building should be designed so that it is capable of being expanded sensibly and functionally in at least three directions. But table 6 indicates that 66 percent of the schools surveyed do not possess these features. In the opinion of 22 percent of the respondents, the factors that contribute to the difficulty and costliness of exterior change is high cost of additional land, grade level to be housed, and the location of the present facility.

The designed capacities for the public schools
in this study are shown in table 7. The National Council on Schoolhouse Construction (NCSC) has developed criteria regarding the size of secondary schools. At the high-school level, the recommended minimum size enrollment is set at approximately three hundred students and the maximum enrollment of about twelve hundred. These figures—minimum and maximum—reflect the thinking of many educational planners.

TABLE 7
DESIGNED CAPACITY OF SECONDARY PUBLIC SCHOOLS

<table>
<thead>
<tr>
<th>Enrollment Capacity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-499</td>
<td>0*</td>
</tr>
<tr>
<td>500-999</td>
<td>22</td>
</tr>
<tr>
<td>1,000-1,499</td>
<td>56</td>
</tr>
<tr>
<td>1,500-1,999</td>
<td>22</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.

The data in table 7 indicates that 22 percent of the structures were designed for five hundred to one thousand students. It can be observed that no school was designed for an enrollment under five hundred while 56 percent of the schools were designed for enrollments between one thousand and fifteen hundred. Twenty-two percent of the schools surveyed were designed for enrollments in excess of fifteen hundred. School facilities
constructed in Puerto Rico since 1967 compare favorably with recognized guidelines regarding size of secondary facilities.

**Principals' Responses to Structural Characteristics**

The responses of the principals to the desirability of selected features in each selected secondary public-school structure are shown in table 8. The questionnaires provided the opportunity for the respondents to indicate their preferences as highly desirable, desirable, or not desirable. In addition, each principal had the opportunity to report whether the selected feature was or was not included within his particular school.

The effectiveness of the teaching-learning situation is influenced by the climate produced within the school. Air-conditioning for school structures has met increased acceptance during recent years. Forty-four percent of the respondents recommended air-conditioning as highly desirable. Thirty-six percent indicated that it was desirable. Some of the comments that were written regarding air-conditioning are the following:

- Air-conditioning is urgent and necessary in this tropical island.

- Air-conditioning is an outstanding feature.

- The air-conditioned classroom makes it very comfortable to the teaching-learning process.
### TABLE 8

RESPONSES TO PRINCIPALS TO STRUCTURE CHARACTERISTICS INCLUDED IN SECONDARY PUBLIC SCHOOLS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Included</th>
<th>Not Included</th>
<th>Highly Desirable</th>
<th>Desirable</th>
<th>Not Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building air-conditioned</td>
<td>5*</td>
<td>95</td>
<td>44</td>
<td>36</td>
<td>20</td>
</tr>
<tr>
<td>Related disciplines clustered</td>
<td>44</td>
<td>56</td>
<td>59</td>
<td>31</td>
<td>10</td>
</tr>
<tr>
<td>Language laboratories</td>
<td>14</td>
<td>86</td>
<td>78</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Rooms darkened easily</td>
<td>55</td>
<td>45</td>
<td>54</td>
<td>34</td>
<td>12</td>
</tr>
<tr>
<td>Combination cafeteria/auditorium</td>
<td>32</td>
<td>68</td>
<td>30</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>Combination cafeteria/gymnasium</td>
<td>12</td>
<td>88</td>
<td>32</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td>Folding gymnasium bleachers</td>
<td>12</td>
<td>88</td>
<td>50</td>
<td>36</td>
<td>14</td>
</tr>
<tr>
<td>Multi-use auditorium</td>
<td>55</td>
<td>45</td>
<td>50</td>
<td>33</td>
<td>17</td>
</tr>
<tr>
<td>Facilities for evening school easily accessible</td>
<td>49</td>
<td>51</td>
<td>45</td>
<td>37</td>
<td>18</td>
</tr>
<tr>
<td>Large instructional spaces</td>
<td>44</td>
<td>56</td>
<td>57</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>Seminar instructional spaces</td>
<td>54</td>
<td>46</td>
<td>58</td>
<td>34</td>
<td>8</td>
</tr>
<tr>
<td>Individual study carrels</td>
<td>18</td>
<td>82</td>
<td>71</td>
<td>19</td>
<td>10</td>
</tr>
</tbody>
</table>
TABLE 8--Continued

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Included</th>
<th>Not Included</th>
<th>Highly Desirable</th>
<th>Desirable</th>
<th>Not Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramps replacing steps</td>
<td>54*</td>
<td>46</td>
<td>46</td>
<td>43</td>
<td>11</td>
</tr>
<tr>
<td>Teacher workrooms</td>
<td>30</td>
<td>70</td>
<td>77</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>Guidance suite</td>
<td>73</td>
<td>27</td>
<td>60</td>
<td>28</td>
<td>12</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.
Air-conditioning is marvelous for a year-round school program.

Complete environmental control for each educational station.

School-plant planners agree that it is highly desirable that spaces housing similar or closely related instructional activities be clustered together. This arrangement was included in 44 percent of the structures and was rated desirable or highly desirable by 90 percent of the respondents. Some of the comments offered on the feature of clustered disciplines were:

Location of disciplines in specific areas is excellent.

Easy to communicate with fellow workers.

Laboratory facilities for all disciplines around which classrooms cluster.

Excellent opportunity for the staff to share ideas and equipment.

The instructional tools of the traditional schools consisted of books, chalkboard, and paper; however, since 1965, electronic teaching aids have come to play a very important role in the educational program. This has come because of federal assistance offered through the Elementary Secondary Education Act. Of the schools surveyed, 14 percent indicated that language laboratories were included. Ninety-two percent of the principals rated this feature as being desirable or highly desirable. Only 8 percent of the respondents
indicated language laboratories to be an undesirable feature.

Easy darkening of rooms for use of audio-visual aids was ranked highly desirable by 54 percent of the respondents. This feature was included in 55 percent of the structures. Forty-five percent indicated that it was not possible to darken rooms easily.

Educational planners and architects in Puerto Rico have in recent years attempted to design more functional school facilities for the changing curriculum and the increasing enrollment (see table 3). Several methods have been used to increase the maximum utilization of available floor space. One attempt in an effort to utilize existing space is the use of folding bleachers in the gymnasium. The folding bleachers were considered desirable or highly desirable by 86 percent of the respondents. But at the same time 14 percent of the principals questioned their desirability.

Another attempt to utilize space is the combination cafeteria/gymnasium and cafeteria/auditorium. The cafeteria/gymnasium was reported by 68 percent as desirable or highly desirable. Running parallel with that figure were 67 percent who chose cafeteria/auditorium as desirable or highly desirable. Cafeteria/gymnasium combination rated as undesirable with 32 percent of those who responded. Again the close figure of 33 percent were those not desiring the cafeteria/auditorium
combination. While these features lend themselves to better utilization, apparently they have not functioned satisfactorily in many of the public secondary schools in Puerto Rico.

The greatest challenge to the school is to conduct a sound educational program. This should be done in existing as well as in new facilities. Social and academic development of the students in school requires space for activities of the small as well as the large groups. Educational-plant planners, architects, administrators, and so forth, as a team, need to design the school structure so that advantage can be taken of group similarities as well as individual differences. Individual differences suggest individual treatment of students. Group similarities call for that which may be used for small or large groups.

Large-group instructional spaces were listed desirable and highly desirable by 84 percent of the principals and were included in 44 percent of the structures. Sixteen percent did not find them desirable. High in percentage (92%) was the desirability of small seminar-type instructional spaces. These were included in 54 percent of the buildings. At the same time only 8 percent indicated these as not desirable. Some of the comments offered were:

Small seminar-type instructional space is necessary.
Excellent opportunity for the teacher and students to share ideas.

Avoid discipline problems.

Facilities for independent study are another means of providing for individual differences. Individual study carrels were listed as desirable or highly desirable by 90 percent of the respondents. But individual study carrels were included in only 18 percent of the selected public secondary schools studied. Some of the comments were as follows:

More space adjacent to the library is needed for study carrels.

We would modernize our library into an independent resource center.

More books, more materials, and more study carrels are urgently needed in the library.

Educational planners should plan facilities to meet the needs of handicapped students. These features should be provided in the educational program and the physical plant. School-plant planners should design accesses as entrances and exits to meet the needs of the handicapped. Of the secondary schools included in this study, only 13 percent made provisions for such students. Forty-six percent of the respondents felt this feature to be highly desirable. Forty-three percent considered it desirable, while 11 percent were negative.

The success of any educational program depends upon the efforts of a group of individuals working as a team and should be approached with a cooperative
attitude. Every day the teacher is confronted with new techniques, methods of instruction, and materials. These new programs not only require additional classroom space but also necessitate facilities for preparation. Teachers' workrooms were included in 30 percent of the selected structures and were deemed desirable or highly desirable by 94 percent of the respondents. The necessity of teachers' workrooms was pointed out by these comments:

- An equipped teachers' workroom is needed.
- Our workroom area is small and without ventilation.
- A larger and better located teacher workroom is urgent.
- Let's separate the workroom and lounge.
- No space for storage, or movement.

A counselor's office was included in 73 percent of the buildings surveyed and was rated as desirable or highly desirable by 88 percent of the principals. A counselor office was recognized as an important feature that generates a better instructional climate for the pupils; only 12 percent of the respondents indicated it to be not desirable.

**Teachers' Responses to Specific Structural Characteristics**

Table 9 reveals the responses of teachers to specific structural characteristics of the selected public schools in Puerto Rico. A variation of "zones of
<table>
<thead>
<tr>
<th>Specific Characteristics</th>
<th>Inadequate</th>
<th>Below Average</th>
<th>Average</th>
<th>Above Average</th>
<th>Superior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrangements of departments and facilities within structures</td>
<td>22*</td>
<td>24</td>
<td>42</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Adequate allocation of space among departments and activities</td>
<td>21</td>
<td>29</td>
<td>36</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Adequacy of general storage facilities</td>
<td>31</td>
<td>25</td>
<td>29</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Suitability for using visual aids</td>
<td>41</td>
<td>32</td>
<td>15</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Adaptability to teaching methods</td>
<td>6</td>
<td>11</td>
<td>55</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Adaptability to curricular changes</td>
<td>8</td>
<td>16</td>
<td>54</td>
<td>18</td>
<td>4</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.*
space: represented by open-campus, closed-campus, and series-of-fingers floor-plan designs was used for 100 percent of the structures. The arrangement of related disciplines clustered in areas in their own schools was considered above average or superior by only 12 percent of the teachers, and 42 percent of the respondents considered that particular feature average in their schools. Forty-six percent of the teachers felt that related disciplines clustered in areas in their schools were below average or inadequate.

Adequate space distribution between departments and activities was rated below average or inadequate by 50 percent of the teachers, while 12 percent of the respondents indicated that feature as above average or superior. Responses from 56 percent of the teachers indicated that adequate storage facilities were below average or inadequate. The phrase "more storage space needed" was a representative comment of the respondents.

Ninety-four percent of the classrooms were rectangular in shape, and the suitability for using visual aids was rated 32 percent below average by the respondents while only 12 percent indicated that feature as above average or superior in the structure.

The theoretical test of design of a structure is its effect on the changes which occur in the adaptability to teaching methods and changes in the curriculum. Each teacher was asked to indicate the extent the
structure was adaptable to teaching methods and curricular changes. Teachers in 83 percent of the schools surveyed indicated above average or superior regarding the adaptability of the school for teaching methods. Seventy-six percent rated average, above average, or superior regarding adaptability to changes in the curriculum. Opinions from 6 percent of the respondents indicated that the school buildings were inadequate regarding adaptability to teaching methods, while 8 percent indicated that the structures were inadequate regarding adaptability to changes in the curriculum.

**Interior Building Characteristics**

Administrators, plant planners, architects, and other members of the team may prepare themselves for the task of planning for the present and future by analyzing trends in education. Authorities in the field of school-plant planning generally agree that structures should be designed for easy adaptability to future practices. School plants should provide flexibility in the building and expansibility of spaces. Features that facilitate flexibility should be incorporated into the structure rather than future additions. It is possible to incorporate many features that promote flexibility and adaptability without increasing the cost of the structure.

Table 10 shows general interior building characteristics that facilitate interior change. In
### TABLE 10

INTERIOR BUILDING CHARACTERISTICS OF SECONDARY PUBLIC SCHOOLS

<table>
<thead>
<tr>
<th>Interior Characteristics</th>
<th>Included</th>
<th>Not Included</th>
<th>Percentage of Inclusion**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Folding walls that divide spaces</td>
<td>83*</td>
<td>17</td>
<td>67* 13 12 8</td>
</tr>
<tr>
<td>Walls made of modular units</td>
<td>27</td>
<td>73</td>
<td>42 19 20 19</td>
</tr>
<tr>
<td>Chalk and bulletin boards of modular units</td>
<td>36</td>
<td>64</td>
<td>46 20 19 15</td>
</tr>
<tr>
<td>Office carpeted</td>
<td>11</td>
<td>89</td>
<td>44 20 18 18</td>
</tr>
<tr>
<td>Library carpeted</td>
<td>12</td>
<td>88</td>
<td>46 18 18 18</td>
</tr>
<tr>
<td>Classrooms carpeted</td>
<td>10</td>
<td>90</td>
<td>41 21 19 19</td>
</tr>
<tr>
<td>Classrooms with unusually large window areas</td>
<td>53</td>
<td>47</td>
<td>30 18 20 32</td>
</tr>
<tr>
<td>Classrooms without windows</td>
<td>17</td>
<td>83</td>
<td>40 20 21 19</td>
</tr>
<tr>
<td>Classrooms with television receivers</td>
<td>22</td>
<td>78</td>
<td>45 20 16 19</td>
</tr>
<tr>
<td>Classrooms with projector screens</td>
<td>14</td>
<td>86</td>
<td>44 20 17 20</td>
</tr>
<tr>
<td>Classrooms easily changed from large to small and small to large</td>
<td>53</td>
<td>48</td>
<td>57 15 22 6</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentage  **I=0-25, II=26-50, III=51-75, IV=76-100.
response to the question asking for the percentage of present interior walls that could fold and unfold to divide spaces, 67 percent of the schools represented had less than 25 percent of the walls that were of the folding type. This particular feature, which added flexibility, was included in 83 percent of the buildings. Some of the comments regarding the use of the folding walls were as follows:

More sliding or folding walls are necessary.

Folding walls help groups to meet together without disturbing others.

Recommend a decrease in the percentage of folding walls.

Another means of adding flexibility to the interior of a building is through the use of modular units or chalk and bulletin boards of modular units. Only 27 percent of the schools included modular-wall units; 42 percent of these schools indicated modular-unit construction in less than 25 percent of the interior walls and only 19 percent of these schools in at least 75 percent of the interior walls. This feature of flexibility was disclosed as not present in 73 percent of the buildings. Some comments of the respondents were as follows:

More modular walls reaching to the ceiling are needed.

Incorporate demountable re-usable partitions.

Design more rooms that can be made into flexible-sized teaching stations.
It may be noted from table 10 that 46 percent of the public schools represented provided less than 25 percent of the chalk-and bulletin-board area as a modular type. This feature as a modular unit was not present in 64 percent of the buildings. Carpeting in the offices, libraries, and classrooms was another feature of interior building characteristics. According to table 10 these features were not included in at least 85 percent of the structures.

Classrooms with television receivers were included in only 22 percent of the structures surveyed, and 45 percent of these were equipped with this feature in less than 25 percent of the building. While classrooms with projector screens were included in only 14 percent of the schools, 20 percent of these schools had projection screens in at least 75 percent of the classrooms.

One of the important advantages of flexibility is the provision for changing of the size of classrooms to meet the demands of a changing curriculum or to complement changes in the methods of instruction. The tabulation of percentages for the ease of changing classroom size may be observed in table 10. Of the 39 percent of the schools which included this feature in the structure, 42 percent reported that less than 25 percent of the classrooms could be changed.
Special Characteristics

The special characteristics that were observed in the public schools included in this study are shown in table 11. The percentages indicate the number of schools which did or did not include these characteristics.

Curricular programs are in constant change, and in the seventies emphasis is given to individual development. Every area in the curriculum is undergoing change, new materials are being introduced, and new techniques and methods of presentation are being used. These programs require special equipment, space, and access to resource material.

Divisible auditoriums were provided in 32 percent of the buildings. Divisible cafeterias were included in only 12 percent of the school plants studied. The feature providing individual study carrels were included in only 18 percent of the schools. The extent of that inclusion ranged from five to twelve carrels.

Language laboratories were included in 55 percent of the school plants. The extent of the inclusion ranged from one to three rooms for this purpose. Carpeting in special areas was included in 13 percent, and seminar rooms for small group instruction were included in 54 percent of the structures. However, the extent of inclusion ranged only from one to six rooms.

Only 22 percent of the public schools surveyed reported some provision for educational television in one
TABLE 11
SPECIAL CHARACTERISTICS INCLUDED IN SECONDARY PUBLIC SCHOOLS

<table>
<thead>
<tr>
<th>Special Characteristic</th>
<th>Percentage Included</th>
<th>Percentage Not Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divisible auditoriums</td>
<td>32*</td>
<td>68*</td>
</tr>
<tr>
<td>Divisible cafeterias</td>
<td>12</td>
<td>88</td>
</tr>
<tr>
<td>Individual study carrels</td>
<td>18</td>
<td>82</td>
</tr>
<tr>
<td>Language laboratories</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Carpeting in special areas</td>
<td>13</td>
<td>87</td>
</tr>
<tr>
<td>Seminar rooms for small-group instruction</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>Provisions for educational television</td>
<td>22</td>
<td>78</td>
</tr>
<tr>
<td>Instructional materials centrally located for easy access</td>
<td>31</td>
<td>69</td>
</tr>
<tr>
<td>Controlled access of areas for after-school use</td>
<td>49</td>
<td>51</td>
</tr>
<tr>
<td>Ramps and inclines replacing steps</td>
<td>18</td>
<td>82</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.

or two rooms. Instructional materials centrally located for easy access were included in 31 percent of the buildings; while controlled access of areas for after-school use was included in 49 percent of the school plants.

The school districts in Puerto Rico are faced with the challenge of perfecting facilities for current educational programs while allowing for changes in teaching methods and instructional materials. The
traditional school contains a certain amount of adaptability and flexibility, but these exist more as a possibility. The inclusion of ramps and inclines replacing steps shows that a more flexible school is possible; only 18 percent of the school plants studied included this feature.

The school of tomorrow will not differ regarding such matters as site selection and development, recreational space, and environmental systems; however, the number and types of space required for the school of tomorrow will involve different designs and instructional features. As stated before, school authorities agree that a structure will be utilized for approximately fifty years. But the utilization of a building should be longer than that at the school of the past if an educational planning program receives attention. In comparing the allocation of space for specific curricular programs (see table 12), the results indicate that additional planning would have been beneficial. All of the buildings visited included at least one of the characteristics listed in table 11; however, in a majority of the structures, the extent of inclusion was limited.

**Allocation of Space for Specific Curricular Programs**

The particular curricular programs investigated were art, biology, business education, chemistry, home economics, industrial arts, and music (see table 12).
The study examined whether or not provision was made for these curricula in the structures and whether the allocation of space for these programs was adequate or inadequate as compared to recommended standards. These particular areas were selected because they require an area larger than the average classroom.

In the selected public secondary schools surveyed, 64 percent allocated space for art. But in 44 percent of the cases inadequate space was provided. In almost every case inadequate storage facilities were a problem. As can be observed in table 12, 100 percent of the schools included space for biology and chemistry, but on the average only 77 percent provided adequate space for both biology and chemistry.

Of the schools surveyed, 75 percent made provisions for business education. However, 33 percent of the facilities did not provide adequate space and storage for the present enrollment. It can be observed in table 12 that 73 percent of the schools included space for home economics, and 24 percent of the facilities were inadequate when compared to recommended standards. School administrators need to give additional attention to this particular program.

Industrial facilities were included in 73 percent of the buildings, but 54 percent of these facilities were inadequate. Storage facilities were reported as a problem. This lack of planning creates a safety problem for
TABLE 12

ALLOCATION OF SPACE FOR SPECIFIC CURRICULAR PROGRAMS IN SECONDARY PUBLIC SCHOOLS

<table>
<thead>
<tr>
<th>Curricular Area</th>
<th>Included</th>
<th>Not Included</th>
<th>Adequate</th>
<th>Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art</td>
<td>64*</td>
<td>36*</td>
<td>53**</td>
<td>47**</td>
</tr>
<tr>
<td>Biology</td>
<td>100</td>
<td>0</td>
<td>78</td>
<td>22</td>
</tr>
<tr>
<td>Business Education</td>
<td>75</td>
<td>25</td>
<td>67</td>
<td>33</td>
</tr>
<tr>
<td>Chemistry</td>
<td>100</td>
<td>0</td>
<td>84</td>
<td>16</td>
</tr>
<tr>
<td>Home Economics</td>
<td>73</td>
<td>27</td>
<td>76</td>
<td>24</td>
</tr>
<tr>
<td>Industrial Arts</td>
<td>73</td>
<td>27</td>
<td>46</td>
<td>54</td>
</tr>
<tr>
<td>Music</td>
<td>61</td>
<td>39</td>
<td>58</td>
<td>42</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.
**Percentage of schools which provided space that met recommended standards.

the enrollment at the moment of the study and leaves no room for additional enrollment in the future.

Vocal and instrumental music facilities were included in 61 percent of the school plants. Forty-two percent of the facilities were inadequate as compared to recommended standards. A very small percentage included additional practice rooms. In many cases, no acoustical material was used to prevent sound vibrations.
CHAPTER V

PRESENTATION AND ANALYSIS OF DATA OF THE PRIVATE SCHOOLS

The purpose of this chapter is to present a description and analysis of the data obtained from the selected private secondary schools represented in this study. The presentation of the data represents information gathered from the administration of a questionnaire, personal visitation, and opinions as expressed by principals, teachers, and architects of the private secondary-school complexes constructed since 1967. Each school official and architect was contacted by letter, telephone, and personal visitation.

Appendix H shows the geographical location of the schools. These school plants provide 494 classrooms and laboratories with a designated capacity for 6,253 students. Employed are 278 teachers who teach grades one to twelve and 153 supporting personnel.

General Description

The majority of the schools represented in this study were of concrete construction and were rectangular in shape. Because of the high cost of land in Puerto Rico,
the private schools operate on restricted sites.

Table 13 lists the shape of the buildings and classrooms included in this study. Ninety-six percent of the structures were reported as rectangular in shape and 100 percent of the classrooms were reported by the principals as rectangular, while circular and hexagonal designs were not represented in either structures or classrooms.

TABLE 13

SHAPES OF STRUCTURES AND CLASSROOMS OF PRIVATE SECONDARY SCHOOLS

<table>
<thead>
<tr>
<th>Design</th>
<th>Structures</th>
<th>Classrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circular</td>
<td>0*</td>
<td>0*</td>
</tr>
<tr>
<td>Rectangular</td>
<td>96</td>
<td>100</td>
</tr>
<tr>
<td>Hexagonal</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.

The data shown in table 14 indicates the types of floor plans and the levels of the buildings surveyed. A series-of-fingers was the type of floor plan reported by 15 percent of the respondents, while open-campus was listed by 32 percent of the principals, and 53 percent indicated enclosed-campus as the style. Thirty-one percent of the school plants were one-story buildings. Forty percent of the cases were two-story buildings, while
only 29 percent were three-story buildings. This tendency to have a large quantity of one- and two-story buildings is based in the school program that includes grades one to twelve.

**TABLE 14**

**TYPES OF FLOOR LEVELS AND NUMBER OF FLOOR LEVELS CONSTRUCTED IN PRIVATE SCHOOLS**

<table>
<thead>
<tr>
<th>Floor-Plan Arrangements and Building Levels</th>
<th>Floor Plans</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series-of-pods</td>
<td>0*</td>
<td></td>
</tr>
<tr>
<td>Series-of-fingers</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Open-campus</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Enclosed-campus</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>One level</td>
<td>31*</td>
<td></td>
</tr>
<tr>
<td>Two levels</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Three levels</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.

In the opinion of 27 percent of the principals, as shown in table 15, the school structure's design was such that future additions could easily be constructed. The opinion that the design of the structure would create some difficulty for the construction of future additions to the structure was expressed by 36 percent of the principals. Respondents in 13 percent of the schools felt that future additions would be impractical,
and 24 percent regarded future additions as difficult and costly.

Table 15 also reveals the adaptability of the private secondary schools studied in Puerto Rico for interior change. Thirty percent of the respondents indicated that the school-building floor plans were such that future changes could be made very easily. The opinion that the design of the floor plan would create some difficulty for future interior change was expressed by 33 percent of the respondents. Twenty-seven percent of the principals felt that future interior change would be difficult and costly, while 10 percent indicated that interior change would be impractical.

### TABLE 15

**INTERIOR AND EXTERIOR FLEXIBILITY OF SECONDARY PRIVATE SCHOOLS**

<table>
<thead>
<tr>
<th>Degree of Difficulty</th>
<th>Exterior</th>
<th>Interior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very easy</td>
<td>27*</td>
<td>30*</td>
</tr>
<tr>
<td>Some difficulty</td>
<td>36</td>
<td>33</td>
</tr>
<tr>
<td>Difficult and costly</td>
<td>24</td>
<td>27</td>
</tr>
<tr>
<td>Impractical</td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.*

School-plant planners should consider the scope and nature of possible changes and carefully examine the implications of possible future changes in every aspect.
of the school program. The planning of structures should include flexibility, and internal and external expansabilities of the spaces. The school plants should be constructed with structural features necessary for future adaptability to the greatest possible extent. The respondents in 70 percent of the schools surveyed indicated that at least some difficulty would be encountered if interior changes were made. Since the majority of the private-school plants in this study were constructed in the last decade, it appears that insufficient educational planning for the present and the future curricular programs has resulted in facilities that are not easily adaptable to change. That some difficulty would be encountered if additions to the exterior structures were made was indicated by 73 percent of the principals.

Ideally, a well-planned structure should be capable of modifications in many forms. Each structure should be planned for horizontal or vertical expansion. But table 15 indicates that 73 percent of the schools surveyed did not possess these features. Such factors as site limitations, the high cost of the property, location of the present facility, and grade levels to be housed indicate that in the opinion of 37 percent of the principals future additions to the structures would be difficult and costly or impractical.

The data shown in table 16 shows the designed
capacities for the private schools studied. The NCSC has developed criteria regarding the size of secondary schools. At the high school level, the recommended enrollment size is between three hundred students as a minimum and twelve hundred as a maximum. The enrollment figures reflect the thinking of many educational planners.

**TABLE 16**

<table>
<thead>
<tr>
<th>School Size</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-499</td>
<td>32*</td>
</tr>
<tr>
<td>500-999</td>
<td>58</td>
</tr>
<tr>
<td>1,000-1,499</td>
<td>0</td>
</tr>
<tr>
<td>1,500-1,999</td>
<td>10</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.*

From table 16 it is observed that 32 percent of the private schools surveyed were designed for an enrollment below five hundred students. Fifty-eight percent of the buildings accommodate enrollments of five hundred to one thousand and only 10 percent accommodate an enrollment over fifteen hundred students.
Principals' Responses to Structure Characteristics

Table 17 lists the responses of the principals as to the desirability of the selected features in each secondary private school studied. The questionnaire provided the opportunity for the respondent to indicate the desirability as highly desirable, desirable, or not desirable. In addition each principal had the opportunity to report whether the selected feature was or was not included within his particular school.

The effectiveness of the teaching-learning situation is influenced by the climate produced within the school. Item number one is air-conditioning, which none of the schools has but which was rated by 68 percent of the principals as desirable or highly desirable. Only 32 percent of the respondents stated that the feature was not desirable. One principal commented, "An air-conditioned building would be marvelous but too expensive." Another commented, "Air-conditioning is necessary throughout the whole school year."

School-plant planners agree that it is highly desirable that spaces housing similar or closely related instructional activities be clustered together. This arrangement was included in 49 percent of the structures and was rated highly desirable or desirable by 84 percent of the respondents. Only 16 percent indicated that the feature was not desirable. "Excellent opportunity
TABLE 17
RESPONSES OF PRINCIPALS TO STRUCTURE CHARACTERISTICS INCLUDED IN SECONDARY PRIVATE SCHOOLS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Included</th>
<th>Not Included</th>
<th>Highly Desirable</th>
<th>Desirable</th>
<th>Not Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building air-conditioned</td>
<td>0*</td>
<td>100*</td>
<td>19*</td>
<td>49*</td>
<td>32*</td>
</tr>
<tr>
<td>Related disciplines clustered</td>
<td>49</td>
<td>51</td>
<td>20</td>
<td>64</td>
<td>16</td>
</tr>
<tr>
<td>Language laboratories</td>
<td>26</td>
<td>74</td>
<td>39</td>
<td>43</td>
<td>18</td>
</tr>
<tr>
<td>Rooms darkened easily</td>
<td>49</td>
<td>51</td>
<td>41</td>
<td>33</td>
<td>26</td>
</tr>
<tr>
<td>Combination cafeteria/auditorium</td>
<td>0</td>
<td>100</td>
<td>22</td>
<td>26</td>
<td>52</td>
</tr>
<tr>
<td>Combination cafeteria/gymnasium</td>
<td>24</td>
<td>76</td>
<td>27</td>
<td>29</td>
<td>44</td>
</tr>
<tr>
<td>Folding gymnasium bleachers</td>
<td>21</td>
<td>79</td>
<td>42</td>
<td>41</td>
<td>17</td>
</tr>
<tr>
<td>Multi-use auditorium</td>
<td>69</td>
<td>31</td>
<td>39</td>
<td>39</td>
<td>22</td>
</tr>
<tr>
<td>Facilities for evening school</td>
<td>76</td>
<td>24</td>
<td>23</td>
<td>53</td>
<td>24</td>
</tr>
<tr>
<td>easily accessible</td>
<td>68</td>
<td>32</td>
<td>33</td>
<td>46</td>
<td>21</td>
</tr>
<tr>
<td>Large instructional spaces</td>
<td>75</td>
<td>25</td>
<td>40</td>
<td>38</td>
<td>22</td>
</tr>
<tr>
<td>Seminar instructional spaces</td>
<td>33</td>
<td>67</td>
<td>38</td>
<td>38</td>
<td>24</td>
</tr>
<tr>
<td>Individual study carrels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic</td>
<td>Included</td>
<td>Not Included</td>
<td>Highly Desirable</td>
<td>Desirable</td>
<td>Not Desirable</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------</td>
<td>--------------</td>
<td>------------------</td>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>Ramps replacing steps</td>
<td>25</td>
<td>75</td>
<td>23</td>
<td>48</td>
<td>29</td>
</tr>
<tr>
<td>Teacher workrooms</td>
<td>71</td>
<td>29</td>
<td>59</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>Guidance suite</td>
<td>56</td>
<td>44</td>
<td>65</td>
<td>29</td>
<td>6</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.*
for teachers and other personnel to share ideas and materials," was a common comment regarding the spaces housing related instructional activities being clustered together.

The third item listed is language laboratories which were included in 26 percent of the school-plants surveyed. Eighty-two percent of the principals rated this feature as desirable or highly desirable. Contrariwise 18 percent of the respondents indicated language laboratories as an undesirable feature. Easy darkening of classrooms for use of audio-visual aids was ranked highly desirable by 41 percent of the respondents. This feature was listed as being provided in 49 percent of the school plants. Twenty-six percent indicated that it was not possible to darken the classrooms easily. That educational planners and architects in Puerto Rico have attempted to design better functional school facilities for the changing curriculum and the increasing enrollment is shown in table 3. Several methods have been used to increase the maximum utilization of available floor space. One attempt in an effort to utilize existing space is the use of folding bleachers in the gymnasium. Forty-two percent of the principals considered that feature highly desirable while 17 percent questioned the desirability of installing folding bleachers.

The combination of cafeteria/gymnasium and cafeteria/auditorium is another attempt to utilize space
in a maximum capacity. The cafeteria/gymnasium was reported by 48 percent as desirable or highly desirable and the cafeteria/auditorium was indicated by 56 percent of the respondents as desirable or highly desirable. At least 44 percent of the respondents indicated that either of the two combinations is not desirable. While these features lend themselves to better utilization of space, it appears they have not functioned satisfactorily in the private secondary schools studied. Some commented: "It does not work," "Is not necessary or important," and "Requires too much money and time to maintain one of those monsters."

The social and academic development of the student in school requires a variety of space for small- and large-group activities. Educational-plant planners, architects, administrators, related personnel, and so forth, as a team, need to design the school structure so that advantages can be taken of group similarities as well as individual differences. The tenth item was large instructional spaces. These were rated desirable or highly desirable by 79 percent of the respondents and were included in 68 percent of the school plants.

Seminar instructional spaces, the eleventh item, were listed desirable or highly desirable by 78 percent of the principals. These were included in 75 percent of the buildings. Only 22 percent of the respondents rated this feature as undesirable. Another
means for providing for individual differences is the
twelfth item, individual study carrels. This feature
was rated desirable or highly desirable by 76 percent of
the respondents. It was included in 33 percent of the
private-school plants surveyed.

Planning facilities to meet the needs of the
handicapped students is one of the tasks of the educa­
tional planner. These features should be provided in
the educational program and the structure. School-plant
planners should design entrances, exits, and other
accesses to meet the needs of the physically impaired
students. Of the private secondary schools included in
this study, only 25 percent had made provision for
these students. Seventy-one percent of the respondents
felt this feature to be either highly desirable or
desirable while 29 percent did not sense the desirability
of having this feature.

Every day the teacher is exposed to new tech­
niques, methods of instruction, and materials. These new
programs not only require additional classroom space but
also necessitate facilities for preparation. Teachers'
workrooms, the fourteenth item, were included in 71 percent
of the school plants represented in this study. The
feature was deemed desirable or highly desirable by
82 percent of the respondents. The phrase "A larger,
ventilated, and better located workroom area" was a
representative comment of the principals regarding teachers' workrooms.

The fifteenth item, a guidance office, was included in 56 percent of the schools surveyed. Sixty-five percent of the respondents felt that this feature was highly desirable. It was rated undesirable by only 6 percent of the principals. A counselor's office is recognized as an important feature that helps to improve a better instructional climate for the students.

**Teachers' Responses to Specific Structural Characteristics**

The data in table 18 reveal the responses of teachers to specific structural characteristics of the selected private schools in Puerto Rico. The first item concerns the arrangements of departments and facilities within structures. These facilities were considered above average or superior by 47 percent of the teachers, while 13 percent rated them inadequate.

Adequate allocation of space among departments and activities in their schools was rated by only 34 percent of the respondents as above average or superior. Responses from 32 percent of the teachers indicated that the particular feature in their schools was below average or inadequate. Adequacy of general storage facilities was the item which was rated inadequate or below average by 47 percent of the respondents. Forty-three percent of
<table>
<thead>
<tr>
<th>Specific Characteristics</th>
<th>Inadequate</th>
<th>Below Average</th>
<th>Average</th>
<th>Above Average</th>
<th>Superior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrangements of departments and facilities within structures</td>
<td>13*</td>
<td>16*</td>
<td>24*</td>
<td>23*</td>
<td>24*</td>
</tr>
<tr>
<td>Adequate allocation of space among departments and activities</td>
<td>11</td>
<td>21</td>
<td>34</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Adequacy of general storage facilities</td>
<td>8</td>
<td>39</td>
<td>38</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>Suitability for using visual aids</td>
<td>7</td>
<td>21</td>
<td>29</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>Adaptability to teaching methods</td>
<td>12</td>
<td>14</td>
<td>26</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>Adaptability to curricula changes</td>
<td>9</td>
<td>16</td>
<td>33</td>
<td>26</td>
<td>16</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.*
the teachers listed the above feature as above average or superior.

Suitability for using visual aids was rated above average or superior by 43 percent of the respondents. At the same time only 7 percent listed the feature as inadequate. Twenty-one percent listed it as below average.

The test of design of a school plant is its effect on the changes that occur in the adaptability to teaching methods and changes in the curriculum. Each teacher was asked to indicate the extent to which the structure was adaptable to teaching methods and curricular changes. Respondents in 49 percent of the schools studied indicated above average or superior in regard to adaptability to teaching methods, and curricular changes were rated by 42 percent. Opinions from 12 percent of the respondents listed the school plants as inadequate regarding adaptability to teaching methods while 9 percent indicated the structures were inadequate with respect to changes in the curriculum.

Interior Structural Characteristics

Authorities in the field of school-plant planning generally agree that structures should be designed for easy adaptability for future practices. School plants should provide flexibility in the building and expansibility of spaces. Features that facilitate flexibility
should be incorporated into the structure as it is initially built, rather than being considered for future additions. It is possible to incorporate many features that promote flexibility and adaptability without appreciably increasing the cost of the school plant.

The data of table 19 show the interior building characteristics that facilitate interior change. Folding walls that divide spaces are one of the characteristics rated that facilitate interior change. In response to the question asking for the percent of interior walls that could fold and unfold to divide spaces, 76 percent of the schools were represented as having less than 25 percent of the folding-type walls. This feature, which adds flexibility, was included in only 27 percent of the school plants. The phrase "More folding walls are needed to improve some of the new techniques and methods of instruction" was a representative comment of the respondents.

The use of walls made of modular units is another means of adding flexibility to the interior of a building. Only 26 percent of the school plants included modular units, and 32 percent of those schools indicated modular units in less than 25 percent of the interior walls; at the same time 29 percent of those schools with modular-unit interior walls had them in at least 75 percent of the walls.

It may be noted from the data of table 19 that
### TABLE 19

**INTERIOR STRUCTURAL CHARACTERISTICS OF SECONDARY PRIVATE SCHOOLS**

<table>
<thead>
<tr>
<th>Interior Characteristics</th>
<th>Included</th>
<th>Not Included</th>
<th>Percentage of Inclusion**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Folding walls that divide spaces</td>
<td>27*</td>
<td>73*</td>
<td>76* 12 5 7</td>
</tr>
<tr>
<td>Walls made of modular units</td>
<td>26</td>
<td>74</td>
<td>32 28 11 29</td>
</tr>
<tr>
<td>Chalk and bulletin boards of modular units</td>
<td>52</td>
<td>48</td>
<td>22 21 29 28</td>
</tr>
<tr>
<td>Office carpeted</td>
<td>29</td>
<td>71</td>
<td>46 16 20 18</td>
</tr>
<tr>
<td>Library carpeted</td>
<td>25</td>
<td>75</td>
<td>36 31 0 33</td>
</tr>
<tr>
<td>Classrooms carpeted</td>
<td>20</td>
<td>80</td>
<td>75 25 0 0</td>
</tr>
<tr>
<td>Classrooms with unusually large window areas</td>
<td>71</td>
<td>29</td>
<td>16 20 21 43</td>
</tr>
<tr>
<td>Classrooms without windows</td>
<td>22</td>
<td>78</td>
<td>71 4 7 18</td>
</tr>
<tr>
<td>Classrooms with television receivers</td>
<td>29</td>
<td>71</td>
<td>68 6 11 15</td>
</tr>
<tr>
<td>Classrooms with projector screens</td>
<td>27</td>
<td>73</td>
<td>64 17 9 10</td>
</tr>
<tr>
<td>Classrooms easily changed from large to small and small to large</td>
<td>32</td>
<td>68</td>
<td>65 16 7 12</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentage **I=0-25, II=26-50, III=51-73, IV=76-100.
only 22 percent of the schools represented provided less than 25 percent of the chalk and bulletin board area as a modular type. This feature was disclosed as being present in 52 percent of the buildings as a modular unit. The next items deal with carpeting in the offices, library, and classrooms as a means of interior flexibility. The percentages of inclusion are shown in table 19; these features were included in at least 20 percent of the school plants.

Classrooms with television receivers were included in only 29 percent of the structures surveyed and of these 68 percent had less than 25 percent of television viewers. Classrooms with projector screens were in only 27 percent of the schools, but 64 percent of these schools had projection screens in 25 percent of the classrooms.

One of the important advantages of flexibility is the provision for the changing of the size of classrooms to meet the demands of a changing curriculum or to complement changes in the methods of instruction. The tabulation of percentages for the ease of changing classroom size may be observed in table 19. While 68 percent of the private schools did not include this feature in the structure, 65 percent reported that less than 25 percent of the classrooms could be changed.
Special Characteristics

Table 20 shows the special characteristics that were observed in the private secondary schools included in this study. The percentages indicate the number of schools which did or did not include these characteristics.

Curricular programs are in constant change, and in the seventies emphasis is given to individual development. However, every area in curriculum is undergoing change with new materials being introduced and new techniques and methods of presentation being used. These programs require special equipment, access to resource material, and space.

Divisible auditoriums were provided in 24 percent of the structures, but divisible cafeterias were not included in any of the school plants surveyed. Study carrels is the next item studied. This feature was included in 33 percent of the schools and the extent of inclusion ranged from three to five carrels.

Language laboratories were included in 49 percent of the school plants, but these buildings had only one room each. Carpeting in special areas was included in 25 percent of the structures, while seminar rooms for small-group instruction were included in 75 percent of the school plants.

Provision for educational television was included in only 29 percent of the schools, and of those the majority provided conduit to one or two rooms.
TABLE 20

SPECIAL CHARACTERISTICS INCLUDED IN SECONDARY PRIVATE SCHOOLS

<table>
<thead>
<tr>
<th>Special Characteristic</th>
<th>Percentage Included</th>
<th>Not Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divisible auditorium</td>
<td>24*</td>
<td>76*</td>
</tr>
<tr>
<td>Divisible cafeteria</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Individual study carrels</td>
<td>33</td>
<td>67</td>
</tr>
<tr>
<td>Language laboratories</td>
<td>49</td>
<td>51</td>
</tr>
<tr>
<td>Carpeting in special areas</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Seminar rooms for small-group instruction</td>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>Instructional materials centrally located for easy access</td>
<td>32</td>
<td>68</td>
</tr>
<tr>
<td>Provisions for educational television</td>
<td>29</td>
<td>71</td>
</tr>
<tr>
<td>Controlled access of areas for after-school use</td>
<td>76</td>
<td>24</td>
</tr>
<tr>
<td>Ramps and inclines replacing steps</td>
<td>25</td>
<td>75</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.

Instructional materials centrally located for easy access were included in 32 percent of the facilities; controlled access of areas for after-school use was included in 26 percent of the school plants.

The private schools in Puerto Rico are faced with the challenge of perfecting facilities for current educational programs while allowing for changes in teaching methods and instructional materials. The inclusion of ramps and inclines replacing steps shows
that a more flexible school plant is possible; yet only 25 percent of the facilities studied included this feature. All the buildings visited included at least one of the characteristics listed in table 20. However, in the majority of the school plants, the extent of inclusion was limited.

**Allocation of Space for Specific Curricular Programs**

Table 21 indicates the particular curricular programs investigated; namely, arts, biology, business education, chemistry, home economics, industrial arts, and music. The study examines the various structures to see if space is allocated for these programs and whether or not the space is adequate as compared to recommended standards. These particular areas were selected because they require an area larger than the average classroom.

In the private secondary schools surveyed, 56 percent allocated space for art, but in 54 percent of the cases inadequate space was provided. In every case storage facilities were inadequate. Seventy-eight percent of the facilities made provision for biology and 44 percent for chemistry. It could be observed that only 37 percent of the biology space was adequate, while 57 percent of the space used for chemistry was rated inadequate according to the recommended standards.
### TABLE 21

**ALLOCATION OF SPACE FOR SPECIFIC CURRICULAR PROGRAMS IN SECONDARY PRIVATE SCHOOLS**

<table>
<thead>
<tr>
<th>Curricular Area</th>
<th>Included</th>
<th>Not Included</th>
<th>Adequate</th>
<th>Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art</td>
<td>56*</td>
<td>44*</td>
<td>46**</td>
<td>54**</td>
</tr>
<tr>
<td>Biology</td>
<td>78</td>
<td>22</td>
<td>63</td>
<td>37</td>
</tr>
<tr>
<td>Business Education</td>
<td>41</td>
<td>59</td>
<td>68</td>
<td>32</td>
</tr>
<tr>
<td>Chemistry</td>
<td>44</td>
<td>56</td>
<td>43</td>
<td>57</td>
</tr>
<tr>
<td>Home Economics</td>
<td>59</td>
<td>41</td>
<td>49</td>
<td>51</td>
</tr>
<tr>
<td>Industrial Arts</td>
<td>42</td>
<td>58</td>
<td>39</td>
<td>61</td>
</tr>
<tr>
<td>Music</td>
<td>67</td>
<td>33</td>
<td>42</td>
<td>58</td>
</tr>
</tbody>
</table>

*All numbers are presented in percentages.
**Percentage of schools which provide space that met recommended standards.

Of the schools studied, 41 percent made provision for business education, but only 68 percent were adequate according to recommended standards. While it was observed that 59 percent of the schools provided space for home economics, it was pointed out that only 49 percent provided adequate space. One of the problems found in this curricular area, as well as in others, was the lack of storage space.

Industrial arts facilities were included in 42 percent of the buildings, and 61 percent of these facilities were inadequate for the present enrollment. Vocal and instrumental music facilities were included...
in 67 percent of the school plants, and 58 percent were inadequate as compared to recommended standards. In many cases, no acoustical materials were used to prevent sound vibration and none of the schools provided additional practice rooms.
CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this investigation was to evaluate spatial allocation for curricular purposes and to analyze special innovative features of twenty-seven selected public and private secondary schools constructed during the decade from 1967 through 1976. This investigation was based upon opinions and factual material obtained from superintendents, principals, teachers, and architects, and by personal visitation.

The literature shows that the need for additional school facilities is a problem which becomes more crucial with increased enrollment. During the 1975-76 school year, public and private schools in Puerto Rico needed an additional one thousand classrooms to meet the increased enrollment. Educational administrators should take into consideration the implications for present and future school-plant needs. School plants should provide for flexibility in the structure and expansibility of spaces. The school plant should not only accommodate the current curricular programs but should also include those features.
necessary to adapt the plant to the greatest possible extent in the future.

The twenty-seven selected public and private schools in this study are scattered throughout the six geographical regions of Puerto Rico. These schools provide 1,214 classrooms and special areas with a designated capacity for 27,400 students. The survey reveals that folding walls were included in 83 percent of the public schools and 27 percent of the private schools, while classrooms with television receivers were included in at least 22 percent of the schools. These features provide interior flexibility and space expansibility for the curricular program. Opinions from at least 30 percent of the respondents indicated that additions to the present school plant could be made very easily. The adaptability of a building for interior and exterior change is necessary in these days of constant change in methods and techniques in the curriculum.

The selected schools included in this study provide such outstanding features as individual study carrels, language laboratories, provisions for educational television, ramps and inclines replacing steps, and so forth (see tables 11 and 20). The study reveals that language laboratories were included in 55 percent of the public schools while the same feature was included in 49 percent of the private schools. Seminar rooms for small-group instruction and controlled access of areas
for after school use were included in at least 49 percent of the public schools which contrasted with a high 75 percent of inclusion in the private schools. Specialized curricular programs, such as home economics, art, and so forth, were investigated to note whether or not they were included in the structures and if the allocation of space for these programs was adequate or inadequate as compared to recommended standards (see tables 12 and 21). These particular areas were selected because they require an area larger than the average classroom. An examination of the school plants showed that schools which did not have special facilities for art, music, business education, and so forth, did not offer elaborate courses in the subject area. Where science laboratories (biology and chemistry) were provided, a more sophisticated science curriculum was pursued. However, the absence of laboratories did not indicate that science was not a part of the curriculum.

The survey shows that biology and chemistry were included in 100 percent of the public schools while the same curricular programs were included in at least 44 percent of the private schools. Business education, home economics, and industrial arts were included in a high 73 percent of the public schools in contrast to a low 41 percent of inclusion in the private schools. The private school principals indicated that the high cost of equipment and lack of funds were factors that influenced
the noninclusion of the specific curricular programs.

Based upon the analysis of the data, the majority of the school plants were rectangular in shape and two stories in height. The majority of the buildings had related disciplines clustered, and a very small percentage included seminar space, pupil resource study space, and library materials unique to the discipline within the area. This arrangement was considered highly desirable by at least 59 percent of the respondents (see tables 8 and 17).

Classrooms were darkened easily for audio-visual instruction in at least 49 percent of the facilities, while folding-type walls were included in 83 percent of the buildings. However, no school had more than three classrooms with foldings walls.

Teachers' workrooms were considered to be a highly desirable feature and were provided in 30 percent of the public and 71 percent of the private school plants. A majority of the respondents indicated the need for additional storage space. The provision for a guidance office was considered highly desirable by at least 60 percent of the respondents.

**Conclusions**

The analysis of the selected public and private secondary school plants in Puerto Rico provides the solution for the basic problem posed at the beginning of this
study. A summary of this solution follows:

1. Were these schools being constructed in accordance with the desired curriculum?

It is evident that the selected public and private schools planned and constructed in Puerto Rico during the decade 1967-76 were planned with a specific curriculum in mind. General satisfaction with the school plant, as it related to the educational program was expressed by the school principals. The only common note of dissatisfaction expressed was that the lack of funds made it necessary for the provision of less adequate laboratory and library equipment than they would have liked. Some private school principals mentioned the confining aspects of the school plant which kept them from adopting innovations. Time might well create a need or a desire for a change in that program, but at the time the plant was designed and later constructed, it was created to serve a planned program.

2. Was the curriculum an outgrowth of the resulting structures?

None of the school plants in the study had been planned to house recent developments in team teaching or modular scheduling. In spite of this, team teaching was operating successfully in two public schools. At least three of the private schools had practiced modular scheduling. These schools had sufficient flexibility built into them so that innovations might be attempted.
A structure designed without adequate educational planning could be a hindrance rather than a benefit to the teachers and students. An important factor to be remembered in the construction of school plants is that the curriculum should give direction in planning for the present and the future.

3. Were the curriculum and the planning of the structures unrelated?

Each of the respondents indicated that discussions concerning course offerings and course content were held at the administrative level prior to the creation of the plans for the school plant. These discussions led to the formulation of educational specifications which were later presented to the architect for consideration in the school plans. The curriculum and the planning of the structures were related based on the state requirements set out by the Public Buildings Authority, and minimum standards and educational specifications required by the Department of Education for the Commonwealth of Puerto Rico.

The analysis of the selected schools in Puerto Rico also answers the questions that were raised at the beginning of this study.

1. What trends are discernible in public and private secondary school building practices in Puerto Rico?

The majority of the school plants represented in this study were two-story buildings with an open- or
enclosed-style floor plan. Classroom shapes were basically rectangular, though some more recently constructed buildings deviated from the traditional style by using circular or hexagonal designs.

The typical secondary school constructed during the decade of the study utilized exterior concrete blocks, concrete columns and beams, aluminum sash windows, ceramic tile restrooms, and electric or fluorescent lamps. Large corridors and big windows and doors were other characteristics.

By inspection of tables 7 and 16 it may be observed that 58 percent of the private and 22 percent of the public secondary facilities included in this study were designed for enrollments ranging from five hundred to one thousand, while 56 percent of the public and none of the private schools were designed for enrollments ranging from one thousand to fifteen hundred students. Appendix J gives descriptive data for each of the school plants.

2. Is adequate space allocated for present and future curricular programs?

Planning, as related to school plant construction, is done to make the school functional in terms of the educational program. As shown in tables 12 and 21 specific curricular programs were chosen for which space allocation was compared with recommended standards. These particular areas were selected because they require
an area larger than the average room. One hundred percent of the public schools included biology and chemistry, while in the private sector chemistry was included in only 44 percent and biology in 78 percent of the school plants. The other programs studied had at least a 78 percent inclusion in the public schools and 50 percent in the private school facilities. Some of the problems were inadequate space, lack of storage, and lack of equipment to accomplish such programs. It may be observed that school administrators need to give additional attention to these particular programs.

3. What are the special innovative features incorporated in the secondary schools constructed in the last decade?

As indicated in tables 8, 10, and 11 in chapter IV and tables 17, 19, and 20 in chapter V, there are features that are being incorporated in selected public and private secondary schools in Puerto Rico. Features which facilitate the curriculum are:

a. Teachers' workrooms
b. Provisions for educational television
c. Small and large instructional spaces
d. Language laboratories
e. Individual study carrels
f. Classrooms darkened easily
g. Related disciplines clustered
h. Classrooms with projector screens
121

1. Provisions for future expansion of the structure
j. Carpeting of special areas
k. Walls made of modular units
l. Ramps and inclines replacing steps

4. What recommendations were secured from principals and teachers for the construction of similar facilities in the future?

The responses of the school principals to the desirability of selected features in each structure are listed in tables 8 and 17. In addition each principal and teacher was asked what changes he or she would recommend if the school plant were redesigned. Some of the comments were:

Add more flexible walls and locate noisy classes away from the academic courses.

Not enough storage. Need better ways to expand.

Carpet the library to make facility less noisy—an aid to those who study there.

Eliminate external noise.

Air-condition the library instead of the office area.

Make use of folding walls or partitions between some of the rooms to allow for flexibility.

More flexibility needed.

Teachers' offices are necessary.

Better teachers' lounge and conference rooms.

I am dreaming but the best way is air-conditioning and carpeting throughout the school plant.

Redesign the music room. It is small and noisy. Disturbs other group activities. Home economics too.
Eliminate industrial arts courses from the program. Put it in the vocational school.

The major issue in the principals' and teachers' comments pertains to flexibility of the school plant and spaces provided for the educational program. A structure designed without adequate educational planning can be a hindrance rather than a benefit to teachers and students, who are the major users. The important factor to remember in the construction of a school plant is that it must house the curriculum for the present and for the future.

Recommendations

These general recommendations for secondary-school plants are based on information gathered during the process of collecting and analyzing the data for this dissertation.

1. Administrators should make every effort to be cognizant of the new developments in school planning and design and hire a capable architect to convert the educational needs into building programs. The administrator should encourage the school board to review architects and visit other schools before employing an architectural firm for a major construction program.

2. Administrators should consider the education consultant services as an aid to strengthening the understanding of educational needs, both present and projected.

3. Teachers and students should be involved in the early stages of the planning process in such a manner
that group interaction takes place with their ideas receiving serious consideration. The administrator should insist that the architect give serious consideration to the views of the school community as he translates the educational specifications into design.

4. Movable-type walls, such as folding walls and modular units should be encouraged in the construction of the interior of the school plant to add flexibility.

5. Teachers' offices within the teaching zones and workrooms in the school should be recognized as important features that generate a better instructional climate for students.

6. Considerable variation exists in construction, size, and cost of secondary-school plants in Puerto Rico. However, there is a lack of individuality in the design of these buildings. Specific architects appear to follow a set pattern in the design of their buildings. School-plant designers should remember that, in developing their pattern of design, the structure should be built in accordance with the desired curriculum.
APPENDIXES
APPENDIX A

Letter to the Secretary of Education
in Puerto Rico
25 de enero de 1976

Dr. Ramon A Cruz, Secretario
Departmento de Instruction Publica
Hato Rey, Puerto Rico 00919

Estimado Dr. Cruz:

Estoy en el proceso de preparacion de mi tesis doctoral en la cual estudio las caracteristicas fisicas y curriculares de las escuelas publicas y privadas construidas en Puerto Rico durante la década del 1967 al 1976.

Necesito de su amabilidad me envie un listado de las escuelas construidas en los anos antes mencionados. Ademas necesitare un directorio de escuelas publicas y privadas que actualmente operan en Puerto Rico.

Como detalle de importancia necesito su autorizacion para realizar dicho estudio en las escuelas secundarias de Puerto Rico que cualifiquen segun las delimitaciones del estudio.

Deseandole exito en su responsabilidades, quedo.

Cordialmente,

Manuel Velazquez, jr.
Garland Apts. D-16
Berrien Springs,
MI 49103
January 25, 1976

Dr. Ramon A. Cruz, Secretary
Department of Education
Hato Rey, Puerto Rico 00919

Dear Dr. Cruz:

I am in the process of preparing my doctoral dissertation, a study of the physical and curricular characteristics of the public and private schools constructed in Puerto Rico during the decade from 1967 to 1976.

Would you kindly send me a list of the schools constructed in the years mentioned above. In addition, I need a directory of public and private schools which are currently in operation.

It is very important that I receive your authorization to carry out my study of the secondary schools of Puerto Rico which qualify according to the delimitations of the study.

Wishing you success in your responsibilities,
I remain

Cordially yours,

Manuel Velazque, Jr.
Garland Apts. D-16
Berrien Springs, MI 49103
APPENDIX B

Letter Authorizing Study
Sr. Manuel Velázquez, Jr.
Garland Apts. D-16
Berrien Springs, Michigan 49103

Estimado señor Velázquez:

Recibimos su petición de autorización y el cuestionario para realizar una investigación en las escuelas secundarias de Puerto Rico.

El cuestionario se corrigió. Debe hacer las correcciones indicadas antes de administrarlo. Agradeceríamos que nos enviara copia del cuestionario ya revisado. Encontramos que el mismo está muy bien construido ya que es preciso y claro.

Adjunto encontrará las cartas de autorización y el cuestionario corregido copia del cual dejamos en nuestros archivos.

Esperamos que tenga éxito en sus estudios y que una vez concluido su trabajo nos envíe copia del mismo ya que resulta de interés para nuestro sistema educativo.

Cordialmente,

Yolanda Suárez
Directora
División de Estudios
Sobre Educación

Anejos

Nota: Le recomendamos añadir a su muestra la escuela Villas de Río Grande en la Región de Humacao.
January 31, 1977

Mr. Manuel Velazquez, Jr.
Garland Apts. D-16
Berrien Springs, MI 49103

Dear Mr. Velazquez:

We received your questionnaire and the request for authorization to make a study of the secondary schools of Puerto Rico.

The questionnaire is corrected. You should make the indicated corrections before administering it. We should appreciate your sending us a copy of the revised questionnaire. We find that it is well constructed and is precise and clear.

Enclosed you will find the letters of authorization and the corrected questionnaire, a copy of which we are placing in our files.

We wish you success in your doctoral studies and request that once you have finished your dissertation, you send us a copy of it. The results of your study will be of great interest to our educational system.

Cordially yours,

Yolanda Suarez
Director Division of Educational Studies

Enclosures:
P.S. We recommend that you add to your sample the Villas de Rio Grande School in the District of Humacao.
APPENDIX C

List of Superintendents
Sr. Manuel Velázquez, Jr.
Garland Apts. D-16
Berrien Springs, MI 49103

Estimado señor Velázquez:

De acuerdo con su carta del 9 de septiembre de 1976, se acompaña un listado de los nombres de los superintendentes de escuelas públicas de Puerto Rico al 19 de agosto de 1976 y un cuadro estadístico indicando el número de salones de clases existentes, el número de salones construidos por año con su costo.

Esperamos que esta información le pueda servir de utilidad para la preparación de su tesis doctoral.

Cordialmente,

Ascensión Rondón de Lorenzana
Secretaria Auxiliar

Anejo
SCHOOL SUPERINTENDENTS

The following is a list of the school superintendents included in the study.

<table>
<thead>
<tr>
<th>Name</th>
<th>School District</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manuel Ruiz Perez</td>
<td>Aguada</td>
</tr>
<tr>
<td>Elba Cabiya de Nazario</td>
<td>Bayamon Norte</td>
</tr>
<tr>
<td>Antonio Perez Melendez</td>
<td>Caguas</td>
</tr>
<tr>
<td>Clemente LLovet Martinez</td>
<td>Carolina</td>
</tr>
<tr>
<td>Primitivo Medina Coss</td>
<td>Cayey</td>
</tr>
<tr>
<td>Angel L. Arzon Martinez</td>
<td>Ceiba</td>
</tr>
<tr>
<td>Julio A. Rivera Martinez</td>
<td>Coamo</td>
</tr>
<tr>
<td>Luis R. Alvarado</td>
<td>Guayama</td>
</tr>
<tr>
<td>Hilda M. Lopez de Ramirez</td>
<td>Las Piedras</td>
</tr>
<tr>
<td>Ediberto Rodriguez Battistini</td>
<td>Mayaguez</td>
</tr>
<tr>
<td>Juan A. Otero Colon</td>
<td>Morovis</td>
</tr>
<tr>
<td>Ruben Lugo Santana</td>
<td>Rio Grande</td>
</tr>
<tr>
<td>Anabel Flores</td>
<td>Rio Piedras A</td>
</tr>
<tr>
<td>Guillermina Zalduondo</td>
<td>Rio Piedras C</td>
</tr>
<tr>
<td>Angel P. Toledo Nazario</td>
<td>Sabana Grande</td>
</tr>
<tr>
<td>Gloria E. Aponte Adorno</td>
<td>San Lorenzo</td>
</tr>
<tr>
<td>Rafael Rosas Couret</td>
<td>Yauco</td>
</tr>
</tbody>
</table>
APPENDIX D

Sample of Letter to Superintendents from
Auxiliary Secretary of Education
MEMORANDO

A: Superintendentes de Escuelas de los distritos escolares de Bayamón Norte, Carolina, Río Piedras A y Río Piedras C

De: Francisco R. Girona
Secretario Auxiliar

Asunto: Autorización para hacer un estudio sobre las facilidades físicas de las escuelas secundarias de esos distritos escolares.

El señor Manuel Velázquez, Jr., quien cursa estudios hacia el doctorado en planificación en la Universidad Andrews de Michigan, solicita se le autorice a administrar un cuestionario sobre las facilidades físicas en las escuelas Sierra Bayamón, Valle Arriba Heights, University Gardens y Río Piedras Heights.

Autorizamos al señor Velázquez a llevar a cabo la administración del cuestionario dejando a su discreción el fijar la fecha de visita a dichas escuelas.
January 28, 1977

MEMORANDUM

To: Superintendents of Schools of the School Districts of Bayamon Norte, Carolina, Rio Piedras A, and Rio Piedras C

From: Francisco R. Girona Auziliary Secretary

Subject: Authorization to make a study of the physical facilities of the secondary schools of the above school districts

Mr. Manuel Velazquez, Mr., who is working towards a doctorate in education at Andrews University in Michigan, is requesting authorization to administer a questionnaire concerning the physical facilities of the schools of Sierra Bayamon, Valle Arriba Heights, University Gardens and Rio Piedras Heights.

We hereby authorize Mr. Velazquez to administer the questionnaire, leaving to your discretion, however, the setting of the dates that he may visit the schools.
APPENDIX E

Letter to the School Principals
Estimado Principal:

Estoy en el proceso de preparación de mi tesis doctoral en la cual estudio las características curriculares y físicas de las escuelas secundarias públicas y privadas construidas en Puerto Rico en la última década (1967-76).

Su escuela ha sido seleccionada como parte de la muestra a ser estudiada por llenar los requisitos basados en los criterios de selección. A tal efecto le estoy enviando siete cuestionarios los cuales deben ser llenados por las siguientes personas:

a. maestro de ciencias
b. maestro de idiomas
c. maestro ciencias sociales
d. maestro economía doméstica
e. maestro artes industriales
f. maestro educación física
g. principal de la escuela.

Esto le tomará solo unos minutos de su tan ocupado tiempo, pero yo se lo agradeceré grandemente.

Esta información será confidencial y se asegura completo anonimato en el análisis final.

Tengo planeado visitar la isla de Puerto Rico, los días del 14 de Marzo al 20 de Abril, 1977, por tal razón confío verle y saludarle personalmente. Adjunto sobre predirigido para su mayor comodidad al devolver los cuestionarios.

Deseándole éxito en su trabajo quedo:

Cordialmente,

Manuel Velázquez, jr.
Garland Apts. D-16
Berrien Springs,
MI 49103

pd. adjunto cuestionarios
January 30, 1977

Dear Sir:

I am in the process of preparing my doctoral dissertation, a study of the curricular and physical characteristics of the public and private secondary schools constructed in Puerto Rico during the last decade (1967-1976).

Your school has been selected as part of the sample to be studied in order to fulfill the basic requirements in the criteria of selection. To this end, I am sending seven questionnaires to be filled out by the following persons:

- a. Science teacher
- b. Language teacher
- c. Social studies teacher
- d. Home Economics teacher
- e. Industrial Arts teacher
- f. Physical Education teacher
- g. School Principal

This will take only a few minutes of your very busy schedule, but I shall be very grateful for your help.

This information will be confidential and completely anonymous in the final analysis.

I plan to visit the Island of Puerto Rico during the time from the 14th of March to the 20th of April, 1977; at which time I hope to see you and salute you personally. For your convenience I am enclosing a self-addressed envelope in which to return the questionnaires.

Wishing you success in your work, I remain

Cordially yours,

Manuel Velazquez, Jr.
Garland Apts. D-16
Berrien Springs,
MI 49103

Enc: questionnaires
PANEL OF EXPERTS

The following is a list of the members of the panel of experts in this study.

Edgard Belen Trujillo, Director
Physical Planning Division
Department of Education
Hato Rey, Puerto Rico

Marta Barros Loubriel
Assistant Auxiliar Secretary
Educational Planning and Development Office
Department of Education
Hato Rey, Puerto Rico

Rosa Milan de Ortiz
Blanca Rosa Malaret High School
Dr. Tio st.
Sabana Grande, Puerto Rico

Adela Hernandez
Rossy Valley Secondary School
Ceiba, Puerto Rico

Wilfredo Perez Utrera
Colegio La Salle
Urb. Riverview
Bayamon, Puerto Rico

Moises Velazquez,
Academia Adv. del Oeste
Bo. Balboa
Mayaguez, Puerto Rico

Luis Rafael Arias
Box 5623, Estacion Viejo S.J.
San Juan, Puerto Rico

Hector Huyke
107 Domenech ave.
Rio Piedras, Puerto Rico

Hayde Mojica
Blanca Rosa Malaret High School
Sabana Grande, Puerto Rico
Rosa Andino  
Rossy Valley Secondary School  
Ceiba, Puerto Rico  

Pedro Rivera  
P.O. Box 1314  
Bayamon, Puerto Rico  

Brunilda Quinonez  
P.O. Box 1629  
Mayaguez, Puerto Rico
APPENDIX G

Letter to the Panel of Experts
18 de Enero 1976

Estimado Sr/Sra.

Como parte de mi tesis, he elaborado un instrumento que analiza las características curriculares y físicas de las escuelas secundarias públicas y privadas de Puerto Rico construidas en los últimos diez años (1967-76).

Usted ha sido seleccionado para ser miembro del panel de expertos que estudiará y evaluará el propuesto instrumento que encontrara adjunto.

Reconozco que usted es una persona muy ocupada, pero agradeceré tome algunos minutos de su tiempo para revisarlo y expresar su opinión al respecto.

Agradeceré sus comentarios ya que su experiencia y habilidad pueden redundar en beneficio del sistema de escuelas en Puerto Rico. Para su conveniencia he incluido un sobre pre-dirigido.

Deseándole éxito en sus responsabilidades, quedo

Cordialmente,

Manuel Velazquez, jr.
Garland Apts. D-16
Berrien Springs
MI 49103

pd. adjunto cuestionario
January 18, 1976

Dear Sir:

As part of my dissertation, I have devised an instrument which analyzes the curricular and physical characteristics of public and private secondary schools in Puerto Rico constructed in the last ten years (1967–1976).

You have been selected to be a member of the panel of experts which will study and evaluate the proposed instrument, a copy of which is enclosed.

I recognize that you are a very busy person, but I would appreciate very much your taking a few minutes of your time to look it over and express your opinion concerning it.

The school system of Puerto Rico can benefit from your experience and ability. I would, therefore, appreciate your comments concerning the questionnaire. For your convenience I have enclosed a self-addressed envelope.

Wishing you success in your work, I remain

Cordially yours,

Manuel Velazquez, Jr.
Garland Apts. D-16
Berrien Springs
MI 49103

Ps. enclosed questionnaire
APPENDIX H

Geographical Location of the Selected Secondary Public and Private Schools
REGIONAL DELIMITATION ESTABLISHED BY THE DEPARTMENT OF EDUCATION

*Geographical Location of the Selected Secondary Public and Private Schools
Map from Junta de Planificación Santurce, Puerto Rico, 1964.
APPENDIX I

List of Architects
LIST OF THE ARCHITECTS

Walter O'Neill, architect
P.O. Box 8867
Santurce, Puerto Rico

Padilla Pietrantoni
269 Ponce de Leon
Hato Rey, Puerto Rico

Efrer Morales, architect
107 Domenech
Hato Rey, Puerto Rico

Capacete, Martin & Cia.
Bayamon, Puerto Rico

Ruiz Burgos & asociados
P.O. Box 977
Hato Rey, Puerto Rico

Samuel Marra
90 Mayaguez
Hato Rey, Puerto Rico

Emilio Cividanes, architect
867 Munoz Rivera
Hato Rey, Puerto Rico

Francisco Agullo
Manati, Puerto Rico

Gelaberty & Navia
Phone 783-0848
Hato Rey, Puerto Rico

Hector Huyke & Olabarieta
107 Domenech
Hato Rey, Puerto Rico

Caban & Ruiz
Phone 765-6956
Rio Piedras, Puerto Rico

J. E. Amaral & Asocs.
Ponce de Leon
Hato Rey, Puerto Rico

Reed, Torres, Beuchamp & Marvel
8 Mejico
Hato Rey, Puerto Rico

Montilla & Latimer
1508 ave. Ponce de Leon
Santurce, Puerto Rico

Juan H. Vazquez
P.O. Box 1787
San Juan, Puerto Rico

Jorge del Rio
301 Sorbona, University Gds.
Rio Piedras, Puerto Rico

Nestor Acevedo Coll
P.O. Box 8755
Santurce, Puerto Rico

Raul Reichard
P.O. Box 1773
Hato Rey, Puerto Rico

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
APPENDIX J

Description of the School Plants
SCHOOL NUMBER ONE

GENERAL DATA:
Principal: Pedro Cesar Colon
Name of the School: Dr. Carlos Gonzalez High School
Location: Calle Colon, Aguada, P.R.
Grades: Ten to twelve
Enrollment: 1,359
Number of teachers: 34
Erected: 1975

FEATURES:
Dr. Carlos Gonzalez High School, a public school, serves the Aguada school district. The structure is of concrete columns and beams, with aluminum windows. It is located in a fair site out of the town. Some of the features of the school are:
1. Cafeteria with seating capacity for ninety.
2. Exterior corridors.
3. Softball park and basketball court.
5. Folding walls between classrooms.
6. Quinmester program.
7. Team-teaching in science and mathematics.
8. Advance courses in Spanish and mathematics.
9. Library with seating capacity for fifty.
10. Three-story building structure.
GENERAL DATA:

Principal: Therese Marie
Name of the School: Academia Maria Reina
Location: Avenue Glasgow, College Park, P.R.
Grades: First to twelve
Enrollment: 339
Number of teachers: 18
Erected: 1969

FEATURES:

Academia Maria Reina, a parochial school is accredited by the Department of Education in Puerto Rico, and by the Middle States Association of Colleges and Secondary Schools. The basic structure consists of concrete columns and beams, concrete blocks and aluminum windows. Some of the features are:

1. Library with a specialized librarian and seating capacity for sixty-five students.
2. Lockers for every student.
3. Exterior corridors.
4. Canteen for snacks.
5. Interior courts.
6. Twenty clubs for extra-curricular activities.
8. Three science laboratories according to recommended standards.
9. Teachers' offices and workrooms.
SCHOOL NUMBER THREE

GENERAL DATA:

Principal: Angel Dexter Beauchamp
Name of the School: Cacique Agueybana High School
Location: Calle 61, Sierra Bayamon, Bayamon Norte, P.R.
Grades: Ten to twelve
Enrollment: 758
Regular instructional areas: 25
Erected: 1974

FEATURES:

Cacique Agueybana High School is one of the secondary schools that serves the Bayamon Norte school district. The structure is of concrete with pre-fabricated beams. Exterior walls are concrete blocks with aluminum windows. It is an enclosed building with interior corridors. Some of the features of the school are:

1. Assembly room with seating capacity for one hundred eighty.
2. Library facilities.
3. Cafeteria with seating capacity for fifty.
4. Two-story building.
GENERAL DATA:

Principal: Wilfredo Perez de Utrera
Name of the School: Colegio de la Salle
Location: Urbanizacion Riverside, Bayamon, P.R.
Grades: Four to twelve
Enrollment: 550
Number of teachers: 18
Erected: 1968

FEATURES:

Colegio de la Salle, a parochial school, is accredited by the Department of Education in Puerto Rico. The two-story building is on an eight-acre campus, dotted with green areas. A gymnasium and parking lot complete the lay-out. Some of the features are:

1. Sixteen regular instructional areas.
2. Two science laboratories.
3. Audio-visual room.
4. Library with seating capacity for forty-five.
5. Canteen for snacks.
6. Assembly area with seating capacity for one hundred.
7. Exterior corridors and courts.
8. Chapel used for special programs.
9. Administrative offices air-conditioned.
SCHOOL NUMBER FIVE

GENERAL DATA:
Principal: Jose A. Mercado
Name of the School: Manuela Toro High School
Location: Calle Siete, Caguas Norte, Caguas, P.R.
Grades: Ten to twelve
Enrollment: 1,800
Instructional areas: 52
Erected: 1969

FEATURES:
Manuela Toro High School is one of the secondary schools of the Caguas school district. The structure is of concrete columns and beams. The plastered walls of the classrooms are painted. Some of the features are:
1. Exterior corridors.
2. Quinmester program.
3. Three-story building.
4. Exterior court.
5. Enclosed building with interior patio.
7. Science laboratories.
GENERAL DATA:
Principal: Jose A. Ramos
Name of the School: Valle Arriba Heights Secondary School
Location: Calle 46-B, Valle Arriba, P.R.
Grades: Seven to ten
Enrollment: 1,033
Instructional areas: 33
Erected: 1975

FEATURES:
Valle Arriba Heights Secondary Schools is a public school that serves the Carolina school district. The basic structure is composed of concrete columns and beams. Low ceiling and darkened, noisy corridors present a problem to teachers and students alike. The classroom walls are painted. Some of the features of the school are:

1. Interior corridors and classrooms at each side.
2. Poor lighting and low ceiling.
3. Library with seating capacity for seventy-five.
4. Administrative area beside the main entrance.
5. Structure is a two-story in height.
7. Cafeteria with seating capacity for eighty.
10. Folding partitions between rooms.
GENERAL DATA:

Principal: Sonia J. C. Guadalupe
Name of the School: Colegio Bautista de Carolina
Location: Avenue 65th Infantry, Carolina, P.R.
Grades: First to twelve
Enrollment: 2,188
Number of Teachers: 82
Erected: 1967

FEATURES:

Colegio Bautista de Carolina is a private school owned by the Baptist church. This school is an open-campus style. Some of the major buildings are concrete with the vocational and physical education areas constructed part in concrete and part in lumber and zinc. It is accredited by the Department of Education in Puerto Rico. Some of the features are:

1. Assembly area with seating capacity for six hundred.
2. Administrative offices are air-conditioned.
3. Cafeteria and snack canteen.
4. Teachers' offices.
5. Resource center.
7. Thirty-two buses serve the school by providing transportation.
9. Campus-plan construction interconnected by walkways.
SCHOOL NUMBER EIGHT

GENERAL DATA:

Principal: Gladys Velez Miranda
Name of the School: Villa Carolina V High School
Location: Villa Carolina, P.R.
Grades: Ten to twelve
Enrollment: 1,038
Number of teachers: 41
Erected: 1975

FEATURES:

Villa Carolina V High School is located in Carolina school district. It serves a suburban community. This public school was constructed in concrete columns and beams, while the exterior walls are concrete blocks. The windows are aluminum sash windows. The size of the property is limited by the location. Some of the features are:

1. Thirty-six instructional classrooms.
2. Library with seating capacity for sixty.
3. Art, music, and two home economics classrooms.
4. Assembly room with seating capacity for two hundred.
5. Partition walls in three rooms.
6. Quinmester program.
7. Structure is of two-story height.
8. Seven classrooms are constructed of lumber and zinc.
SCHOOL NUMBER NINE

GENERAL DATA:

Principal: Lydia Denizar Rivera
Name of the School: Miguel Munoz High School
Location: Carretera Vieja Caguas, Cayey, P.R.
Grades: Ten to twelve
Enrollment: 1,225
Instructional areas: 42
Erected: 1975

FEATURES:

Miguel Munoz High School is part of the Cayey school district. This newly constructed public high school is three stories in height and serves the town and suburban areas. The structure is concrete columns and beams. The site is fair with no trees or areas of passive activity. Some of the features are:

1. Partition walls in some of the rooms.
2. Library with seating capacity for eighty.
3. Quinmester program.
4. Eight science laboratories.
5. Cafeteria with seating capacity for two hundred.
6. Teachers' Lounge.
7. Advance programs for English, mathematics, Spanish, and humanities.
8. Exterior corridors and court.
9. Two physical-education classrooms.
GENERAL DATA:
Principal: Adela Hernandez
Name of the School: Rossy Valley Secondary School
Location: Urbanizacion Rossy Valley, Ceiba, P.R.
Grades: Eight to twelve
Enrollment: 912
Instructional areas: 20
Erected: 1975

FEATURES:

Rossy Valley Secondary School is part of the Ceiba school district on the east side of the island. This newly constructed public school is three stories in height. The structure is constructed of concrete columns and beams. Exterior walls are concrete blocks with aluminum windows. Interior classroom fixtures are open fluorescent and electric bulbs, walls are painted with vivid colors. Some of the features of the school are:

1. Library with seating capacity for one hundred.
2. Home economics, industrial arts, technology, radio and TV, carpentry, and construction classrooms.
3. Assembly room with seating capacity for two hundred.
4. Partition walls in three classrooms.
5. Cafeteria with seating capacity for ninety.
7. Interior patio and court.
SCHOOL NUMBER ELEVEN

GENERAL DATA:
Principal: Emiliano Guzman Berrios
Name of the School: Florencio Santiago High School
Location: Urbanización El Eden, Coamo, P.R.
Grades: Ten to twelve
Enrollment: 1,345
Instructional areas: 24
Erected: 1974

FEATURES:

Florencio Santiago High School is part of the Coamo school district. This public school was erected on a hillside so that part of the structure is two stories in height while the opposite side is three stories. It is constructed of concrete columns and beams. The exterior walls are concrete blocks with aluminum sash windows. The site is beautified with gardens and walkways that make a pleasant atmosphere for students. Some of the features of this school are:

1. Cafeteria with seating capacity for one hundred.
2. Four science laboratories.
3. Library with seating capacity for sixty.
5. Folding partitions in three classrooms.
7. Quinmester program.
8. Interior patio.
SCHOOL NUMBER TWELVE

GENERAL DATA:
Principal: Roberta Fair
Name of the School: Academia Wesleyana
Location: Km. 1.6, Camino Alejandrino, Guaynabo, P.R.
Grades: First to twelve
Enrollment: 470
Number of teachers: 24
Erected: 1967

FEATURES:

Academia Wesleyana is a private school owned by the Wesleyan Mission in Puerto Rico. The academy has; seventeen classrooms, an air-conditioned library and study hall, a place to buy books and supplies, and a refreshment window. The athletic facilities consist of an outdoor paved basketball court, with bleachers to accommodate approximately eight hundred. The seven-acre campus is dotted with playground equipment for the younger children. This equipment includes painted logs, huge concrete pipes, and tether ball poles. Some of the features are:

1. Air-conditioned library.
2. Exterior corridors.
3. Use of church for religious services and other activities.
4. Teachers' workroom.
5. Gymnasium for multiple uses.
6. Ramps and steps utilized for various accesses.
GENERAL DATA:

Principal: Emma Albino Gonzalez
Name of the School: Rafael Lopez Landron High School
Location: Urbanizacion Vives, Guayama, P.R.
Grades: Ten to twelve
Enrollment: 1,980
Instructional areas: 46
Erected: 1975

FEATURES:

The Rafael Lopez Landron Public High School was erected in a fair site. The basic structure is constructed of concrete columns and beams. The exterior walls are concrete blocks with aluminum windows. This school is an enclosed type campus with exterior corridors and patio, and is three stories in height. Some of the features of the school are:

1. Folding partitions in three classrooms.
2. Library with seating capacity for eighty.
4. Assembly room with folding walls and platform.
5. Cafeteria with seating capacity for one hundred.
6. Quinmester program.
7. Two physical education classrooms.
9. Vocational facilities for various programs.
GENERAL DATA:

Principal: Maria Soledad Burgueno
Name of the School: Colegio Lourdes
Location: Calle Mayaguez 87, Hato Rey, P.R.
Grades: First to twelve
Enrollment: 620
Instructional areas: 20
Number of teachers: 32
Erected: 1968

FEATURES:

Colegio Lourdes is a parochial school accredited by the Department of Education in Puerto Rico. The basic structure is concrete columns and beams. The exterior walls are of concrete blocks and glass windows. The building is painted in beautiful tones. Some of the features are:

1. Air-conditioned library.
2. Teachers' office.
3. Home economics, art, music, and physical education classrooms.
4. Cafeteria and snack canteen.
5. Science laboratories.
6. Air-conditioned administrative office.
7. Exterior corridors and court.
8. Use of the chapel as assembly room with seating capacity for three hundred fifty.
10. Ramps and steps utilized for various accesses.
GENERAL DATA:

Principal: Manuel Castro
Name of the School: Ramon Power & Girald High School
Location: Calle Jesus T. Pinero, Las Piedras, P.R.
Grades: Ten to twelve
Enrollment: 1,050
Instructional areas: 30

FEATURES:

Ramon Power & Girald High School is located near road Las Piedras to San Lorenzo in the eastern part of the island. The basic structure is constructed of concrete columns and beams, while the exterior walls are concrete blocks with aluminum windows. This two-story building is finger shape with exterior corridors. Some of the features are:

1. Exterior basketball and volleyball courts.
2. Folding walls in three classrooms.
3. Library with seating capacity for eighty students.
4. Industrial art, home economics, business education, and mechanical and construction drawing classrooms.
5. Assembly room with seating capacity for one hundred fifty students.
6. Cafeteria with seating capacity for seventy.
7. Science laboratories.
GENERAL DATA:

Principal: Antonio F. Agullo
Name of the School: Colegio Marista "El Salvador"
Location: Road number two, Km. 45.4, Manati, P.R.
Grades: First to twelve
Enrollment: 540
Number of teachers: 22
Erected: 1971

FEATURES:

Colegio Marista "El Salvador" is a parochial school accredited by the Department of Education in Puerto Rico. The basic building is constructed of concrete columns and beams, and exterior concrete blocks walls and aluminum windows. The chapel seats two hundred. Some of the features of the school are:

1. Language laboratory.
2. Science laboratories.
3. Amphitheater for general activities.
4. Workroom area for general activities.
5. Basketball and volleyball courts.
6. Counselor and chaplain offices.
7. Twelve instructional areas.
8. Cafeteria and small snack canteen.
9. Library with seating capacity for seventy.
10. Air-conditioned administrative office.
11. Ramps and inclines.
SCHOOL NUMBER SEVENTEEN

GENERAL DATA:

Principal: Elena Rodriguez Vega
Name of the School: Jose de Diego High School
Location: Bo. Sabalos, Mayaguez, P.R.
Grades: Ten to twelve
Enrollment: 1,016
Instructional areas: 39
Erected: 1974

FEATURES:

Jose de Diego High School is a suburban school that serves the south side of Mayaguez City. The basic structure is constructed in concrete columns and beams. The exterior walls are concrete and wooden doors and aluminum windows. The site is hilly and limited parking area. Some of the features are:

1. Six science laboratories.
2. Library with seating capacity for one hundred.
3. Assembly room.
4. Basketball and volleyball court with bleachers.
5. Two industrial art, two home economics, one business education, one commerce, and two physical education classrooms.
6. Cafeteria with seating capacity for two hundred.
7. Language laboratory.
8. Folding partitions in some rooms.
9. Two counselor offices.
10. Ramps and steps utilized for various accesses.
11. Seminar rooms.
SCHOOL NUMBER EIGHTEEN

GENERAL DATA:
Principal: Moises Velazquez
Name of the School: Academia Adventista del Oeste
Location: Bo. Balboa, Mayaguez, P.R.
Grades: Seven to nine
Enrollment: 160
Erected: 1969

FEATURES:

Academia Adventista del Oeste is a private school owned by the Seventh-day Adventists of Puerto Rico. This school is accredited by the Department of Education. The basic structure is of concrete and asbestos cement with aluminum roof. The exterior walls are concrete walls and aluminum windows. The school is a one-story building with the library in the corner in the second floor. Some of the features are:

1. Library with seating capacity for thirty-six.
2. Volleyball and basketball court.
3. Exterior corridors.
4. Air-conditioned administrative office.
5. Cafeteria with seating capacity for forty.
6. Traditional program.
GENERAL DATA:

Principal: Luis Marrero Padilla
Name of the School: Morovis Secondary School
Location: Morovis, Puerto Rico
Grades: Seven to twelve
Enrollment: 1,077
Erected: 1974

FEATURES:

Morovis Secondary School is the only school that serves grades seven to twelve in the Morovis school district. This public school is an open-campus style with corridors connecting each building. The structures are of concrete columns and beams with exterior walls of concrete blocks and aluminum windows. The structure is two stories in height. Some of the features are:

2. Language laboratory.
3. Folding partitions in some rooms.
4. Assembly room with seating capacity for two hundred.
5. Forty-three regular instructional areas.
7. Ramps and steps utilized for various accesses.
8. Cafeteria with seating capacity for one hundred ten.
10. Vocational facilities for various programs.
11. Campus plan construction interconnected by covered walkways.
12. Quinmester program.
GENERAL DATA:

Principal: Micaela Hurtado
Name of the School: Colegio Ntra. Senora de la Providencia
Location: Monacillos, Rio Piedras, P.R.
Grades: First to twelve
Enrollment: 867
Number of teachers: 36
Erected: 1968

FEATURES:

Colegio Ntra. Senora de la Providencia Secondary School is a parochial school accredited by the Department of Education in Puerto Rico. The basic construction is in concrete columns and beams with exterior walls of concrete block. This building is carefully painted, nice interior corridors and a big lobby. Some of the features are:

1. Auditorium with seating capacity for six hundred.
2. Twenty-nine instructional areas.
3. Air-conditioned administrative office.
5. Cafeteria and snack canteen.
6. Two science laboratories, art, music, mechano- graphy, and home economic classrooms.
7. Audio-visual room.
8. Folding partitions in some classrooms.
9. Teachers' offices.
10. Relocatable walls in some classrooms.
SCHOOL NUMBER TWENTY-ONE

GENERAL DATA:
Principal: Victor Poupart Santos
Name of the School: Pedro Falu High School
Location: Bda. Las Flores, Rio Grande, P.R.
Grades: Ten to twelve
Enrollment: 1,200
Instructional areas: 26
Erected: 1971

FEATURES:

Pedro Falu High School is part of the Rio Grande school district on the east side of the island. The basic structure is of concrete columns and beams. Other structures are of lumber and aluminum roof as provisional.

Some of the features of the school are:
1. Gymnasium and basketball court.
2. Exterior corridors with an interior patio.
3. Folding walls in some rooms.
4. Assembly room with partitions.
5. Air-conditioned administrative office.
7. Home economics, commerce, business education, and music classrooms.
8. Four science laboratories.
9. Quinmester program.
10. Language laboratory.
SCHOOL NUMBER TWENTY-TWO

GENERAL DATA:
Principal: Maria Davila
Name of the School: University Gardens High School
Location: Avenue Notre Dame, Rio Piedras A, P.R.
Grades: Ten to twelve
Enrollment: 816
Instructional areas: 21
Erected: 1975

FEATURES:
This public school structure is built of steel columns and beams. The exterior walls are concrete blocks while interior walls are movable with vinyl tile floors. Some of the features are:
1. Air-conditioned building.
2. Language laboratories.
3. Media center air-conditioned with seating capacity for ninety.
4. Small seminar rooms.
5. Commons room for multiple use.
6. Home economics and industrial arts classrooms.
7. The open classroom concept is used since there are no corridors.
8. Mezzanine as part of the library for independent study and discussion groups.
9. Team teaching.
10. Relocatable walls in the classrooms.
11. Provision for educational television.
12. Ramps and steps utilized for various accesses.
GENERAL DATA:

Principal: Wilfredo Vazquez Arce
Name of the School: Academia Adventista Metropolitana
Location: Julio Andino ave., Rio Piedras, P.R.
Grades: Seven to twelve
Enrollment: 509
Instructional areas: 15
Erected: 1967

FEATURES:

Academia Adventista Metropolitana Secondary School is constructed of concrete columns and beams with exterior concrete block walls. The school is located on ten acres of land. Some of the features are:

1. Air-conditioned library with seating capacity for seventy.
2. Gymnasium with seating capacity for fifteen hundred.
3. Exterior corridors.
4. Air-conditioned administrative office.
5. Exterior basketball and volleyball courts.
6. Cafeteria with seating capacity for one hundred twenty-five.
7. Two science laboratories.
8. Mechanographic, art and crafts classrooms.
10. Ramps and steps utilized for various accesses.
SCHOOL NUMBER TWENTY-FOUR

GENERAL DATA:

Principal: Paula Coreano Burgos
Name of the School: Rio Piedras Heights Secondary School
Location: Penasco Final, Rio Piedras Heights, P.R.
Grades: Seven to twelve
Enrollment: 1,668
Instructional areas: 38
Erected: 1975

FEATURES:

Rio Piedras Heights Secondary School is constructed of concrete columns and beams. This campus-type school has a vocational building, a three-story building for academic courses, and a two-story building for laboratories and cafeteria. Some of the features are:

1. Three industrial art and two home economics classrooms.
2. Cafeteria with seating capacity for one hundred.
3. Assembly room and school theater.
4. Folding walls in three classrooms.
5. Air-conditioned administrative office.
6. Vocational facilities for various programs.
7. Language laboratories.
8. Quimnester program.
10. Campus plan construction interconnected by covered walkways.
GENERAL DATA:

Principal: Rosa Milan Ortiz
Name of the School: Blanca Malaret High School
Grades: Ten to twelve
Enrollment: 836
Instructional areas: 31
Erected: 1975

FEATURES:

Blanca Malaret High School is constructed of concrete columns and beams. The enclosed campus type has exterior corridors. The structure is three stories in height. Some of the features of the school are:

1. Library with seating capacity for fifty.
2. Home economics, physical education, photography, electronic, music, theater, and business education courses.
3. Assembly room with seating capacity for one hundred fifty.
4. Folding walls in some rooms.
5. Cafeteria with seating capacity for eighty.
6. Interior corridors.
7. Language laboratory.
8. Administrative and counselor offices.
SCHOOL NUMBER TWENTY-SIX

GENERAL DATA:

Principal: Ana Consuelo Iglesias  
Name of the School: Jose Campeche High School  
Location: Calle Emilio Buitrago, San Lorenzo  
Grades: Ten to twelve  
Enrollment: 1,318  
Instructional areas: 26  
Erected: 1975

FEATURES:

Jose Campeche High School is a two-story building with exterior corridors and an interior patio. It has concrete columns and beams with concrete blocks in the exterior walls. Some of the features of the school are:

1. Separate vocational facilities for various programs.  
2. Twenty-six instructional areas.  
4. Assembly room with seating capacity for one hundred fifty.  
5. Three classrooms with folding walls.  
7. Library with seating capacity for fifty.  
8. Ramps and steps utilized for various accesses.
GENERAL DATA:

Principal: Elvin Cupril Serrano
Name of the School: Yauco High School
Location: Bo. Susua Baja, Yauco, P.R.
Grades: Ten to twelve
Enrollment: 1,830
Instructional areas: 48
Erected: 1974

FEATURES:

Yauco High School is constructed of concrete columns, beams, and concrete block exterior walls. It is a three-story building with exterior corridors and an interior patio. Some of the features are:

1. Library with seating capacity for seventy-five.
2. Science laboratories.
3. Home economics classrooms.
4. Assembly room with seating capacity for one hundred fifty.
5. Administrative and counselor offices.
6. Cafeteria with seating capacity for ninety.
7. Folding walls in some rooms.
8. Ramps and steps utilized for various accesses.
9. Separate vocational facilities for various programs.
APPENDIX K

Instrument Used in Collecting Data
### CUESTIÓNARIO

Por favor, indique para cada uno de los ítems que aparecen a continuación cómo se caracteriza la escuela de acuerdo con su juicio, de 1 a 5 en la escala siguiente:

- **1** Inadecuado
- **2** Sobre promedio
- **3** Promedio
- **4** Sobre promedio
- **5** Superior

#### Datos Generales

<table>
<thead>
<tr>
<th>Número</th>
<th>Descripción</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>¿Cuál es la relación de los alumnos por espacio?</td>
</tr>
<tr>
<td>2</td>
<td>¿Cuántos profesores hay por grupo?</td>
</tr>
<tr>
<td>3</td>
<td>¿Cuántos aulas hay por nivel de estudio?</td>
</tr>
<tr>
<td>4</td>
<td>¿Cuántas aulas están equipadas con video?</td>
</tr>
<tr>
<td>5</td>
<td>¿Cuántas aulas están equipadas con computadoras?</td>
</tr>
<tr>
<td>6</td>
<td>¿Cuántas aulas están equipadas con laboratorios?</td>
</tr>
<tr>
<td>7</td>
<td>¿Cuántos aulas están equipadas con bibliotecas?</td>
</tr>
<tr>
<td>8</td>
<td>¿Cuántos aulas están equipadas con laboratorios de ciencias?</td>
</tr>
<tr>
<td>9</td>
<td>¿Cuántos aulas están equipadas con laboratorios de humanidades?</td>
</tr>
<tr>
<td>10</td>
<td>¿Cuántos aulas están equipadas con laboratorios de ciencias y humanidades?</td>
</tr>
<tr>
<td>11</td>
<td>¿Cuántos aulas están equipadas con laboratorios de artes?</td>
</tr>
<tr>
<td>12</td>
<td>¿Cuántos aulas están equipadas con laboratorios de deportes?</td>
</tr>
<tr>
<td>13</td>
<td>¿Cuántos aulas están equipadas con laboratorios de tecnología?</td>
</tr>
<tr>
<td>14</td>
<td>¿Cuántos aulas están equipadas con laboratorios de musicales?</td>
</tr>
<tr>
<td>15</td>
<td>¿Cuántos aulas están equipadas con laboratorios de musicales y deportes?</td>
</tr>
</tbody>
</table>

#### Direcciones

Por favor, indique con una marca de círculo (Ο) cuál de las siguientes medidas se ha hecho en la escuela bajo indicación para que se mantenga la calidad de la escuela:

- **1** Mejorar la biblioteca en los campos de estudio de ciencias y humanidades.
- **2** Mejorar la biblioteca en los campos de estudio de ciencias y humanidades.
- **3** Mejorar la biblioteca en los campos de estudio de ciencias y humanidades.
- **4** Mejorar la biblioteca en los campos de estudio de ciencias y humanidades.
- **5** Mejorar la biblioteca en los campos de estudio de ciencias y humanidades.

#### Indicaciones

Indique brevemente las características sobresalientes de su escuela en el diseño interior.
Haga una breve descripción de las actividades realizadas en sus clases durante el día escolar _____________

COMENTARIOS ADICIONALES
Haga una breve descripción de _____________

INDIQUE LOS CAMBIOS CURRICULARES QUE EXISTEN EN SU ESCUELA ( ) Y/O CLASES (Diferentes al concepto tradicional)

1.
2.
3.
4.
5.
6.
7.

MUCHAS GRACIAS COMPAÑERO, POR HABER TENIDO LA AMABILIDAD DE CONTESTAR ESTE CUESTIONARIO.
QUESTIONNAIRE

I

DIRECTIONS: Please indicate for each of the following items: First—is it or not a characteristic of your school. Second—indicate your judgement of its desirability (even though it may be a part of your new school).

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>*(1)</td>
<td>*(2)</td>
</tr>
<tr>
<td>1. Building air-conditioned.</td>
<td>___</td>
</tr>
<tr>
<td>2. Related disciplines clustered in areas.</td>
<td>___</td>
</tr>
<tr>
<td>3. Language laboratories.</td>
<td>___</td>
</tr>
<tr>
<td>4. Rooms darken easily for audio-visual.</td>
<td>___</td>
</tr>
<tr>
<td>5. Cafeteria/Gymnasium combination.</td>
<td>___</td>
</tr>
<tr>
<td>6. Cafeteria/auditorium combination.</td>
<td>___</td>
</tr>
<tr>
<td>7. Folding type gymnasium bleachers.</td>
<td>___</td>
</tr>
<tr>
<td>8. Multi-use of the auditorium.</td>
<td></td>
</tr>
<tr>
<td>9. Facilities for evening school and community use isolated but easily accessible.</td>
<td>___</td>
</tr>
<tr>
<td>10. Large group instructional spaces (50 or more students).</td>
<td>___</td>
</tr>
<tr>
<td>11. Seminar instructional spaces.</td>
<td>___</td>
</tr>
<tr>
<td>12. Individual study carrels.</td>
<td>___</td>
</tr>
<tr>
<td>13. Ramps and inclines for handicapped.</td>
<td>___</td>
</tr>
<tr>
<td>14. Teacher workrooms (accessible, efficient).</td>
<td>___</td>
</tr>
<tr>
<td>15. Guidance area.</td>
<td>___</td>
</tr>
</tbody>
</table>

* KEY *(1)*—highly desirable, *(2)*—desirable, *(3)*—not desirable

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
II

DIRECTIONS: Please indicate with a check mark ( ) on the scale below the extent to which you feel each of the following items are provided for in your new school.

* (1) (2) (3) (4) (5)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Arrangements of departments and facilities within the building.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Adequate allocation of space among departments and activities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Adequacy of general storage facilities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Adaptability to teaching methods.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Adaptability to changes in the curriculum.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Library use by students and teachers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Flexible school program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. State briefly the outstanding feature or features of your school interior design.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

25. If you were to redesign the building, what interior changes would you recommend?   

* KEY (1)—inadequate, (2)—below average, (3)—average, 
(4)—above average, (5)—superior

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
### DIRECTIONS

Please indicate with a check mark (✓) on the scale below the following: First—is it or not included in your school. Second—is it included, percentage of inclusion.

<table>
<thead>
<tr>
<th>*(1) (2) Percentage of Inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I</strong></td>
</tr>
</tbody>
</table>

26. Folding walls that divide spaces.  
27. Walls that are made of modular units.  
28. Chalk and bulletin boards of the modular units.  
29. Carpeting—office.  
   - library  
   - classrooms  
30. Classrooms with large window areas.  
31. Classrooms with no windows.  
32. Classrooms with TV receivers.  
33. Classrooms with screen projectors.  
34. Classrooms that can be easily changed from large to small and vice versa size.  
35. Audio-visual aids and equipment accessible to teachers.  
36. Teachers' office.

**KEY:** *(1)—included, (2)—not included

**I=0-25%, II=26-50%, III=51-75%, IV=76-100%.
GIVE A BRIEF DESCRIPTION OF ACTIVITIES CARRIED ON IN YOUR CLASSES DURING THE SCHOOL DAY_______________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

______________________________________________________________________________

INDICATE THE CURRICULAR CHANGES THAT HAVE BEEN MADE IN YOUR SCHOOL ( ), AND/OR CLASSES ( ).

1. ____________________________________________________________________________

2. ____________________________________________________________________________

3. ____________________________________________________________________________

4. ____________________________________________________________________________

5. ____________________________________________________________________________

6. ____________________________________________________________________________

7. ____________________________________________________________________________

8. ____________________________________________________________________________

9. ____________________________________________________________________________

ADDITIONAL COMMENTS

Give a brief description of the school

Thank you very much for taking time to answer this questionnaire
Sr. Manuel Velázquez, Jr.
Garland Apts. D-16
Berrien Springs, Michigan 49103

Estimado señor Velázquez:

Lo felicitamos por haber realizado una labor tan exhaustiva para su disertación sobre las características curriculares y físicas de las escuelas superiores de Puerto Rico. Los hallazgos de su estudio ayudarán grandemente al enfoque educativo que debe dársese a nuestras escuelas.

Le deseamos mucho éxito y le exhortamos para que siga contribuyendo en el mejoramiento de la educación en Puerto Rico.

Cordialmente,

Marta Barros-Loubriel
Ayudante Secretario Auxiliar
Planificación y Desarrollo Educativo
April 4, 1977

Mr. Manuel Velequez, Mr.
Garland Apts. D-16
Berrien Springs, Michigan 49103

Dear Mr. Velazquez:

We wish to congratulate you for the extensive work which you have done for your dissertation on the curricular and physical characteristics of the secondary schools of Puerto Rico. The findings of your study will help us greatly in the educational focus that should be given to our schools.

We wish you much success and encourage you to continue contributing to the improvement of education in Puerto Rico.

Cordially yours,

Marta Barros-Loubriel
Assistant Auxiliar
Secretary Educative
Plannification and Development
BIBLIOGRAPHY


American Association of School Administrators (AASA). 


Bloom, Arnold M. "Good Schools are no Accident." The American School and University 38 (October 1965): 9.


________. "One of the Best New High School Building This Decade Has Produced." *The American School Journal* 162 (February 1975): 32-34.


Hayward, Beresfold L. Toward Comprehensive Educational Planning in Puerto Rico. (Report #1 to the Secretary of Education), San Juan, Puerto Rico: Editorial del Departamento de Instruccion Publica, 1958.


Hill, Frederick W. "Good Facilities are a Good Investment." The American School and University 46 (September 1972): 19.


Name: Manuel Velazquez, Jr.

Date and Place of Birth: July 30, 1938, Sabana Grande, Puerto Rico

Education:

Munoz Rivera High School, Sabana Grande, P.R.
1956 High School Diploma

College of Agriculture and Mechanical Arts, Mayaguez, P.R.
1962 Science Program (Mathematics)

University of Puerto Rico, Rio Piedras, P.R.
1972 Bachelor of Arts (Education)

University of Puerto Rico, Rio Piedras, P.R.
1974 Master of Education (Administration & Supervision)

Andrews University, Berrien Springs, Michigan
1977 Doctor of Education (Educational Administration)

Professional Experience:

1962-66 Instructor and Physical Facilities director, Antillian College, Mayaguez, P.R.

1966-68 Associate pastor, Puerto Rico Conference of S.D.A.

1968-73 Youth Affairs director and Physical Facilities Services director, Puerto Rico Conference of S.D.A., San Juan, P.R.

1973-74 Voice of Prophecy director and teacher, East Puerto Rico Conference of S.D.A. and Metropolitan Academy, San Juan, P.R.

1974-75 School Principal, Rio Piedras S.D.A. School, Rio Piedras, P.R.

1975 (summer) Visiting Instructor, Northeastern Illinois University, Chicago: pastor Aurora Spanish Church, Aurora Illinois
Professional Associations:

Phi Delta Kappa
Council Educational Facility Planners