

CHAPTER IV

RESULTS

The purpose of this study was to explore public-school-owned and operated planetaria across the United States. Only non-portable planetaria were included. A survey was developed and mailed to 210 public school planetarium directors. During the ten-week period of data collection ending May 31, 1999, 131 surveys (62%) were returned and analyzed.

Descriptive Data for the Five Domains in the Survey

Descriptive data are presented in the following five domains:

- (a) The job (duties, tasks, and skills) of public school planetarium directors.
- (b) The curriculum taught (grades 1- 6) in public-school-owned planetaria.
- (c) The placement of planetaria and directors within the organizational structure of school systems.
- (d) The location, equipment, and physical size of the planetarium facility.
- (e) The director's experience and academic background.

The Job of the Planetarium Director

The job of the planetarium director was covered by questions 2 - 13 (see Appendix B). The director's job can be divided into three major components:

preparing for and teaching planetarium programs, administration of the planetarium, and other assigned duties.

Components of the Job

Preparing and teaching planetarium programs. Over three-fourths of directors write curriculum and personally schedule student visits to the planetarium. The number of lessons being taught per day in the planetarium ranged from 0 to 6 with an average attendance of 35 students per lesson. One director reported no daily classes and stated the planetarium was used only ten times per month (see Table 9).

Planetarium duties. The amount of time directors spend on planetarium duties varies from zero percent (only volunteer time) to 100 percent. Half of the directors reported spending at least 40 percent of their time on planetarium duties. Eleven directors reported spending 100 percent of their time involved in planetarium duties.

Administration of the planetarium. Generally speaking, directors spend little time on administrative duties involving the planetarium. Over 71 percent of directors reported spending less than 50 percent of their day on administrative duties. No directors reported spending 100 percent of their time on administrative

Table 9

Duties of Planetarium Directors in Public-School-Owned Planetaria in the United States, N=131

| | <u>n</u> | <u>Mdn</u> | <u>M</u> | <u>SD</u> | <u>Min</u> | <u>Max</u> | <u>No</u> | | <u>Yes</u> | | <u>No response</u> | |
|---|----------|------------|----------|-----------|------------|------------|-----------|----------------------|------------|----------------------|----------------------|----------|
| | | | | | | | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> | <u>n^a</u> | <u>%</u> |
| Teaching and administrative duties | | | | | | | | | | | | |
| Personally write curriculum | 108 | | | | | | 7 | 5.3 | 101 | 77.1 | 23 | 17.6 |
| Personally schedule programs | 107 | | | | | | 8 | 6.1 | 99 | 75.6 | 24 | 18.3 |
| Percentage of day on general duties involving the planetarium | 104 | 40.00 | 46.22 | 31.91 | 0 | 100 | | | | | 27 | 20.6 |
| Percentage of day on planetarium administrative duties | 96 | 8.00 | 12.33 | 14.19 | 0 | 80 | | | | | 35 | 26.7 |
| Number of lessons per day | 102 | 2.00 | 2.33 | 1.47 | 0 | 6.0 | | | | | 29 | 22.1 |
| Number of students per lesson | 106 | 30.00 | 34.79 | 12.37 | 12 | 80 | | | | | 25 | 19.1 |
| Number of staff you supervise | 104 | 0.00 | 0.68 | 2.20 | 0 | 17 | | | | | | |
| Number of months open | 105 | 10.00 | 9.56 | 1.30 | 1 | 12 | | | | | | |

^a Percentage of total respondents (N = 131).

duties. Over 62 percent of the directors reported that they do not supervise other personnel, and 12 reported they supervised one person.

Other assigned duties. Directors are assigned duties outside the planetarium environment. Twenty-four duties were identified with the most frequently reported duty being that of “teaching” other subjects in a traditional classroom. A small percentage of directors (10.7 %) reported no duties beyond the job of planetarium director (see Table 10).

Job Tasks

Directors were asked questions about 14 job tasks. The greatest number of directors perform the job task of “ writing school programs.” Other frequently performed tasks were “maintenance on the star-projector,” “teaching in a classroom,” “working on the planetarium budget,” and “taking photographs used in planetarium instruction.” The job tasks of “ hiring staff” and “producing video tapes” were reported the lowest number of times (see Table 11). The task on which directors spend the most time is that of “teaching in a classroom” (see Table 12).

Skills Needed to Do the Job

Communication and creative skills are considered so important that directors could not perform their jobs without them. The six skills listed in order

Table 10

Other Assigned Job Duties of Planetarium Directors of Public-School-Owned

Planetaria in the United States, N=131

| Other assigned job duties | n | % ^a | No | | Yes | | No response | |
|---------------------------|-----|----------------|----|----------------|-----|----------------|-------------|----------------|
| | | | n | % ^a | n | % ^a | n | % ^a |
| Other assigned job duties | 104 | 79.4 | 14 | 10.7 | 90 | 68.7 | 27 | 20.6 |
| List of other duties | | | | | | | | |
| Classroom teacher | 74 | 56.5 | | | | | | |
| Hall Duty | 6 | 4.6 | | | | | | |
| Science department chair | 5 | 3.8 | | | | | | |
| Bus duty | 2 | 1.5 | | | | | | |
| Lunch duty | 2 | 1.9 | | | | | | |
| Building administrator | 1 | 0.8 | | | | | | |
| Special projects | 1 | 0.8 | | | | | | |
| Physical education | 1 | 0.8 | | | | | | |
| Media director | 1 | 0.8 | | | | | | |
| Fund raiser | 1 | 0.8 | | | | | | |
| Committee chair | 1 | 0.8 | | | | | | |
| Coordinator of technology | 1 | 0.8 | | | | | | |
| Auditorium monitor | 1 | 0.8 | | | | | | |

(table continues)

Table 10 (continued)

Other Assigned Job Duties of Planetarium Directors of Public-School-Owned

Planetaria in the United States, N=131

| Other assigned job duties | <u>n</u> | <u>%^a</u> | <u>No</u> | | <u>Yes</u> | | <u>No response</u> | |
|----------------------------|----------|----------------------|-----------|----------------------|------------|----------------------|--------------------|----------------------|
| | | | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> |
| Suspension monitor | 1 | 0.8 | | | | | | |
| Bathroom duty | 1 | 0.6 | | | | | | |
| Library duty | 1 | 0.6 | | | | | | |
| Ski club | 1 | 0.6 | | | | | | |
| Student tutoring | 1 | 0.6 | | | | | | |
| Satellite data application | 1 | 0.6 | | | | | | |
| Greenhouse | 1 | 0.6 | | | | | | |
| Girls golf coach | 1 | 0.6 | | | | | | |
| Electronics curriculum | 1 | 0.6 | | | | | | |
| Observatory | 1 | 0.6 | | | | | | |
| Activity chair | 1 | 0.6 | | | | | | |

^a Percentage of total respondents (N = 131).

Table 11

Job Tasks that Directors of Public-School-Owned Planetaria in the United StatesPerform, N =131

| Task | n | % ^a |
|---------------------------------------|----|----------------|
| Write school programs | 90 | 68.7 |
| Perform maintenance on star-projector | 85 | 64.9 |
| Teach in a classroom | 81 | 61.8 |
| Prepare budget | 74 | 56.5 |
| Take photographs (slides or prints) | 68 | 51.9 |
| Write public programs | 60 | 45.8 |
| Produce public programs | 57 | 43.5 |
| Conduct workshops for teachers | 53 | 40.5 |
| Prepare media releases | 51 | 38.9 |
| Build special-effects projectors | 42 | 32.1 |
| Produce artwork | 38 | 29.0 |
| Program computers | 36 | 27.5 |
| Produce video tapes | 30 | 22.9 |
| Hire staff | 11 | 8.4 |

^a Percentage of total respondents (N = 131).

Table 12

Job Tasks on Which Directors of Public-School-Owned Planetaria in the United States Spend the Most Time, N = 131

| Task | <u>n</u> | <u>%^a</u> |
|---------------------------------------|------------|----------------------|
| Teach in a classroom | 67 | 51.1 |
| Write school programs | 15 | 11.5 |
| Produce public programs | 6 | 4.6 |
| Perform maintenance on star-projector | 3 | 2.3 |
| Program computers | 2 | 1.5 |
| Prepare budget | 2 | 1.5 |
| Conduct workshops for teachers | 1 | 1.5 |
| Take photographs (slides or prints) | 0 | 0.0 |
| Produce video tapes | 0 | 0.0 |
| Produce artwork | 0 | 0.0 |
| Prepare media releases | 0 | 0.0 |
| Hire staff | 0 | 0.0 |
| Build special-effects projectors | 0 | 0.0 |
| Write public programs | 0 | 0.0 |
| No response | 35 | 26.7 |
| Total | <u>131</u> | <u>100.0</u> |

^a Percentage of total respondents (N = 131).

of their importance to the directors are: (1) communication, (2) creativity, (3) mechanical, (4) writing, (5) electrical, and (6) artistic (see Table 13).

Communication and creative skills were reported by the directors as the two skills on which directors spend the most time. No time was reported for the “artistic” skill (see Table 14).

Planetarium Use and Curriculum

The planetarium use and curriculum in school-owned planetaria were covered by questions 14 - 30 in the survey (see Appendix C).

Planetarium Use

Grade level use. Directors present planetarium lessons to grades K - 12. The upper elementary (grades 3, 4, 5, and 6) were the most frequently reported grades using the planetarium. The lower elementary (grades K, 1, 2, and 3) were the second most frequently reported grades using these facilities. The lowest grade usage was for the upper grade levels (grades 7, 8, 9, and 10) with grade 7 being reported less frequently than any other grade level. A slight increase in usage over grades 7 - 10 is noted and in grades 11 and 12 (see Table 15).

Number of visits per year. The number of visits per year for each grade level was not clear from the data received. There was some confusion in the interpretation of the survey question by many of the respondents. Some directors

Table 13

Job Skills Directors of Public-School-Owned Planetaria in the United StatesConsider Most Important, N =131

| Job skills | Times selected | % ^a |
|------------------|----------------|----------------|
| Communication | 85 | 32.4 |
| Creative | 67 | 25.6 |
| Mechanical | 32 | 12.2 |
| Writing | 13 | 5.0 |
| Electrical | 11 | 4.2 |
| Artistic | 1 | 0.3 |
| No response | 53 | 20.2 |
| Total selections | 262 | 100.0 |

Note. Directors were asked to pick two job skills they considered important. There is no order to these skills; they are just the top two.

^a Percentage of times selected equals n (131) times two because each respondent selected two skills (total selections = 262).

Table 14

The Single Job Skill on Which Directors of Public-School-Owned Planetaria in the United States Spend the Most Time, N = 131

| Skill | n | % ^a |
|---------------|-----|----------------|
| Communication | 59 | 40.5 |
| Creative | 23 | 17.6 |
| Mechanical | 8 | 6.1 |
| Writing | 4 | 3.1 |
| Electrical | 3 | 2.3 |
| Artistic | 0 | 0.0 |
| No response | 34 | 26.0 |
| Totals | 131 | 100.0 |

^a Percentage of total respondents (N = 131).

Table 15

Grade Levels that Use Public-School-Owned Planetaria in the United States, N =131

| Grade level | <u>n</u> | <u>%</u> ^a |
|-------------|----------|-----------------------|
| K | 69 | 65.1 |
| 1 | 69 | 65.1 |
| 2 | 67 | 63.2 |
| 3 | 78 | 73.6 |
| 4 | 76 | 71.7 |
| 5 | 80 | 75.5 |
| 6 | 71 | 67.0 |
| 7 | 51 | 48.1 |
| 8 | 61 | 58.1 |
| 9 | 59 | 55.7 |
| 10 | 60 | 56.6 |
| 11 | 68 | 64.2 |
| 12 | 72 | 67.0 |

^a Percentage of total respondents (N = 131).

reported the total number of visits per year for a given grade level. In other cases directors reported the number of times a particular classroom visited the planetarium. Cases where directors reported exceptionally low or exceptionally high numbers of visits indicated error in the understanding of the survey question. It would be difficult for any classroom to visit the planetarium 300 times per year (see Table 16).

Curriculum Topics

Directors were asked to report the main topic taught for grade levels one through six. Twenty-five topics were reported. Topics varied across grade levels. Topic complexity increased with grade level. The simpler topics such as “Day and Night” and “Introduction to the Sky” were taught in grade one, while more complex topics such as “Stellar Evolution” and “The Universe” only appear in grades five and six. Six topics were taught at all grade levels. They were “Solar System,” “Constellation ID,” “Basic Astronomy,” “Celestial Motion,” “Introduction to the Sky,” and “Teacher’s Choice.” The topics “Solar System” and “Constellation ID” were taught most frequently at all grade levels. The least frequently taught topics were “Scales of Space,” “Tides,” “Fun Introduction,” “Aliens,” and “Distance” (see Table 17).

Table 16

Number of Visits Per Year for Each Grade Level That Uses Public-School-Owned Planetaria in the United States, N = 131

| Grade level | <u>n</u> | <u>Mdn</u> | <u>M</u> | <u>SD</u> | <u>Min</u> | <u>Max</u> |
|-------------|----------|------------|----------|-----------|------------|------------|
| K | 59 | 5.0 | 14.05 | 15.92 | 1 | 55 |
| 1 | 59 | 5.0 | 14.05 | 15.92 | 1 | 55 |
| 2 | 60 | 5.0 | 14.65 | 23.40 | 1 | 150 |
| 3 | 72 | 8.0 | 17.21 | 22.73 | 1 | 110 |
| 4 | 67 | 5.0 | 22.07 | 37.42 | 1 | 160 |
| 5 | 72 | 6.0 | 20.86 | 31.34 | 1 | 160 |
| 6 | 62 | 4.5 | 14.34 | 24.01 | 1 | 160 |
| 7 | 40 | 4.0 | 9.53 | 12.99 | 1 | 61 |
| 8 | 52 | 5.0 | 14.81 | 21.61 | 1 | 120 |
| 9 | 50 | 5.0 | 21.86 | 50.61 | 1 | 300 |
| 10 | 48 | 10.0 | 35.21 | 59.36 | 1 | 200 |
| 11 | 55 | 15.0 | 44.85 | 70.16 | 1 | 300 |
| 12 | 57 | 15.0 | 42.54 | 63.33 | 1 | 200 |

Note. Data in this table may be in error due to directors reporting incorrect numbers. In some cases the total number of visits for all classrooms at a particular grade level was reported instead of the number of visits for one classroom per year.

Table 17
Main Topics Used in Grade Levels One Through Six in Public-School-Owned Planetaria in the United States, N = 131

| Topic | Grade level | | | | | | | | | | | |
|----------------------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
| | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> |
| Day and Night | 14 | 10.7 | 7 | 5.3 | 1 | 0.8 | 0 | 0.0 | 1 | 0.8 | 0 | 0.0 |
| Sun | 2 | 1.5 | 4 | 3.1 | 2 | 1.5 | 2 | 1.5 | 0 | 0.0 | 0 | 0.0 |
| Solar System | 5 | 3.8 | 10 | 7.6 | 29 | 22.1 | 20 | 15.3 | 12 | 9.2 | 6 | 4.6 |
| Constellation ID | 10 | 7.6 | 14 | 10.7 | 11 | 8.4 | 13 | 9.9 | 10 | 7.6 | 12 | 9.2 |
| Moon | 0 | 0 | 4 | 3.1 | 10 | 7.6 | 8 | 6.1 | 7 | 5.3 | 4 | 3.1 |
| Weather | 1 | 0.8 | 0 | 0.0 | 2 | 1.5 | 0 | 0.0 | 1 | 0.8 | 0 | 0.0 |
| Universe | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 6 | 4.6 | 7 | 5.3 |
| Earth in Space | 1 | 0.8 | 3 | 2.3 | 1 | 0.8 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Time | 0 | 0.0 | 1 | 0.8 | 0 | 0.0 | 0 | 0.0 | 1 | 0.8 | 0 | 0.0 |
| Basic Astronomy | 2 | 1.5 | 1 | 0.8 | 1 | 0.8 | 5 | 3.8 | 4 | 3.1 | 3 | 2.3 |
| Nature of Light | 0 | 0.0 | 2 | 1.5 | 0 | 0.0 | 0 | 0.0 | 5 | 3.8 | 4 | 3.1 |
| Celestial Motion | 2 | 1.5 | 4 | 3.1 | 4 | 3.1 | 1 | 0.8 | 2 | 1.5 | 5 | 3.8 |
| Space Travel | 0 | 0.0 | 1 | 0.8 | 0 | 0.0 | 1 | 0.8 | 2 | 1.5 | 2 | 1.5 |
| Scales of Space | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.8 |
| Star Stories | 0 | 0.0 | 1 | 0.8 | 1 | 0.8 | 7 | 5.3 | 1 | 0.8 | 2 | 1.5 |
| Celestial Navigation | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.8 | 1 | 0.8 |
| Tides | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.8 |
| Introduction to Sky | 22 | 16.8 | 7 | 5.3 | 2 | 1.5 | 1 | 0.8 | 1 | 0.8 | 1 | 0.8 |

(table continues)

Table 17 (Continued)

Grade Level Topics Used in Grades One Through Six in Public-School-Owned Planetaria in the United States, N = 131

| Topic | Grade level | | | | | | | | | | | |
|-------------------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
| | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> | <u>n</u> | <u>%</u> |
| Teacher's Choice | 3 | 2.3 | 4 | 3.1 | 3 | 2.3 | 4 | 3.1 | 4 | 3.1 | 6 | 4.6 |
| Seasons | 1 | 0.8 | 0 | 0.0 | 5 | 3.8 | 6 | 4.6 | 6 | 4.6 | 4 | 3.1 |
| Stellar Evolution | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 3 | 2.3 | 5 | 3.8 |
| Fun Introduction | 1 | 0.8 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Aliens | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Distance | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.8 | 1 | 0.8 |
| Earth Coordinates | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.8 | 1 | 0.8 | 1 | 0.8 |
| No response | 67 | 51.1 | 68 | 51.9 | 59 | 45.0 | 62 | 47.3 | 62 | 47.3 | 65 | 49.6 |
| | --- | ----- | --- | ----- | --- | ----- | --- | ----- | --- | ----- | --- | ----- |
| Total | 131 | 100.0 | 131 | 100.0 | 131 | 100.0 | 131 | 100.0 | 131 | 100.0 | 131 | 100.0 |

Note. Not all respondents reported topics for each grade level. Percentages are based on the total sample returned (N = 131).

The three most frequently reported topics for each grade in grades 1 - 3 were as follows: “Day and Night,” “Constellation ID,” and “Solar System” in grade 1, “Constellation ID,” “Solar System,” and a tie for third with “Day and Night” and “Introduction to the Sky” in grade 2; and “Solar System,” “Constellation ID,” and “The Moon” in grade 3. Curriculum topics covering the solar system and constellation identification dominated grades 2 - 6 (see Table 18).

Organization and Development of Curriculum and Instruction in Planetaria

The planetarium experience was considered an integral part of the science curriculum by the responding directors. About 50 percent of the directors reported that teachers are involved in the development of the curriculum. Lesson guides were more available for grades K - 6 than middle or secondary grades. Less than a third of the directors reported that the curriculum in their planetaria was based on state mandates. A large majority of the directors felt that their principals consider the planetarium experience to be valuable. About three-fourths of the directors reported that students are encouraged to participate during planetarium lessons (see Table 19).

Table 18

Main Curriculum Topics in Public-School-Owned Planetaria in the United States forGrades 1 - 6, N = 131

| Grade | Topic | <u>n</u> | <u>%</u> ^a |
|-------|-------------------------------|----------|-----------------------|
| 1 | Introduction to the Night Sky | 22 | 16.8 |
| 2 | Constellation Identification | 14 | 10.7 |
| 3 | Solar System | 29 | 22.1 |
| 4 | Solar System | 20 | 15.3 |
| 5 | Solar System | 12 | 9.2 |
| 6 | Constellation Identification | 12 | 9.2 |

^a Percentage of total respondents (N = 131).

Table 19

Director's Responses to Survey Questions About the Curriculum and Instruction in
Public-School-Owned Planetaria in the United States, N = 131

| Curriculum and instruction | No | | Yes | | No response | |
|--|----------|----------------------|----------|----------------------|-------------|----------------------|
| | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> |
| Curriculum | | | | | | |
| Planetarium experience part of science curriculum | 16 | 12.2 | 89 | 67.9 | 26 | 19.8 |
| Teachers involved in development of curriculum | 40 | 30.5 | 64 | 48.9 | 27 | 20.6 |
| Lessons are integrated into science curriculum | 10 | 7.6 | 95 | 72.5 | 26 | 19.8 |
| Planetarium curriculum based on state-mandate | 60 | 45.8 | 43 | 32.8 | 28 | 21.4 |
| Instruction | | | | | | |
| Lesson guide for elementary grades K - 6 | 44 | 33.6 | 60 | 45.8 | 27 | 20.6 |
| Lesson guide for middle and secondary grades 7 - 12 | 57 | 43.5 | 47 | 35.9 | 27 | 20.6 |
| Believe principals consider planetarium valuable | 20 | 15.3 | 81 | 61.8 | 30 | 22.9 |
| Students are encouraged to participate | 7 | 5.3 | 98 | 74.8 | 26 | 19.8 |

^a Percentage of total respondents (N = 131).

Opinions of Planetarium Directors About Instruction in Planetaria

Planetarium director's opinions on the teaching environment, the teaching purpose, and effective teaching strategies in planetaria are covered in questions 24 - 30 in the survey (see Appendix C). Planetarium directors were asked their level of disagreement or agreement on selected statements using a four-point Likert scale ranging from strongly disagree (1) to strongly agree (4). Overall, directors agreed the planetarium was an effective educational tool when used in connection with regular classroom instruction (see Table 20).

Teaching Environment of Planetaria

Directors strongly agreed the planetarium is a more effective place to teach astronomy than a traditional classroom. Although there is a wide variance in the degree of sophistication of planetarium equipment, ranging from simple slide projectors to computer controlled automation, the directors believed teaching in a planetarium is no more difficult than teaching in a traditional classroom.

Teaching Purpose of Planetaria

Directors agreed the planetarium's primary purpose is to support what is taught in the classroom. They felt very strongly that the curriculum taught in the planetarium should be integrated with the curriculum taught in the classroom.

Teaching Strategies in Planetaria

Directors strongly agreed that teachers must prepare their students to benefit from planetarium lessons, that lessons in which students participate are superior to traditional (show and tell) lessons, and that lessons should not be longer than one hour (see Table 20).

The Organizational Structure of Planetaria

The organization of planetaria is covered by questions 13 and 31 - 42 in the survey (see Appendix C). Planetaria are placed in different positions in organizational charts of school districts. They often do not fit into a predefined category of school structures. Planetaria are often viewed as autonomous entities. Directors are often miss-labeled on administrative charts and appear to be administrators when in fact they are not.

Classification of Planetarium Directors

Three classifications for directors were listed in the survey. The classifications were (1) administrator, (2) teacher, and (3) other (see Table 21). Over two-thirds of all directors were classified as teachers in their school districts. Less than seven percent are classified as administrators. One of every five directors is classified as “other” by their school administration and have titles indicating a variety of jobs.

Table 20

Planetarium Directors' Opinions on the Teaching Environment, the Teaching Purpose, and Effective Teaching Strategies in Public-School-Owned Planetaria in the United States, N = 131

| Opinions | <u>n</u> | <u>M</u> | <u>SD</u> | <u>Min</u> | <u>Max</u> |
|--|----------|----------|-----------|------------|------------|
| Teaching environment | | | | | |
| The planetarium is a more effective place to teach astronomy than a classroom. | 105 | 3.49 | 0.79 | 1 | 4 |
| Teaching in a planetarium is more difficult than a traditional classroom. | 104 | 2.40 | 0.85 | 1 | 4 |
| Teaching purpose | | | | | |
| The planetarium's primary purpose is to support what is taught in the classroom. | 105 | 3.13 | 0.69 | 1 | 4 |
| Teaching strategies | | | | | |
| The curriculum used in the planetarium and classroom should be integrated. | 105 | 3.63 | 0.52 | 2 | 4 |
| Teachers must prepare their students for the planetarium experience if it is to be successful. | 105 | 3.37 | 0.69 | 2 | 4 |
| Participatory lessons are better than traditional lessons. | 105 | 3.35 | 0.64 | 1 | 4 |
| Planetarium lessons should be no longer than one hour. | 106 | 3.25 | 0.76 | 1 | 4 |

Note. A four-response Likert scale was used: 1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree.

Table 21

Job Classifications of Planetarium Directors in the United States, N = 131

| Classification | <u>n</u> | <u>%^a</u> |
|----------------|------------|----------------------|
| Administrator | 9 | 6.9 |
| Teacher | 91 | 69.5 |
| Other | 6 | 4.6 |
| No response | 25 | 19.1 |
| Total | <u>131</u> | <u>100.0</u> |

^a Percentage of total respondents (N = 131).

Titles of Planetarium Directors

Fourteen titles were reported. “Director” and “teacher” were reported most often. Slightly more than 13 percent reported their title as “director plus other.” A few (less than 5 %) had the title of “planetarium teacher.” There was a scattering of “supervisors,” “managers,” “coordinators,” and “specialists” within the group and one was listed as a “curator” (see Table 22).

Certification of Planetarium Directors

Nearly all directors are certified teachers. Over 90 percent are certified at the secondary level. Slightly over one-third are certified at the middle school level, and about 11 percent are certified at the elementary level. Areas of certification are generally in sciences and math, with general science and earth science being reported most frequently. A few are certified in the humanities (English, history, and social studies) (see Table 23).

Supervision of Planetarium Directors

Directors are supervised by 10 different administrative positions, the most frequent is a school principal. Science supervisors, directors of curriculum, and department chairs are the three most reported positions reported to have responsibility for planetarium directors (see Table 24).

Table 22

Titles of Directors Working in Public-School-Owned Planetaria in theUnited States, N = 131

| Titles | <u>n</u> | <u>%^a</u> |
|---------------------------------------|----------|----------------------|
| Director | 34 | 26.0 |
| Teacher | 34 | 26.0 |
| Director plus other title | 18 | 13.7 |
| Planetarium teacher | 6 | 4.6 |
| Resource person | 2 | 1.5 |
| Planetarium coordinator | 2 | 1.5 |
| Co-director | 1 | 0.8 |
| Planetarium supervisor | 1 | 0.8 |
| District science coordinator | 1 | 0.8 |
| Curator | 1 | 0.8 |
| Assistant principal | 1 | 0.8 |
| Coordinator of science and technology | 1 | 0.8 |
| Planetarium specialist | 1 | 0.8 |
| Planetarium manager | 1 | 0.8 |
| No response | 27 | 20.6 |
| Totals | 131 | 100.0 |

^a Percentage of total respondents (N = 131).

Table 23

Certification of Directors Operating Public-School-Owned Planetaria in the United States, N = 131

| Classification category | n | % ^b | No | | Yes | | No response | |
|-----------------------------|----|----------------|----|----------------|-----|----------------|-------------|----------------|
| | | | n | % ^a | n | % ^a | n | % ^a |
| Certified as a teacher | | | 4 | 3.1 | 99 | 75.6 | 28 | 21.4 |
| Levels certified to teach | | | | | | | | |
| Elementary | 12 | 11.1 | | | | | | |
| Middle | 39 | 36.1 | | | | | | |
| Secondary | 95 | 90.7 | | | | | | |
| Subjects certified to teach | | | | | | | | |
| Biology | 29 | 13.8 | | | | | | |
| Chemistry | 19 | 20.4 | | | | | | |
| English | 5 | 5.4 | | | | | | |
| Earth science | 54 | 58.1 | | | | | | |
| History | 5 | 5.4 | | | | | | |
| Math | 21 | 22.6 | | | | | | |
| Physical education | 4 | 4.3 | | | | | | |
| Physics | 20 | 21.5 | | | | | | |
| General science | 59 | 64.5 | | | | | | |
| Social studies | 3 | 3.2 | | | | | | |
| Astronomy | 14 | 15.1 | | | | | | |
| Gifted | 1 | 1.1 | | | | | | |

^a Percentage of total respondents (N = 131).

^b The percentage for levels certified to teach are greater than 100% because some respondents are certified at more than one level. The percentages for subjects certified to teach are greater than 100% because some respondents are certified for more than one subject.

Table 24

Titles of Immediate Supervisors of Directors of Public-School-Owned Planetaria in the United States, N = 131

| Title of immediate supervisor | <u>n</u> | <u>%^a</u> |
|-------------------------------|------------|----------------------|
| Principal | 53 | 40.5 |
| Science Supervisor | 14 | 10.7 |
| Director of Curriculum | 10 | 7.6 |
| Department Chair | 9 | 6.9 |
| Director of Instruction | 5 | 3.8 |
| Assistant Superintendent | 4 | 3.1 |
| Superintendent | 2 | 1.5 |
| Assistant Principal | 2 | 1.5 |
| Coordinator of Science | 1 | 0.8 |
| School Leadership Chair | 1 | 0.8 |
| No response | 30 | 22.9 |
| Total | <u>131</u> | <u>100.0</u> |

^a Percentage of total respondents (N = 131).

Main Policy-Making Body

The main policy-making body for planetaria was reported by the respondents to be the directors themselves. One-third of the directors reported they were the main policy-making body for the daily operation of the planetarium. School boards and science supervisors were also listed as main policy-makers. Overall, 13 policy-making bodies were identified (see Table 25).

Loose Coupling

As organizational units planetaria are very loosely coupled (Weick, 1976) to their school districts. Their purposes are unclear. Over one-third (39.7 %) reported that a purpose was not included in their policies, and 42 percent of the directors reported they operate autonomously within their school districts. Despite this claim of autonomy, 52.4 percent of the respondents strongly agree that the planetarium is an integral part of the school system. Over 73.3 percent of the directors work less than twelve months (see Table 26).

Planetarium Facilities

Planetarium facilities were covered by questions 46 - 66 in the survey (see Appendix C).

Location and Use of Planetaria

Most planetarium facilities are physically attached to public school buildings.

Table 25

Main Policy-Making Body for Public-School-Owned Planetaria in the United States, N = 131

| Policy-making body | <u>n</u> | <u>%^a</u> |
|--|------------|----------------------|
| Planetarium director (self) | 43 | 32.8 |
| School board | 15 | 11.5 |
| Science supervisor | 6 | 4.6 |
| Assistant superintendent | 4 | 3.1 |
| Planetarium staff | 4 | 3.1 |
| School district | 4 | 3.1 |
| Department chair | 3 | 2.3 |
| Planetarium director plus science supervisor | 3 | 2.3 |
| Curriculum director | 3 | 2.3 |
| Planetarium director plus director of elementary education | 2 | 1.5 |
| Teachers | 2 | 1.5 |
| Superintendent | 1 | 0.8 |
| Planetarium curriculum committee | 1 | 0.8 |
| No response | 36 | 27.5 |
| Total | <u>131</u> | <u>100.0</u> |

^a Percentage of total respondents (N = 131).

Table 26

Organizational Characteristics of Public-School-Owned Planetaria in the UnitedStates, N = 131

| Characteristics | No | | Yes | | No response | |
|--|----|----------------|-----|----------------|-------------|----------------|
| | n | % ^a | n | % ^a | n | % ^a |
| Stated purpose in policy book | 52 | 39.7 | 42 | 32.1 | 37 | 28.2 |
| Planetarium operates autonomously | 45 | 34.4 | 55 | 42.0 | 31 | 23.7 |
| Planetarium accessible to district schools | 12 | 9.2 | 94 | 71.8 | 25 | 19.1 |
| Director works 12 months | 96 | 73.3 | 9 | 6.9 | 26 | 19.8 |

^a Percentage of total respondents (N = 131).

Less than 10 percent are in separate facilities. Nearly three-fourths of the respondents recommended the planetarium not be a separate building. Secondary schools have more planetaria than elementary and middle schools, and middle schools have more than elementary. Planetaria are usually not designed for other uses, and a majority of the facilities have a work space adjacent to the planetarium. Nearly three-fourths of the planetaria do not have an exhibit area adjacent to them (see Table 27). Directors are ambivalent about whether planetaria should be located inside or physically attached to a school building. However, they agree that the planetarium should only be used as a planetarium and not serve as a “multiple-use room”(see Table 28).

Size and Socioeconomic Status of School Districts with Planetaria

Facilities are located in school districts ranging in size from less than 300 students to over 1,000,000 students. Slightly more than one half of the directors reported their districts were of medium socioeconomic status (see Table 29). Only 13 percent reported that they were in high socioeconomic districts.

Recommended Dome Size and Number of Seats

Directors recommended a wide range of dome sizes from 12 feet to 200 feet. Only one director recommended a 200 foot dome. Over 42 percent of the directors

Table 27

Characteristics of the Facilities of Public-School-Owned Planetaria in the United States, N = 131

| Characteristics | <u>n</u> | <u>%^a</u> | No | | Yes | | No response | |
|---|----------|----------------------|----------|----------------------|----------|----------------------|-------------|----------------------|
| | | | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> |
| Planetarium physically attached to a public school | | | 9 | 6.9 | 97 | 74.0 | 25 | 19.1 |
| Type of school to which the planetarium is attached | | | | | | | | |
| Elementary | 8 | 6.1 | | | | | | |
| Middle | 30 | 22.9 | | | | | | |
| Secondary | 56 | 42.7 | | | | | | |
| Other | 3 | 2.3 | | | | | | |
| No response | 34 | 26.0 | | | | | | |
| | ---- | ----- | | | | | | |
| Total | 131 | 100.0 | | | | | | |
| Recommend the planetarium be | | | | | | | | |
| a separate building | | | 76 | 58.0 | 27 | 20.6 | 28 | 21.4 |
| Planetarium designed for other uses | | | 84 | 64.1 | 22 | 16.8 | 25 | 19.1 |
| Work space adjacent to planetarium | | | 45 | 34.4 | 61 | 46.6 | 25 | 19.1 |
| Exhibit area adjacent to planetarium | | | 78 | 59.5 | 28 | 21.4 | 25 | 19.1 |

^a Percentage of total respondents (N = 131).

Table 28

Directors' Opinions About the Location and Use of Public-School-Owned Planetarium Facilities in the United States, N = 131

| Facility location and use | <u>n</u> | | <u>M</u> | <u>SD</u> | <u>Min</u> | <u>Max</u> |
|---|----------|------|----------|-----------|------------|------------|
| The planetarium should be located inside a public school building | 106 | 2.91 | 0.85 | 1 | 4 | |
| The planetarium should only be used as a planetarium | 106 | 3.20 | 0.86 | 1 | 4 | |

Note. A four-response Likert scale was used: 1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree.

Table 29

Descriptive Data on District Size, District Socioeconomic Status, and Number of Seats inPublic-School-Owned Planetaria in the United States, N = 131

| District data | <u>n</u> | <u>%^a</u> | <u>M</u> | <u>SD</u> | <u>Min</u> | <u>Max</u> |
|--|----------|---------------------------|-----------|------------|------------|------------|
| District size (enrollment) | 103 | 78.6 | 21,610.56 | 100,068.50 | 290 | 1,000,000 |
| Less than 1000 | 8 | 6.10 | | | | |
| 1000 - 10,000 | 69 | 52.67 | | | | |
| 10,001 - 20,000 | 10 | 7.63 | | | | |
| 20,001 - 30,000 | 8 | 6.10 | | | | |
| 30,001 - 40,000 | 4 | 3.05 | | | | |
| More than 40,000 | 4 | 3.05 | | | | |
| Totals | 103 | 78.62 (28 missing 21.37%) | | | | |
| Number of seats | 106 | | 52.42 | 22.02 | 0 | 125 |
| District socioeconomic status ^b | | | | | | |
| Low | 19 | 14.5 | | | | |
| Medium | 71 | 54.2 | | | | |
| High | 17 | 13.0 | | | | |
| No response | 24 | 18.3 | | | | |
| Total | 131 | 100.0 | | | | |

^a Percentage of total respondents (N = 131).^b No scale was given for socioeconomic status. Directors reported the district status based on personal knowledge of the district.

recommended a 30-foot dome. The mean diameter recommended for public-school-owned planetarium facilities was 31.9 feet. The number of seats recommended was 61 seats (see table 30).

Year of Construction

Over one-third of all public-school-owned planetaria surveyed were constructed between the years 1966-1970. Since that period, there has been a rapid decline in public school planetarium construction (see Table 31).

Planetarium Funding

Eleven funding methods were reported; however, almost one-third of the directors reported not knowing the actual funding method. Districts funded almost one-fifth of all planetaria surveyed. Federal, state, and private funding is predominate in about half of the districts (see Table 32).

Equipment

Planetaria equipment tends to be non-automated and out-of-date. Directors reported equipment purchased in the early 60s and 70s had not been maintained. Automated star-projectors are in less than 20 percent of the planetaria. Some improvements in technology have been made: Almost 50 percent of planetaria

Table 30

Directors' Responses to Survey Questions on Seating and Dome Size for Public-School-Owned Planetaria in the United States, N = 131

| <u>Seating and facility dome size</u> | <u>N</u> | <u>M</u> | <u>SD</u> | <u>Min</u> | <u>Max</u> |
|---------------------------------------|----------|----------|-----------|------------|------------|
| Number of seats directors recommend | 102 | 60.05 | 24.05 | 20 | 120 |
| Dome diameter directors recommend | 97 | 31.88 | 18.37 | 12 | 200 |

Table 31

Descriptive Data on Year Public-School-Owned Planetaria First Opened in the United States.N = 131

| Year first opened | <u>n</u> | <u>%^a</u> |
|-------------------|------------|----------------------|
| Grouped in years | | |
| 1961 - 1965 | 21 | 16.0 |
| 1966 - 1970 | 51 | 38.9 |
| 1971 - 1975 | 15 | 11.5 |
| 1976 - 1980 | 10 | 7.6 |
| 1981 - 1985 | 2 | 1.5 |
| 1986 - 1990 | 2 | 1.5 |
| 1991 - 1997 | 2 | 1.5 |
| No response | 28 | 21.5 |
| Total | <u>131</u> | <u>100.0</u> |

^a Percentage of total respondents (N = 131).

Table 32

Descriptive Data on Funding Sources of Public-School-Owned Planetaria in the United States.N = 131

| Planetarium facility funding source | <u>n</u> | <u>%^a</u> |
|---|------------|----------------------|
| District | 23 | 17.6 |
| Combination of federal, state, and district | 15 | 11.5 |
| Grant | 11 | 8.4 |
| Federal | 9 | 6.9 |
| NDEA | 7 | 5.3 |
| District plus state | 7 | 5.3 |
| Private (gift) | 6 | 4.6 |
| National Science Foundation plus district | 5 | 3.8 |
| Federal plus State | 2 | 1.5 |
| District plus grant | 2 | 1.5 |
| Title III and private | 1 | 0.8 |
| No response | 43 | 32.8 |
| Total | <u>131</u> | <u>100.0</u> |

^a Percentage of total respondents (N = 131).

have video projectors, and over one-third have other projectors or automated devices. Only a little over 15 percent of planetaria have added Internet access (see Table 33).

Manufacturer

Directors reported six manufacturers of planetarium star-projectors. Spitz Incorporated located in Chadds Ford, Pennsylvania, installed over 67 percent of the star-projectors. Viewlex/Goto ran a poor second with less than seven percent of the market (see Table 32).

Community and College Use

Over one half of the planetaria are used by groups not enrolled in the public school system. Public programs are offered to the community in slightly more than one half of the planetaria; however, most planetaria offer few of these (median of three per year). Generally speaking, community colleges and universities do not use public-school-owned planetarium facilities. Less than one-fifth of planetaria reported any use by colleges or universities (see Table 34).

Table 33

Equipment and Technology in Public-School-Owned Planetaria in the United States, N=131

| Equipment and technology | <u>n</u> | % ^a | <u>No</u> | | <u>Yes</u> | | <u>No response</u> | |
|--|------------|----------------|-----------|----------------------|------------|----------------------|--------------------|----------------------|
| | | | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> |
| Star-projector automated | | | 82 | 62.6 | 24 | 18.3 | 25 | 19.1 |
| Other projectors or devices automated | | | 58 | 44.3 | 48 | 36.6 | 25 | 19.1 |
| Video projectors used in school programs | | | 42 | 32.1 | 64 | 48.9 | 25 | 19.1 |
| Internet access | | | 86 | 65.6 | 20 | 15.3 | 25 | 19.1 |
| Manufacturer of your star-projector | | | | | | | | |
| Spitz Incorporated | 88 | 67.2 | | | | | | |
| Viewlex/Goto | 9 | 6.9 | | | | | | |
| Zeiss | 2 | 1.5 | | | | | | |
| Fahrquahr | 2 | 1.5 | | | | | | |
| Minolta | 1 | 0.8 | | | | | | |
| Space Education Laboratory | 1 | 0.8 | | | | | | |
| No report | 28 | 21.4 | | | | | | |
| Total | <u>131</u> | <u>100.0</u> | | | | | | |

^a Percentage of total respondents (N = 131).

Table 34

Community Use of Public-School-Owned Planetaria in the United States, N=131

| | <u>n</u> | <u>Mdn</u> | <u>M</u> | <u>SD</u> | <u>M in.</u> | <u>Max.</u> | <u>No</u> | <u>Yes</u> | No response | |
|---|----------|------------|----------|-----------|--------------|-------------|-----------|----------------------|-------------|----------------------|
| | | | | | | | _____ | _____ | | |
| Community use | | | | | | | <u>n</u> | <u>%^a</u> | <u>n</u> | <u>%^a</u> |
| Planetarium used by groups not enrolled in the public school system | | | | | | | 25 | 19.1 | 81 | 61.8 |
| Community college or university use | | | | | | | 81 | 61.8 | 24 | 18.3 |
| Planetarium offers public programs | | | | | | | 40 | 30.5 | 67 | 51.1 |
| Number of public programs presented each month | 48 | 1 | 2.28 | 3.06 | 0 | 20 | | | | |
| Number of public programs presented each year | 20 | 3 | 3.10 | 1.74 | 1 | 8 | | | | |

Note. A four-response Likert scale was used: 1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree.

^a Percentage of total respondents (N =131).

Planetarium Directors

The characteristics of planetarium directors were covered by questions 67 - 72 in the survey (see Appendix C). The typical director is male and 48 years old. The director has a masters degree in a science-related field, and has been a director for over 13 years. Overall, directors do not change jobs and have not directed other planetarium facilities during their careers (see Table 35).

Table 35

Characteristics of Directors of Public-School-Owned Planetaria in the United States, N = 131

| Characteristics | <u>n</u> | <u>%^a</u> | M | SD | <u>Min</u> | <u>Max</u> |
|-------------------------------------|------------|----------------------|-------|------|------------|------------|
| Number of years as a director | 106 | | 13.22 | 9.45 | 1 | 32 |
| Number of years at present location | 106 | | 12.44 | 9.20 | 1 | 32 |
| Number of other facilities directed | 107 | | 0.21 | 0.51 | 0 | 3 |
| Director's age | 102 | | 47.89 | 9.94 | 24 | 72 |
| Highest degree earned | | | | | | |
| Bachelor of arts | 7 | 5.3 | | | | |
| Bachelor of science | 21 | 16.0 | | | | |
| Masters | 68 | 51.9 | | | | |
| Certificate of advanced studies | 3 | 2.3 | | | | |
| Doctorate | 6 | 4.6 | | | | |
| No response | 26 | 19.8 | | | | |
| Total | <u>131</u> | <u>100.0</u> | | | | |
| Gender | | | | | | |
| Male | 80 | 61.1 | | | | |
| Female | 27 | 20.6 | | | | |
| No response | 24 | 18.3 | | | | |
| Total | <u>131</u> | <u>100.0</u> | | | | |

^a Percentage of total respondents (N =131).