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AUTHOR Kleinke, David J.; Gardner, Eric F.
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ABSTRACT

This report concerns a test, the Syracuse Environmental Awareness Tests-Level III (SEAT-III), developed at Syracuse University and designed to measure knowledge of and concern for man's environment among high school students and adults. There are four forms of SEAT-III; forms A and B are intended to provide measures of knowledge about environmental problems and issues; forms C and D (the affective tests) were planned to assess attitudes toward environmental issues. This report is intended to serve two purposes. First, it contains information about the test's score distributions and reliability, as well as of the content and underlying rationale of the tests. Second, it is designed to serve as a final report on the construction of the test. Included in the report are: an introduction, the initial stages of development, the development of test norms, score distributions, item statistics, and test reliability. Tables and appendices are also included. (Author/TK)

SYRACUSE ENVIRONMENTAL AWARENESS TESTS---LEVEL III

Final Report on Construction and Norming

David J. Kleinke
Eric F. Gardner

NEED

The development of these tests has been funded by the Northeastern Environmental Education Development, a cooperative effort of The State Education Departments of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont under a grant from the United States Office of Education (ESEA Title 5-Sec. 505). Inquiries regarding this organization should be sent to:

Northeastern Environmental Education Development
New York State Education Department
Division of General Education
Albany, New York 12224

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TABLE OF CONTENTS

LIST OF TABLES

Introduction

The Syracuse Environmental Awareness Tests-Level III were designed to measure knowledge of and concern for man's environment among high school students and adults. There are four forms of SEAT-III. Forms A and B (the "cognitive tests") are intended to provide measures of knowledge about environmental problems and issues. Each consisting of 56 multiple-choice questions, they were designed to be equivalent to each other, so they could be used interchangeably. Forms C and D (the "affective tests") were planned to assess attitudes toward environmental issues. They are not equivalent forms, although each consists of 105 two-option forced-choice items. The purpose of Form C is to tap relative concerns among seven environmental areas. Form D is intended to measure overall level of concern for environmental problems, as opposed to concern for other social issues.

SEAT-III was developed at Syracuse University under the sponsorship of the Northeastern Environmental Education Development (NEED), a cooperative effort of the State Education Departments of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The funding was under a grant from the United States Office of Education.

This report is intended to serve two purposes. It is primarily for those who wish to use SEAT in order to assess the level of information about, concern for, or both, that others have in the environment. It therefore contains information about the tests' score

distributions and reliability, as well as of the content and under-lying rationale of the tests. In this sense, it is a "preliminary technical manual." It is preliminary in that, as must be in the case with a new test, validity information is not available until after research studies are undertaken. But this report is also designed to serve as the final report on the construction of SEAT-III. For that reason, it is organized in narrative, historical fashion, retracing the steps in the development and initial analysis of the tests.

Initial Stages

Test Blueprints

When a standardized test of achievement in a school subject is constructed, the normal first step is to consult with experienced teachers and supervisors of that subject and to examine typical and popular textbooks and course outlines in order to determine what content is taught and what the relative emphases are in the subject. During the spring of 1971, when the preparation of SEAT was beginning, this would have been impossible. There simply were not enough environmental education courses actually being taught or materials in circulation to identify any as being "typical and popular" or representative. A second approach was therefore taken.

In a series of meetings involving the authors, representatives of the Syracuse University Environmental Studies Institute, professors of relevant subjects (e.g., social studies education, engineering and forestry), and high school educators, a broad content outline for a hypothetical course in environmental education was produced. The approach was: "If there were a required course in environmental

education, what would it consist of?" The result was the following content outline:

I. Pollution
   A. Air
   B. Land
   C. Noise
   D. Water
II. Population
III. Science, Growth, and Technology
IV. Ecological Relationships

While the rubrics "pollution" and "population" are fairly straightforward, the others should be explained. "Science, growth, and technology" has to do with unchecked and ecologically destructive growth of industry in our society. In Forms A and B, it includes questions (items) about such matters as the supersonic transport airplane. In the attitudes measures, one's priorities are sought between such developments and other alternatives. "Ecological relationships" is devoted to relationships within and among environmental issues. If an item is concerned with, say, air pollution only, it is classified as "air pollution." If, however, the interest is in relationship between two different kinds of pollution or between, say pollution and population growth, the item is considered to be within the ecological relationships area. Also, concerns about biosystems and communities, such as coral reefs, are logically placed here.

In addition to the desire to have Forms A and B reflect the content allocations of the hypothesized course of instruction, an attempt

was also made to have the items included therein to tap the mental processes that would also be included in the goals of instruction. Because higher mental processes are based upon knowledge of basic facts and principles, which are in turn based on knowledge of terms and definitions, emphasis in the hypothesized course of instruction, and therefore in the items in Forms A and B, was placed on such knowledge. The allocation of items to the cognitive tests is presented in Table 1.

Table 1. Numbers of items in content-by-process table of specifications: Forms A & B

	Cognitive Process			
	Knowledge of		Ability to Apply	
Content	Facts and Items	Principles	Principles	Total
Pollution	17	4	3	24
Science, Growth, & Technology/Ecological Relations	9	5	2	16
Population	8	4	4	16
Total	34	13	9	56

The affective tests contain items about the environmental areas in equal numbers. That is, taking each of the pollution subcategories as full areas, there are seven content areas. These areas are equally represented in the affective tests. In Form C, the examinee is asked to select between two environmental issues; for it, the intention was to have each area reflected in thirty items.* In Form D, the choices

* Because of a typgraphical error in the May 1972 edition, there are 29 air pollution items and 31 in which noise pollution is an option.

are between an environmental option and another social issue, such as drug use. In it, each of the environmental areas is represented by 15 items.

The choice of the format and content of the items for the affective tests was made after much preliminary consideration of alternative approaches. The forced-choice format was decided upon because this afforded a wide sampling of content while keeping the reading task to a minimum and maintaining direct and easily-understood scoring. On the other hand, earlier considerations about including a "personal" dimension were discarded. The constraints imposed by the necessity for developing an instrument that could be administered in one 45-minute period and would not be a test of reading speed, while yielding reliable information, dictated against doing so. Indeed, one of the reasons why there are two affective tests, each intended for its own purpose, is the existence of these reasonable constraints.

Item Preparation

The items for the affective tests were initially prepared at the Syracuse University Institute for Community Psychology. After initial preparation they were reviewed for accuracy and for proper assignment to content area.

For the cognitive test, item writer training sessions were held. The item writers were Syracuse University professors and graduate students, and high school teachers in relevant fields. All of the items were subjected to technical review by measurement specialists. Following this review and revision, they were assembled into pretests

and then reviewed for subject-matter accuracy by persons in appropriate substantive fields.

Pretesting

In November and December 1971, nearly 4,000 eleventh grade students in twelve schools took part in the pretesting phase. The schools are listed in Appendix B. Each examinee took two tests in separate, 45-minute periods. There were three cognitive tests, each containing 56 items, and two affective tests, containing a total of 325 forced-choice items. This field testing of potential items for the final forms was carried out in order to eliminate or revise items on the basis of students' responses to them.

At about the same time, over one hundred Syracuse University undergraduates were presented with greatly altered forms of the affective items. The items were recast as direct statements to which the undergraduates were asked to respond with the degree of importance each, for example, "... to sign a petition against air pollution," has overall level of involvement reflected in each of the options.

Development of Norms

In order to be useful as standardized tests and to provide baseline data, SEAT was administered to a large number of high school students throughout the NEED region in May and June of 1972. As can be seen in Tables 4a through 4d, approximately 1,300 students were included in each of the four norming samples. To obtain as representative a group as possible, the preliminary report of the 1970 United States Census was employed as the source of population information. The intention was to have the proportion of students from a given state in the sample reflect the proportion of population in that state. The nine-state distribution

is presented in Table 2. At the same time, community type was thought to be relevant, that students in various community types might respond differently to the cognitive tests, the affective tests, or both. After consultation with demographers from the Syracuse University Sociology Department, it was decided that, for

Table 2. Distributions of Norming Samples, by State, Forms A-D

	State								
	Form	CT	ME	MA	NH	NJ	NY	PA	RI	VT
Obtained Percentages	A	6.5	5.4	10.7	3.1	9.0	33.3	27.0	3.6	1.3
	B	6.3	4.9	11.0	3.2	9.6	33.8	26.4	3.7	1.0
	C	6.9	5.0	9.8	3.2	9.5	34.7	26.7	3.5	0.7
	D	6.8	5.0	10.2	3.0	9.4	35.2	26.3	3.6	0.6
Percent of Population		6.2	2.0	11.6	1.5	14.6	37.1	24.1	1.9	0.9

the region involved, community size was the most appropriate consideration. A "large" community was defined as one having more than 200,000 population; a "medium" community was one with 40,000 to 200,000; and a "small" community, one with fewer than 40,000 people. Table 3 contains the percentages of examinees by community size.

Table 3. Distributions of Norming Sample, by Community Size, Forms A-D

	Community Size		
Form	Less than 40,000	40,000 200,000	More than 200,000
A	57.6	23.2	19.2
B	56.0	23.4	20.6
C	56.6	21.6	21.8
D	57.3	21.7	21.0
Percent of Population	57.3	17.0	25.7

The schools to participate in the norming were selected by the authors using random selection methods from among those listed in the U. S. Office of Education's Directory of Public Secondary Schools. In order to obtain 53 schools for the norming group, a total of 159 schools were selected, 53 groups of three schools each, matched for state-, community-, and school size as nearly as possible. If the first school in a group was unable to participate, the second school was contacted. In a few instances, the third school in a group was invited, and in one case, a fourth had to be substituted. After initial agreement, four schools declined to participate, too late in the school year to be replaced. Therefore, the norms are based on the performance of students in 49 schools in the nine states.

Contact with the schools was made by the NEL) representative in each of the states, usually an official of that state's education department. Each school that was contacted was asked to select 25 percent of its eleventh-graders, taking care that they were typical and that no important group, e.g., Advanced Placement students or those in a vocational program, be excluded. Each pupil was to take two tests, one week apart. The instructions to the schools made specific mention of the fact that this would result in approximately one-fourth of the students' taking the same form twice. For developing the norms, only the first testing of a student who took the same form twice was counted. The second testings of these students were used for information as to the tests' stability (see below).

Score Distributions

Overall score distributions are presented in Tables 4a through 4d. A few definitions are in order here. First, the "percentile

Table 4a.

Forms A and B: Total Test and Subtest Percentile Ranks and Summary Statistics

Raw Score	Total Test A*	Total Test B**	Raw Score	Raw Score	Total Test A	Total Test B	Pollution A	Pollution B	SGT/ER A	SGT/ER B	Population A	Population B	Raw Score
50+	100	100	50+	24	28	28	100	100					24
				23	24	24	100	100					23
49	99	100	49	22	21	21	99	99					22
48	99	99	48	21	17	17	98	98					21
47	99	99	47	20	14	14	95	95					20
46	98	98	46										
45	97	97	45	19	12	12	92	90					19
				18	9	9	87	84					18
44	96	96	44	17	6	7	80	77					17
43	95	94	43	16	5	5	71	69	100	100	100	100	16
42	94	92	42	15	3	3	62	62	99	100	100	99	15
41	92	90	41										
40	89	88	40	14	2	2	53	54	98	98	99	98	14
				13	2	1	43	45	95	96	97	95	13
39	86	85	39	12	1	1	34	35	89	91	93	89	12
38	83	82	38	11	1	1	26	26	81	85	87	82	11
37	81	79	37	10	1		19	19	71	77	77	73	10
36	77	76	36										
35	73	72	35	9			12	13	59	66	67	63	9
				8			7	8	46	53	55	52	8
34	69	69	34	7			4	5	33	41	42	40	7
33	65	65	33	6			2	2	23	27	32	29	6
32	61	62	32	5			1	1	14	16	23	19	5
31	56	59	31										
30	51	55	30	4					8	9	14	11	4
				3					4	4	7	6	3
29	47	51	29	2					1	2	3	3	2
28	43	46	28	1							1	2	1
27	40	42	27	0								1	0
26	36	37	26										
25	32	33	25										
				Mean	29.5	29.4	13.6	13.7	8.3	7.8	7.5	7.9	Mean
				SD	8.3	8.4	3.8	4.0	2.9	2.9	3.0	3.1	SD
				KR20	.83	.84	.67	.69	.61	.60	.64	.67	KR20

* N = 1,345

** N = 1,324

Table 4b. Form C: Subtest Percentile Ranks and Summary Statistics*

RAW SCORE	AP	LP	NP	WP	POP	SGT	ER	SCORE
30		100	100	100	100	100	100	30
29	100	100	100	99	99	100	100	29
28	99	100	100	97	99	100	100	28
27	97	99	100	94	88	100	100	27
26	95	98	100	90	97	100	100	26
25	91	96	100	86	96	100	99	25
24	87	94	100	80	95	99	98	24
23	82	90	99	73	93	99	97	23
22	76	85	99	66	92	99	94	22
21	69	80	98	59	90	98	90	21
20	61	73	97	51	88	98	83	20
19	52	64	95	43	86	96	74	19
18	43	55	94	34	83	95	65	18
17	35	46	92	26	79	93	55	17
16	28	36	89	20	74	90	45	16
15	21	27	86	15	69	87	35	15
14	15	19	81	11	63	83	26	14
13	10	12	75	7	58	77	18	13
12	7	8	68	4	52	71	13	12
11	5	5	62	3	46	65	9	11
10	3	3	56	2	41	57	5	10
9	2	2	51	1	36	50	3	9
8	1	1	44	1	30	42	2	8
7	1	1	37	1	24	34	1	7
6	1		31		20	27	1	6
5			24		17	20	1	5
4			18		13	14		4
3			13		10	10		3
2			8		6	6		2
1			4		3	2		1
0			1		1			0
Mean	18.7	17.5	9.3	19.9	11.9	9.4	16.4	Mean
SD	4.6	4.1	5.3	4.6	6.6	4.9	3.8	SD
KR20	.75	.66	.82	.74	.88	.78	.60	KR20

Table 4c.

Form D: Total Environmental and Total Social Percentile Ranks and Summary Statistics*

RAW SCORE	PR ENV	PR SOC	RAW SCORE	PR ENV	PR SOC	RAW SCORE	PR ENV	PR SOC
104	100	100	69	70	89	34	12	29
103	99	100	68	69	88	33	11	28
102	99	100	67	67	87	32	10	27
101	99	100	66	66	86	31	9	26
100	98	100	65	64	85	30	8	24
99	98	100	64	63	83	29	8	23
98	97	100	63	62	81	28	7	21
97	97	99	62	60	80	27	6	20
96	97	99	61	59	79	26	6	18
95	96	99	60	57	77	25	5	16
94	96	99	59	55	76	24	5	15
93	95	99	58	53	74	23	4	14
92	95	99	57	51	71	22	4	13
91	94	99	56	49	69	21	3	12
90	94	99	55	47	67	20	3	11
89	93	98	54	44	66	19	3	10
88	92	98	53	42	64	18	2	9
87	91	98	52	40	62	17	2	9
86	91	98	51	38	60	16	2	8
85	90	97	50	37	57	15	2	7
84	89	97	49	35	55	14	1	6
83	88	97	48	33	53	13	1	5
82	87	97	47	30	51	12	1	5
81	86	96	46	28	49	11	1	4
80	85	96	45	26	47	10	1	4
79	84	95	44	25	45	9	1	4
78	82	95	43	23	44	8	1	3
77	81	94	42	22	42	7	1	3
76	80	94	41	20	41	6		2
75	78	93	40	18	39	5		2
74	77	93	39	17	38	4		2
73	76	92	38	16	36	3		1
72	75	92	37	14	35	2		1
71	73	91	36	13	33			
70	71	90	35	12	31			

	ENV	SOC
Mean	57.8	45.2
SD	20.3	19.9
KR20	.95	.95

* N = 1,252

Table 4d.

Form D: Subtest Percentile Ranks and Summary Statistics*

RAW SCORE	SUBTEST AP	LP	NP	WP	POP	SGT	ER	RAW SCORE
15	97	98	99	98	98	99	97	15
14	91	93	98	92	95	96	91	14
13	82	88	96	84	90	93	83	13
12	72	81	94	74	84	87	74	12
11	63	72	91	65	78	81	63	11
10	53	64	87	55	70	74	53	10
9	44	55	81	46	62	65	42	9
8	35	44	75	36	53	55	32	8
7	26	34	68	26	42	45	23	7
6	18	25	59	19	32	35	16	6
5	12	18	48	13	24	25	10	5
4	8	12	37	8	17	17	6	4
3	5	8	26	5	11	11	3	3
2	3	4	16	3	7	6	2	2
1	1	2	7	1	3	2	1	1
0			2		1			0
Mean	9.4	8.5	5.7	9.3	7.8	7.6	9.5	Mean
SD	3.5	3.6	3.5	3.5	3.7	3.5	3.3	SD
KR20	.79	.78	.80	.78	.80	.78	.75	KR20

* N = 1,252

rank" of a score is the percentage of examinees in the score group who scored less than the midpoint of that score. Hence, on Form A, if one achieved a total-test score of 40, that means that his performance surpassed that of about 89 percent of the norms group. Actually, for reporting purposes, it would serve better in reporting individual performance to take the "standard error of measurement" (SEM) into account, by adding and substracting three points to the obtained 40, and characterizing scoring 40 points as surpassing the performance of about 81 (the percentile rank of a score of 37) to 95 (that of a score of 43) percent of the examinees. Doing so would serve to avoid over-interpreting small differences between individuals.

For groups, however, overall statistics are useful. Hence, the "mean," an average score, and the "standard deviation" (SD), a measure of the overall spread of scores. "KR20" is a measure of the internal consistency of a test. It will be discussed in a later section.

It will be recalled that Forms A and B were designed to be interchangeable. While they contain totally different items, the intent was to have them yield essentially the same score distributions so that alternate forms would be available for retesting purposes and the like. Inspection of Table 4a indicates the extent to which the percentile ranks are virtually identical throughout the total-test score range.

Tables 5a through 5d and 6a through 6c contain score information by state and community size, respectively. It may be noted that the performances in the various states were virtually identical. While no statistical procedure was employed to confirm that this was so,

Table 5a. Form A: Selected Percentiles, by State

Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			19		18	19	18		
75	17	16	17	16	16	16	16	15	16
50	14	13	14	14	13	13	14	13	14
25	11	11	11	10	11	11	12	9	11
10			8		9	8	9		
Mean	13.7	13.6	13.8	13.4	13.4	13.4	14.1	12.1	13.7
SD	4.0	3.8	4.1	3.9	3.7	4.0	3.4	3.7	3.3

Science, Growth, and Technology/Ecological Relationships

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			13		13	12	12		
75	10	10	11	11	11	10	10	9	11
50	8	8	9	10	8	8	9	7	8
25	6	7	6	8	6	6	7	5	6
10			4		5	4	5		
Mean	7.8	8.4	8.4	9.3	8.5	8.2	8.5	7.3	8.2
SD	3.3	2.3	3.2	2.7	3.1	3.0	2.7	2.6	2.6

Population

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			12		11	11	11		
75	10	10	10	9	10	10	10	8	8
50	8	8	8	8	7	8	8	7	7
25	5	6	5	5	5	5	5	5	6
10			3		3	4	4		
Mean	7.8	8.2	7.4	7.3	7.3	7.6	7.6	6.6	7.1
SD	3.2	2.6	3.2	2.7	3.1	3.1	3.0	2.9	2.7

Total Form A

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			41		41	41	40		
75	36	35	37	35	35	35	35	31	33
50	30	30	31	29	29	29	30	25	28
25	21	25	22	25	22	23	25	20	24
10			16		18	18	21		
Mean	29.3	30.2	29.6	30.0	29.2	29.2	30.2	26.0	29.1
SD	9.2	7.2	9.2	7.9	8.6	8.6	7.4	7.7	7.2
N	87	73	144	42	121	447	363	49	17

Table 5b. Form B: Selected Percentiles, by State

Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			19		20	19	19		
75	17	16	17	17	18	16	17	17	14
50	14	13	14	13	14	13	14	13	12
25	11	11	11	11	10	10	12	11	10
10			8		8	8	10		
Mean	13.8	13.4	14.0	13.4	13.8	13.0	14.4	13.6	12.9
SD	3.7	3.3	4.2	3.8	4.6	4.1	3.6	3.4	3.4

Science, Growth, and Technology/Ecological Relationships

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			12		12	11	12		
75	9	10	10	10	10	9	10	9	9
50	7	8	8	7	8	7	8	6	8
25	6	6	7	5	6	5	6	5	6
10			5		4	4	5		
Mean	7.9	8.0	8.4	7.6	7.9	7.4	8.3	6.8	7.8
SD	2.7	2.6	2.7	3.3	3.1	2.8	2.9	2.6	2.4

Population

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			12		12	12	13		
75	10	10	10	9	10	10	11	9	9
50	8	8	8	7	8	7	9	7	8
25	6	7	6	5	6	5	6	6	7
10			4		4	3	4		
Mean	8.0	8.2	8.2	7.3	8.0	7.5	8.3	7.3	8.2
SD	2.9	2.6	2.9	2.7	3.1	3.2	3.3	2.6	2.3

Total

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			42		42	40	42		
75	36	34	36	34	37	34	38	31	30
50	29	29	31	28	29	27	31	28	27
25	22	25	25	22	23	21	25	23	24
10			19		18	17	21		
Mean	29.7	29.6	30.7	28.2	29.7	27.9	31.0	27.7	28.9
SD	7.8	6.8	8.2	8.2	9.4	8.6	8.2	6.8	6.5
N	83	65	146	43	127	448	350	49	13

Table 5c. Form C: Selected Percentiles, by State

Air Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			25		24	25	24		
75	23	23	21	23	21	22	21	21	22
50	21	19	19	19	17	19	19	19	19
25	18	16	15	16	15	16	16	16	16
10			12		13	13	13		
Mean	20.3	19.0	18.3	19.0	17.9	18.7	18.6	18.5	18.7
SD	4.5	4.6	4.7	4.8	4.2	4.7	4.4	4.0	4.6

Land Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			22		23	23	23		
75	20	22	20	20	20	20	20	19	24
50	18	19	17	18	18	18	18	16	19
25	15	16	14	16	15	15	14	15	12
10			13		12	12	12		
Mean	18.0	18.7	17.0	18.3	17.6	17.5	17.4	16.8	18.7
SD	3.7	4.3	3.8	4.1	4.3	4.1	4.3	3.8	5.8

Noise Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			19		15	16	16		
75	13	10	14	10	13	13	13	12	14
50	8	7	11	9	8	9	9	9	9
25	5	4	5	5	5	5	6	6	6
10			2		3	2	4		
Mean	8.6	7.2	10.4	8.4	9.0	9.3	9.7	9.4	10.0
SD	5.3	4.8	6.2	4.2	4.9	5.5	5.1	4.9	5.4

Water Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			27		26	26	26		
75	23	26	24	25	23	23	23	21	21
50	20	22	20	23	19	20	19	19	21
25	17	18	16	20	17	17	16	17	19
10			13		15	14	14		
Mean	19.6	21.9	20.0	21.8	19.9	19.7	19.5	19.1	20.9
SD	4.0	4.5	5.1	4.5	4.4	4.6	4.6	4.7	3.3

Table 5c.
Form C: Selected Percentiles, by State (Cont.)

Population

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			19		20	22	20		
75	16	16	15	16	16	16	17	18	9
50	12	13	11	11	11	12	12	14	4
25	7	8	7	7	7	7	7	8	3
10			4		2	4	3		
Mean	11.8	12.1	11.3	11.5	11.5	12.3	11.8	13.4	8.2
SD	6.4	6.5	5.8	6.5	6.8	6.8	6.7	7.3	7.8

Science, Growth, and Technology

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			17		18	15	16		
75	13	11	14	11	13	12	13	12	16
50	10	8	10	8	10	9	9	10	6
25	6	5	7	6	7	5	5	8	5
10			3		4	2	3		
Mean	9.7	8.3	10.1	8.6	10.3	9.0	9.3	10.2	9.7
SD	4.6	5.0	4.8	4.2	4.9	4.9	5.0	5.3	7.9

Ecological Relationships

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			21		21	21	21		
75	19	20	18	19	20	19	19	17	20
50	16	18	16	17	17	16	16	15	19
25	13	15	13	15	14	14	14	13	14
10			10		12	11	12		
Mean	16.0	17.4	15.8	17.2	16.8	16.3	16.4	14.9	17.3
SD	4.0	3.8	4.4	3.3	3.8	3.9	3.6	3.4	3.8
N	88	64	125	41	123	444	342	45	9

Table 5d. Form D: Selected Percentiles, by State

Air Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			14		14	14	14		
75	12	13	12	13	12	12	12	12	14
50	9	10	10	11	10	9	10	8	13
25	7	7	7	8	7	7	7	5	11
10			5		5	4	6		
Mean	9.3	9.2	9.4	10.5	9.7	9.1	9.7	8.1	12.6
SD	3.6	4.0	3.4	3.2	3.5	3.7	3.3	4.2	1.3

Land Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			13		14	13	14		
75	10	12	11	12	12	11	12	9	13
50	8	8	9	9	9	8	9	7	11
25	5	6	7	7	6	5	7	3	8
10			4		4	3	5		
Mean	7.7	8.3	8.8	9.2	8.7	8.2	9.2	7.0	10.7
SD	3.5	4.0	3.4	3.4	3.9	3.6	3.2	4.1	2.8

Noise Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			10		12	10	11		
75	6	7	9	9	9	8	8	7	8
50	4	3	7	6	6	5	6	3	8
25	2	2	4	4	4	3	3	2	3
10			2		2	1	2		
Mean	4.5	4.4	6.4	6.7	6.5	5.4	6.0	4.7	6.4
SD	3.0	3.9	3.4	3.4	3.9	3.4	3.5	3.7	3.1

Water Pollution

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			14		14	14	14		
75	11	13	12	13	12	12	12	11	12
50	9	10	10	12	10	9	10	8	12
25	7	7	7	9	7	6	8	5	12
10			5		4	4	5		
Mean	8.8	9.3	9.6	11.0	9.6	8.8	9.7	8.0	12.1
SD	3.4	3.9	3.4	3.1	3.5	3.5	3.2	3.7	.4

Table 5d. Form D: Selected Percentiles, by State (Cont.)

Population

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			12		14	13	13		
75	10	11	10	11	11	10	11	10	10
50	8	7	7	9	8	7	8	7	7
25	4	4	5	7	6	5	6	5	6
10			3		3	3	3		
Mean	7.7	7.6	7.4	8.2	8.6	7.5	8.2	7.4	7.0
SD	4.1	4.0	3.5	3.7	3.7	3.6	3.8	3.9	3.1

Science, Growth, and Technology

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			12		14	12	13		
75	9	10	9	11	11	10	11	11	12
50	7	6	7	10	9	7	8	6	10
25	4	4	5	7	6	4	6	5	6
10			3		4	2	4		
Mean	6.9	6.9	7.5	9.2	8.7	7.1	8.1	7.0	9.0
SD	3.2	4.1	3.5	3.3	3.6	3.5	3.2	3.5	3.1

Ecological Relationships

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			14		14	14	14		
75	12	12	12	13	13	12	12	11	13
50	9	9	10	11	10	10	10	9	12
25	7	7	7	10	8	7	8	6	10
10			5		6	5	6		
Mean	9.3	9.2	9.3	11.0	9.9	9.2	10.0	8.5	11.4
SD	3.3	3.4	3.3	2.7	3.4	3.5	3.0	3.3	2.4

Environmental Total

Percentile	CT	ME	MA	NH	NJ	NY	PA	RI	VT
90			83		94	84	87		
75	68	73	72	78	75	70	75	67	80
50	55	49	58	67	62	54	58	48	69
25	40	42	47	54	46	41	48	34	65
10			32		34	30	39		
Mean	54.1	54.9	58.6	65.8	61.7	55.3	60.9	50.7	69.3
SD	19.2	23.4	19.7	19.6	21.6	20.4	18.4	22.0	11.1
N	85	63	127	37	117	440	329	45	7

Table 6a.

Forms A and B. Selected Percentiles, by Community Size

Small (N = 759) (N = 728)

Percentile	Form A Poll.	SGT/ER	Pop.	Total	Form B Poll.	SGT/ER	Pop.	Total
90	19	13	12	42	19	12	12	42
75	17	11	10	37	17	10	11	38
50	15	9	8	32	14	8	9	31
25	12	7	6	26	12	6	6	25
10	10	5	4	21	9	5	4	20
Mean	14.5	8.9	8.2	31.6	14.4	8.3	8.5	31.2
SD	3.6	2.8	2.9	7.8	3.7	2.8	3.1	8.0

Medium (N = 311) (N = 309)

Percentile	Form A Poll.	SGT/ER	Pop.	Total	Form B Poll.	SGT/ER	Pop.	Total
90	17	11	10	37	19	11	11	39
75	15	9	9	32	16	9	9	34
50	13	8	7	26	13	7	7	27
25	10	5	4	21	10	6	6	22
10	8	4	3	17	8	4	4	18
Mean	12.6	7.6	6.7	26.9	13.2	7.4	7.4	28.0
SD	3.5	2.9	2.9	7.6	4.0	2.8	2.7	7.9

Large (N = 258) (N = 273)

Percentile	Form A Poll.	SGT/ER	Pop.	Total	Form B Poll.	SGT/ER	Pop.	Total
90	17	11	10	38	18	11	11	38
75	15	9	9	32	15	9	9	31
50	12	7	7	25	12	7	7	25
25	9	5	4	20	9	5	4	19
10	7	4	3	16	7	4	3	16
Mean	12.1	7.3	6.6	26.0	12.1	7.1	6.8	26.1
SD	3.9	2.9	3.0	8.4	4.1	2.8	3.3	8.7

Table 6b.

Form C. Selected Percentiles, by Community Size

Small (N = 725)

Percentile	AP	LP	NP	WP	Pop	SGT	ER
90	24	23	15	26	21	16	21
75	21	21	12	24	16	13	19
50	18	18	8	20	12	9	17
25	15	15	5	17	7	6	14
10	13	13	2	14	3	3	12
Mean	18.2	17.8	8.7	20.1	12.1	9.6	16.6
SD	4.4	4.2	5.0	4.5	6.9	5.1	3.7

Medium (N = 277)

Percentile	AP	LP	NP	WP	Pop	SGT	ER
90	25	23	16	27	19	16	21
75	22	20	13	24	16	12	19
50	19	17	9	20	12	9	17
25	16	15	5	17	7	6	14
10	13	13	3	14	3	4	12
Mean	19.1	17.7	9.4	20.3	11.5	9.4	16.5
SD	4.4	3.9	5.1	4.7	6.1	4.5	3.7

Large (N = 279)

Percentile	AP	LP	NP	WP	Pop	SGT	ER
90	26	22	20	25	22	15	21
75	23	19	15	22	16	12	19
50	20	17	10	19	12	8	16
25	17	15	6	16	7	5	13
10	13	11	3	14	4	2	10
Mean	19.4	16.7	10.6	18.8	12.1	8.7	15.6
SD	5.0	4.1	6.1	4.6	6.6	4.9	4.3

Table 6c.

Form D: Selected Percentiles, by Community Size

Small (N = 717)

Percentile	AP	LP	NP	WP	Pop	SGT	ER	Total Env.	Total Social
90	14	14	11	14	14	13	14	88	66
75	13	12	8	12	11	11	13	76	56
50	10	9	5	10	8	8	10	60	42
25	8	7	3	8	6	6	8	48	28
10	5	5	2	5	3	3	6	37	16
Mean	10.0	9.2	6.0	9.2	8.3	8.2	10.1	61.6	42.0
SD	3.3	3.4	3.6	3.3	3.8	3.5	3.1	19.7	19.4

Medium (N = 271)

Percentile	AP	LP	NP	WP	Pop	SGT	ER	Total Env.	Total Social
90	14	13	10	14	12	12	13	81	76
75	12	11	8	12	10	10	12	70	61
50	9	8	5	9	7	7	9	54	50
25	7	5	2	7	5	5	7	43	34
10	4	3	1	4	3	3	5	27	23
Mean	9.0	8.1	5.4	9.0	7.2	7.2	9.2	55.2	48.9
SD	3.7	3.7	3.5	3.6	3.5	3.5	3.3	20.4	20.2

Large (N = 262)

Percentile	AP	LP	NP	WP	Pop	SGT	ER	Total Env.	Total Social
90	13	12	10	13	12	11		76	75
75	11	9	7	10	9	9		61	64
50	9	7	5	8	7	6		49	51
25	6	5	3	6	5	4		38	36
10	3	3	1	4	3	2		26	25
Mean	8.3	7.2	5.1	8.0	7.0	6.4	8.3	50.2	50.6
SD	3.7	3.4	3.2	3.4	3.4	3.2	3.4	19.0	19.1

inspection of Tables 5a through 5d suggests this. There does appear to be some relationship between community size and test performance, in that there was superior performance in the small (under 40,000) communities. At the same time, performance in the medium and large communities appears to be about the same. It will be recalled that the origianl intention was to provide region-wide information. In view of the results of the norming, this appears to have been a reasonable approach. Hence the recommendation is that one use the norms appropriate to the size of the community in which he is located in order to interpret SEAT results. Naturally, individual schools and systems are encouraged to develop their own local norms and comparisons both at a given point in time and as time and environmental education advance.

Item Statistics

"P-values" for the individual items are presented in Tables 7a through 7c. A "P-value" is the percentage of examinees who selected the "correct" response. For cognitive tests it is an "item difficulty index." Because, however, there are no truly "correct" or "incorrect" responses to the affective items, the term "P-value" is here employed.

These indices were first determined for the pretesting sample, the students who took the preliminary forms. This was done for purposes of item selection. It was through the use of this information, for instance, that Forms A and B were selected to be interchangeable. Also, one normally excludes extremely easy or extremely difficult items. However, this was not always done. Note, for instance, Item 24 in Form A. Only 15 percent of the students in the norming sample responded

Table 7a.

Forms A and B: P-Values and Keys

ITEM No.	Pollution FORM A Key	P	FORM B Key	P	ITEM No.	SGT/ER FORM A Key	P	FORM B Key	P	ITEM No.	Population FORM A Key	P	FORM B Key	P
1	4	88	1	89	25	2	52	3	33	41	4	32	2	75
2	3	82	2	77	26	1	55	2	48	42	1	80	3	69
3	1	76	2	84	27	2	49	2	58	43	4	63	3	72
4	4	75	1	70	28	3	91	1	78	44	2	63	1	46
5	2	79	4	72	29	4	70	4	69	45	3	60	4	49
6	3	67	2	59	30	1	61	1	73	46	2	52	4	41
7	1	55	3	71	31	4	61	3	57	47	1	52	4	40
8	2	72	3	63	32	1	64	3	61	48	4	39	3	38
9	2	49	4	76	33	4	43	4	51	49	1	45	2	56
10	4	61	1	69	34	2	49	2	54	50	3	47	4	71
11	3	41	3	53	35	1	44	2	48	51	4	53	2	33
12	1	54	1	46	36	3	35	3	44	52	4	38	4	52
13	1	68	2	57	37	2	45	3	28	53	2	27	1	34
14	3	58	4	45	38	4	51	1	33	54	3	36	2	29
15	4	51	1	51	39	1	30	4	33	55	1	42	1	41
16	4	53	1	46	40	3	28	3	18	56	2	23	3	42
17	2	45	4	51										
18	1	60	3	40										
19	1	44	2	31										
20	3	38	2	44										
21	4	60	4	38										
22	3	45	1	39										
23	1	30	3	59										
24	1	15	4	35										

Table 7b.

Form C: P-Values

ITEM NO.	Subtest A	L	N	W	P	S	E
1	72	27					
2						12	88
3		87	12				
4					73	26	
5			08	91			
	A	L	N	W	P	S	E
6				90	10		
7	89		10				
8					34		65
9		26		74			
10				79		21	
	A	L	N	W	P	S	E
11			36		64		
12				85			15
13	63			36			
14			42			57	
15		86			14		
	A	L	N	W	P	S	E
16			18				82
17	73				27		
18		82				18	
19	87					12	
20		23					77
	A	L	N	W	P	S	E
21	72						28
22	69						31
23		68					31
24	74					25	
25		83				16	
	A	L	N	W	P	S	E
26	79				21		
27			25				74
28		66			33		
29			58			42	
30	38			62			
	A	L	N	W	P	S	E
31				83			17
32			37		62		
33				82		18	
34		35		65			
35					35		65

NO.	Subtest A	L	N	W	P	S	E
36	89		10				
37				76	24		
38			19	80			
39					56	43	
40		83	16				
	A	L	N	W	P	S	E
41						20	79
42	31	68					
43	61	38					
44						15	85
45		87	13				
	A	L	N	W	P	S	E
46					55	45	
47			29	70			
48				77	23		
49	78		21				
50					28		71
	A	L	N	W	P	S	E
51		35		64			
52				87		12	
53			43		56		
54				52			47
55	48			51			
	A	L	N	W	P	S	E
56			46			52	
57		70			29		
58			16				83
59	79				20		
60		78				21	
	A	L	N	W	P	S	E
61	76					23	
62		70					29
63	61						38
64	46						53
65		44					54
	A	L	N	W	P	S	E
66	76					22	
67		69				29	
68	68				31		
69			39				60
70		60			39		

NO.	Subtest A	L	N	W	P	S	E
71			43			55	
72	38			61			
73				39			59
74			50		48		
75				59		39	
	A	L	N	W	P	S	E
76		40		58			
77					45		52
78	87		11				
79				62	35		
80			30	67			
	A	L	N	W	P	S	E
81					48	49	
82		58	39				
83						40	57
84	49	48					
85	45	52					
	A	L	N	W	P	S	E
86						37	60
87		60	37				
88					54	42	
89			33	64			
90				53	44		
	A	L	N	W	P	S	E
91	76		21				
92					31		65
93		31		64			
94				68		27	
95			45		49		
	A	L	N	W	P	S	E
96				39			56
97	45			50			
98			43			52	
99		47			48		
100				44			51
	A	L	N	W	P	S	E
101			35		60		
102		67				27	
103	57					38	
104		64					31
105	43						51

Table 7c.

Form D: P-Values

ITEM No.	Subtest A	L	N	W	P	S	E	Soc.
1	70							30
2	67							33
3		41						57
4			64					35
5				66				33
	A	L	N	W	P	S	E	Soc.
6					20			79
7						73		26
8						41		59
9				24				76
10		40						60
	A	L	N	W	P	S	E	Soc.
11	33							67
12	70							29
13		82						18
14					86			14
15						69		31
	A	L	N	W	P	S	E	Soc.
16			37					62
17	77							23
18		18						82
19					39			60
20		49						50
	A	L	N	W	P	S	E	Soc.
21				68				32
22	48							52
23		67						32
24				28				72
25						49		51
	A	L	N	W	P	S	E	Soc.
26					68			31
27			60					40
28		48						51
29						74		26
30					35			65
	A	L	N	W	P	S	E	Soc.
31				62				37
32			60					40
33		59						40
34		63						35
35	78							21

ITEM No.	Subtest A	L	N	W	P	S	E	Soc.
36	49							51
37		55						45
38			54					45
39				63				36
40					45			54
	A	L	N	W	P	S	E	Soc.
41					74			25
42						45		54
43						68		31
44				67				32
45		54						46
	A	L	N	W	P	S	E	Soc.
46	67							32
47		32						67
48			58					41
49					42			57
50						63		36
	A	L	N	W	P	S	E	Soc.
51			70					29
52	61							38
53		34						65
54					58			42
55		43						56
	A	L	N	W	P	S	E	Soc.
56				38				61
57	69							30
58		34						65
59				60				39
60						85		14
	A	L	N	W	P	S	E	Soc.
61					53			45
62				69				29
63		38						60
64						74		24
65					52			46
	A	L	N	W	P	S	E	Soc.
66				53				44
67			76					23
68		23						75
69	74							24
70	63							35

ITEM No.	Subtest A	L	N	W	P	S	E	Soc.
71	68							31
72		68						30
73			30					67
74				56				42
75					66			32
	A	L	N	W	P	S	E	Soc.
76					49			48
77						67		31
78						67		30
79				48				50
80		32						65
	A	L	N	W	P	S	E	Soc.
81	66							31
82		68						29
83			77					20
84					42			54
85						60		37
	A	L	N	W	P	S	E	Soc.
86			55					41
87	64							32
88		24						72
89					44			53
90		60						36
	A	L	N	W	P	S	E	Soc.
91				51				44
92	72							24
93		35						61
94				48				48
95						53		43
	A	L	N	W	P	S	E	Soc.
96					57			39
97			63					33
98		63						32
99						66		30
100					39			56
	A	L	N	W	P	S	E	Soc.
101				60				35
102			65					30
103		21						74
104		55						39
105	56							38

correctly to it. (In the pretest group, it was 18 percent.) Despite this performance, which is less than that which would have been obtained if the students had merely guessed randomly, the item was included because it asked a fundamental question about eutrophication. If SEAT is to provide baseline data, such an item had to have been included. The hope is that in years to come, students will respond correctly to it in much higher numbers. Table 7a also indicates the "key," or correct response for each of the items in the cognitive tests. This information is intended for users of SEAT. Naturally, it, as is the case of the content of the tests themselves, must be kept confidential.

Inspection of Tables 7b and 7c will reveal the patterns used in the construction of the affective tests. A systematic rotating design was employed to prevent extraneous mental sets from affecting the results.

Reliability

There are two basic approaches to estimating the "reliability" of a test. One is to investigate its stability, to ask, "Does it matter when people take the test?" The other deals with the test's consistency, essentially asking, "Does it matter which particular set of questions (assuming, of course, that content validity is maintained) are included in the tests?" The norming of SEAT was designed to enable both aspects of reliability to be explored. The results of these explorations are summarized in Table 8.

First, consider the internal-consistency estimates. These are represented by the Kuder-Richardson Formula 20 reliability coefficients. They are equivalent to the values that would be obtained if one took

Table 8. Summary of Reliability Estimates

		KR20[1]	Test-Retest[2]	Alt. Form[3]
Form A	Poll	.67	.69	.55
	SGT/ER	.61	.73	.50
	Pop	.64	.67	.52
	Total	.83	.79	.67
Form B	Poll	.69	.72	.55
	SGT/ER	.60	.67	.50
	Pop	.67	.70	.52
	Total	.84	.76	.67
Form C	A	.75	.53	
	L	.66	.53	
	N	.82	.75	
	W	.74	.57	
	Pop	.88	.71	
	SGT	.78	.70	
	ER	.60	.54	
Form D	A	.79	.68	
	L	.78	.74	
	N	.80	.72	
	W	.78	.67	
	Pop	.80	.70	
	SGT	.78	.72	
	ER	.75	.57	
	Env. Tot.	.95	.78	
	Soc. Tot.	.95	.72	

[1] Based on 1,282 to 1,345 examinees

[2] Based on 84 to 93 examinees

[3] Based on 290 examinees

all of the possible ways to divide a test in half, estimated the reliabilities therefrom, and averaged them. These obtained ("KR20") estimates are in the first column of Table 8.

Next, some of the examinees took the same form twice, with approximately a one-week interval between testings. (A one-week lapse is most common in investigations of test stability.) The correlations between scores on these two testings are presented in Column 2. They are sufficiently high to support the idea that the particular time at which one takes a form of SEAT is of little consequence. It should be noted incidentally that there were no important differences in overall level of performance between the first and the second testings of those who took the same form twice. That is, although the stability, "test-retest reliability," of a test does not take average performance into account, the scores obtained at the second testing were essentially no higher (or lower) than those on the first.

Finally for Forms A and B, it was appropriate to investigate the stability and consistency simultaneously. This is done by having examinees take one form at the first testing and then, after an interval, take the other, alternate, form. The results of this are in Column 3.

Appendix A

Authors

Eric F. Gardner; Professor of Education and Psychology, Chairman, Psychology Department[1]

David J. Kleinke; Assistant Professor (Measurement and Statistics)

Robert Cohen; Adjunct Associate Professor (Community Psychology)

Consultants and Item Writers

Richard Beischline; Executive Secretary, Clean Air Commission

James R. Manwaring; Former Director, Environmental Studies Institute

John McManus; Graduate Student (Social Psychology)

Carol R. Mercurio; Graduate Student (Social Studies Education)

James L. Newman; Assistant Professor (Geography)

James M. Oswald; Assistant Professor (Social Studies Education)

William C. Ritz; Director, Environmental Studies Institute

Rodney G. Roberts; Graduate Student (Instructional Technology)

Virginia Strong; Former High School Teacher, Chittenango, N. Y.

John L. Sullivan; Professor (Civil Engineering)

Donald G. Trites; Graduate Student (Curriculum)

Volker Weiss; Professor (Chemical Engineering)

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[1] Unless otherwise noted, institutional affiliation is Syracuse University

Appendix B

Connecticut	
Warren Harding H. S.	Bridgeport
Simsbury H. S.	Simsbury
Maine	
Bangor H. S.	Bangor
Dexter Regional H. S.	Dexter
Houlton H. S.	Houlton
Lewiston H. S.	Lewiston
Mattanowcook Academy	Lincoln
Portland H. S.	Portland
Westbrook H. S.	Westbrook
Wiscassett H. S.	Wiscassett
Massachusetts	
East Boston H. S.	Boston
North Framingham H. S.	Framingham
Gardner H. S.	Gardner
Georgetown H. S.	Georgetown
Hudson H. S.	Hudson
Lynnfield H. S.	Lynnfield
Newton Technical H. S.	Newton
Triton Regional H. S.	Rowley
Sharon H. S.	Sharon
Watertwon H. S.	Watertown
Bartlett H. S.	Webster
New Hampshire	
Manchester West H. S.	Manchester
Inter-Lakes H. S.	Meredith
New Jersey	
Bernardsville H. S.	Bernardsville
Lincoln H. S.	Jersey City
North Plainfield H. S.	North Plainfield
Parsippany High East	Parsippany
Pemberton Township H. S.	Pemberton
New York	
Albany H. S.	Albany
Bayside H. S.	Bayside
Onteora	Boiceville
Broadalbin C. S.	Broadalbin
Prospect Heights H. S.	Brooklyn
West Genesee H. S.	Camillus
Campbell H. S.	Campbell
Catskill Sr. H. S.	Catskill
Coxsackie-Athens H. S.	Coxsackie
South Side H. S.	Elmira
Friendship C. S.	Friendship
Glens Falls Sr. H. S.	Glens Falls

Appendix B (Cont.)

New York	
Levittown H. S.	Levittown
Mattituck Union Free School	Mattituck
New York Mills H. S.	New York Mills
Oxford Academy	Oxford
Benjamin Franklin H. S.	Rochester
Rome Free Academy	Rome
West Lake Sr. H. S.	Thornwood
Ticonderoga C. S.	Ticonderoga
West Hempstead H. S.	West Hempstead
Pennsylvania	
Cedar Cliff H. S.	Camp Hill
Cochranton Area H. S.	Cochranton
Bensalem H. S.	Cornwell Heights
Fairview H. S.	Fairview
Richland Sr. H. S.	Gibsonia
Kennett Consolidated H. S.	Kennett Square
Lake-Lehman H. S.	Lehman
Muncy H. S.	Muncy
John S. Fine H. S.	Nanitcoke
Central Boys H. S.	Philadelphia
West Scranton H. S.	Scranton
Shamokin Area H. S.	Shamokin
Sharpsville Area Sr. H. S.	Sharpsville
Rhode Island	
Central Falls H. S.	Central Falls
Central H. S.	Providence
Vermont	
Danville H. S.	Danville
Richford H. S.	Richford