HIGH SCHOOL PHYSICS IN THE STATE OF INDIANA.¹

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INTRODUCTORY REMARKS.

STATEMENT OF THE OUTLINE. Progress in any line of work must result largely from the efforts of the individuals who labor in that particular field. It is one thing to desire merely a change from the customary usage, and quite another to seek for the facts upon which to base cautiously, a definite and permanent improvement. This investigation is the result of a desire to learn the general practise in the teaching of secondary school physics in the state of Indiana. The results are now offered to science instructors, in the hope that the study may contain something of general interest. This article assumes that the reader knows the shortcomings of the questionnaire method and can judge for himself the amount of confidence to place in it. In this case, however, there was no other plan available for obtaining the necessary information. The replies to the questions have been arranged in a tabulated form, and have been analyzed in a manner that reveals, we trust, the actual status of the teaching of high school physics in Indiana for the year 1911 and 1912.

SOURCES OF MATERIAL. The data was obtained by correspondence with the superintendents and principals of the state. The physics teachers were expected to answer the questions, but, in some cases, either the superintendent or the principal filled out the blanks. But, even if one takes into consideration these and other possible sources of error, some facts appear significantly important.

GENERAL IMPRESSIONS OF DATA. There is a wide variation in the teaching of high school physics in the state of Indiana. This appears in the total amount of time devoted to the subject, the length of the laboratory period, and the methods of instruction. Although over sixty per cent are in favor of segregation, there is at present no serious attempt to differentiate the subject matter for boys and girls. It is not the largest and best equipped schools ordinarily that make physics an optional subject. As has been pointed out previously in SCHOOL SCIENCE AND MATHEMATICS, schools differ widely in the number of failures in physics. The lecture demonstration is not in general use in this state.

¹This report is a portion of a more extensive study now in progress. The work was begun under the supervision of the School of Education of Indiana University.

Although the present text-books are better adapted to boys than to girls, no substantial modification in the subject matter is desired.

COLLECTION OF DATA.

The list of questions, which will be given later, was sent to sixty-five superintendents of the larger *commissioned* high schools in the state of Indiana, late in the spring of 1912. Thirty-two replies were received. Again in the fall of 1912, thirty letters were mailed to the principals over the state and twenty-seven answers were returned. All of these reports are given in the accompanying table of data, as nearly verbatim as space will permit. It was necessary in certain instances (the question mark indicates that) to eliminate shades of meaning or extreme exceptions, but every effort has been made to exclude personal equations. It must be said, however, that in a few cases the reader might secure a slightly different interpretation from that of the author, if the entire reply were recorded.

Every high school in this list is *accredited* by the North Central Association of Colleges and Secondary Schools,² except schools numbered 1, 6, 13, 17, 18, 22, 23, 25, 26, and 27. It is interesting to note in this connection that whereas the state of Indiana has fifty-four high schools that are members of the North Central Association of Colleges and Secondary Schools; Michigan has eighty-five; Ohio has one hundred and thirty-one; and Illinois has one hundred and thirty-three.

ANALYSIS OF RESULTS³.

1. In which year is physics given?

- (a) Fourth year, 52 per cent.
- (b) Third year, 30 per cent.
- (c) Third and fourth years, 12 per cent.
- (d) Two schools did not report.
- (e) One school offers the subject in both the first and third years.

2. Is physics prescribed or optional? (Any choice is regarded as making the subject optional.)

- (a) Prescribed, 35 per cent.
- (b) Optional, 61 per cent.
- (c) Two schools failed to answer this question.

²List of schools accredited by the North Central Association of Colleges and Secondary Schools (Adopted March 22, 1912).

³The percentages are calculated either on the basis of fifty-nine schools, or on the number of schools reporting upon the particular question.

Per cent of Failures.	Do You Have a Definite Plan for Caring for Failing Pupils?	Outline the Plan Briefly.	Do You Have a Plan for Caring for Students of Different Ability?	Is There Any Topic Commonly Discussed in High School Texts Which Should be Dropped?	Are There Topics Which Should Be Treated Which Are Not Mentioned in the Present Textbooks?	Is the Average Text Too Difficult?	
						Girls.	Boys.
10-15%	No.		Weak students do fewer experiments.	Topics selected according to the class.	Yes, in segregated classes.	Yes (?)	(?)
10-15%	Give special aid.	Meet the students outside of class.	Use qualitative experiments.	Yes.	Yes.	Yes.	Yes.
5%	No.		Not the same standard for all pupils.	No.	Historical side, practical affairs.	No.	No.
5-8%	Yes.	Individual attention in laboratory.				No.	(?)
10%	Yes.	Extra work outside of school.	Yes.	Yes.	Yes.	Yes.	Yes.
5%	Yes.	Give a summer course.	No.	Yes.	No.	No.	No.
10%	Yes.	Condition students and give special work.	No.	No.	No.	Yes.	No.
5%	Yes.	Extra work from teacher.	No.	No.	No.	Yes.	No.
6%	No.						
10%	No.		Yes.		No.	Yes.	No (?)
	Individual attention and extra hours.		No.	No.		Yes.	No.
25%	No.		No.	Omit the subject of Light.	No.	Yes.	No.
14%	Yes.		Extra work.			Yes.	Yes.
8%	No.		No.	Too much material in most texts.		Yes.	No.
5%	No.		No.	Abridge Sp. Gravity, Sound, and Properties of Matter.	For boys, strength of materials.	No.	No.
None.	Yes.	Students report at definite periods.	Give adv. students more lab. work.		Yes.		Yes.
10%	No.		No.	No.	No.	No.	No.
None.	No.		No.	No.	No.	Yes.	Yes.
10%	No.					No.	No.
None.	Yes.	Individual attention.	Yes.	No.		No.	No.
No data.	No.		No.	Yes.	Yes.	Yes.	Yes.
6%	Yes.	Private instruction.	No.	No.	Yes.	Yes.	No.
		Give students another science.					
None.	Yes.			No.	X-Rays, batteries, and mechanics.	Yes.	No.
10%	No.			No.		No.	No.
	Yes.	Average: lab., prob., recitation, exam.	Yes.	Depends upon school apparatus.	Elementary design.	Yes.	No.
	Yes.	Students report at end of day.					
1%	No.		No.	Hard problems.	Practical affairs.	Yes.	Yes.
		Extra period at end of day.	Yes.	No.	No.	No.	No.
17%	Yes.			Technical subjects.	Practical affairs.	Yes.	Yes.
15%	No.	No.	No.	No.	Modern applications.	Yes.	No.
5%	No.	None.	No.	No.	Modern applications.	Yes.	Yes.
10%	None.		No.	Accelerated motion.	No.	Yes.	Yes.
20%							
3.6%, 1912-13.	No.	(No rank failures)	No.	Some parts of Light.		Yes.	No.
5 to 10%		Extra attention.	No.		None.	No.	No.
				No.		No.	No.
10 to 12%	Yes.	On indication of poor work, special atten.	Standard and optional experiments.	Extreme technical discussions.	None.	No.	No.
5%	No.			No.	Modern applications.	No.	No.
None.					Weather maps.	No.	No.
None (?)						No.	No.
5%					Practical problems.	Yes.	No.
						No.	No.
7%	Yes.	Night school.	Summer vac. school.	Static electricity.	Modern applications.	Yes.	No.
10%	No.		No.	Elec. potential not presented so students can understand it.		No.	No.
10%						(Newer books)	
None.						Yes.	Yes.
None.					Modern applications.	Yes (?)	No.
25%	Yes.	Individual attention.				No.	No.
None.	Yes.	Extra time.				Yes.	No.
						No.	No.
None.			Round table discuss.	Problems in Electricity and Heat.		Yes.	Yes.
10%			Extra conf. period.			Yes.	No.
None.					Modern applications.	No.	No.
5%					Agricultural Physics.	No (?)	No.
						Yes.	No.
0% (?)						No.	No.
10%	Yes.	Extra period.	No.	No.		Yes.	No.
					Economic side of physics.	Yes.	Yes.
None.	No.		No.	Part of Electricity.		Yes.	No.
None.	No.		Yes, extra instructor for this work.	No.	Qualitative work.	No.	No.
6%, 10 to 15%*	Yes.	Students are reported def. on fail. to recite.	Yes (personal suggestion).	No, if students expect to enter college.	Illust. should be drawn from the locality.	Yes.	No.
16%	Yes.	Condition student and require extra work.					

Prescribed or Optional	Adopted Text	Name of Bound Manual	Experiments, Various Texts	Written Directions	Typewritten Experiments	Other Methods	No. per Class Each Week	Length of Period	No. Lab. Periods per Class Each Week	Length of Lab. Period	Total No. Minutes Each Week	Is the Lecture Demonstration a Success With High School Students?	Do all Students work on the Same Experiment at the Same Time?	Do You Favor the Plan of Different Experiments at the Same Period?	Do You Give Boys and Girls Different Courses in Physics?	Would You Segregate the Sexes If Conditions Would Permit?	Total Enrollment in High School	How Many Boys Take Physics?	How Many Girls Take Physics?
Prescribed	Car. & C., Gorton			Yes	Yes		3	40	2	80	280	No	Yes	Good work may be done this way.	No	Yes	500 (?)	32	51
Prescribed	Car. & C.	Chute	Yes			Oral directions	5	40	Average 2 1/2	40	300	No (?)	No	No	No	No	155	17	22
Prescribed	Hoadley		Yes				3 & 4	40	1 & 2	Varies	200 (?)	No	No	Yes	No	Yes	264	20	30
Optional	M. & G.	M. & G.		Yes	Yes		4	30	7	42	420	With elective students	As much as possible	No	No	Yes	500	35	3
Optional	Car. & C.	Chute	Yes	Yes	Yes		Average 2 1/2	40	2	80	260	No	No	Yes	No	Yes	237	17	2
Physics or Chemistry	M. & G.	M. & G.					3	80	2	80	400	Yes	No	Yes	No	No	217	40	40
Physics or Chemistry	Car. & C.	Loose leaf manual					3	40	2	80	400	To a limited extent	No	Yes	No	Yes	240	17	5
Optional	M. & G.	M. & G.					1	40	4	80	360	Yes, under the present condition	Yes	No	No	Uncertain	363	24	26
Optional	Adams	Adams	Yes	Yes	Yes		2 & 3	40	2	85	315	Yes, as used	No	Yes (?)	To a limited extent	Yes	251	9	5
Optional	Adams	Chute	Yes	Yes			3	45	2	90	315	No	No	Yes	No	Yes	225	15	None
Optional	Car. & C.	M. & G.					3	45	2	90	315	No	Two sets	No	No	Yes	280 (?)	15	12
Optional	Hoadley				Yes		3	40	2	80	280	No	Yes	Yes	No	Yes	254	11	18
Optional	M. & G.	M. & G.	Yes				3	40	2	80	280	No	No	Yes	No	Yes	200	10	4
Optional	M. & G.	M. & G.					2	45	2 (?)	90 (?)	270	No	No	No	No	Yes	240	10	2
Physics or Chemistry	Hoadley	Hoadley	Yes				5	45	2	90	405	No	No	Yes, for exp. which follow text work	No	Yes, for first half year	345	22	18
Optional	Car. & C.	Atk. Mentzer & Grover					5	40	4	40	360	Yes	No	Yes	No	Girls do not take physics	1000	32	None
Optional	M. & G.	M. & G.	Yes				3	40	2	85	315	No	Yes	No	No	Yes	550	30	20
Prescribed	Mumper	None	None	None	None	None	5	40	None		200	No	No	No	No	Uncertain	381	16	8
Prescribed	Car. & C.	Chute	None	None	None	None	5	45	5	45	450	No	No	No	No	Yes	304		
Prescribed	M. & G.	M. & G.	Yes	Yes	No		3	45	2	90	315	No	No	Yes	No	No	138	10	14
Prescribed	Hoadley	Use own text	Yes	Yes	Yes		5	40	1	40	240	No	No	Yes	No	Yes, in physics	165	8	20
Prescribed	M. & G.	None	Yes	Yes	No		4	40	1	40	400	No	Yes	Yes	No	Yes	219	14	16
Prescribed	M. & G.	M. & G.	Yes	Yes			2	40	4	80	400	Yes	No	Yes	No	Yes	153	8	None
Prescribed	M. & G.		Yes	Yes	Yes	Yes	5	40	2	40	320	No	Yes	No	No	No	150	16	15
Prescribed	M. & G.						5	45	2	Varies	225	Yes	No	Yes	No	Yes	196	23	3
Prescribed	M. & G.		A few	Yes	Yes		1 to 3	40	1 to 3	80	200	Yes	No	No	No	Uncertain	223		
Prescribed	M. & G.	M. & G.					3	45	2	90	315	Yes, to a certain extent	No	Yes	No	Yes	340	20	12
Optional	Hoadley		Yes	Yes	Yes	Loose leaf notebook	2	40	3	80	320	No	Yes	Yes	No	Yes	243	21	12
Optional	M. & G.		Yes	Yes	No		2	40	3	90	360	No	No	Yes	No	Yes	498	30	6
Prescribed	M. & G.	M. & G.	Yes	Yes	No		3	40	2	80	280	No	No	Yes	No	Yes	217	20	21
Prescribed	Gorton	None	No	Yes	Yes		6	40	2	80	480 (?)	No	No	To a certain extent	No	Yes	630	About 45	About 55
Optional with girls	Hoadley	Carter					Not regular	45	2	45	270	Yes	Yes	No	No	Yes, with different texts	860	75	70
Optional	Gorton		Yes	Yes			5	45	1	90	315	Yes (?)	No	No	No	Yes	150	12	3
Optional	Car. & C. (Revised)		Yes		Yes		3	40	4	40	280	Not regularly	No	Yes	No	No	333	17	13
Prescribed	Linebarger							40	About 3	40	225 (?)	Yes	No	No	No	No	439	25 (?) All graduates	25 (?) All graduates
Optional	Gorton (M. & G., Car. & C.)	M. & G., Chute		Yes	Yes		2 & 3, Double periods	90	3 & 2	90	450	No (Not in college style)	No	No	No	Practically the same	1600	70	80
Prescribed in some courses	Car. & C.		Yes		Yes		3	45	3	45	270	Yes (?)	No	Yes	No	Not in this school	180	15	8
Optional	M. & G.	M. & G.	Yes				3	40	2	80	280	No	No	Yes	No	No	137	4	0
Optional	M. & G.	M. & G.	Yes				3	45	2	90	315	Yes (?)	No	No	No	Yes	141	14	1
Optional	Car. & C. (Revised)	M. & G.	Yes	Yes	Yes		3	40	2	80	280	No	Yes (?)	No	No	No	825	35	8
Optional	Gorton	Chute	Yes	Yes			3	85	2	85	450, 144 (1/2 yr.)	No	No	Yes	No	Yes (in 9th year) No	200	40	16
Prescribed	Hoadley				Yes		3	45	2	90	315	To a limited extent	No	Yes	No	No (Not in a one year course)	454	25 (?) All graduates	25 (?) All graduates
Prescribed	Linebarger	Linebarger					5	40	No regular program	40	200	Yes	No	No	Yes	No	275	15	15
Optional	Adams	Adams	Yes				2 & 3	45	4	45	180	Yes	No	No	No	Uncertain	13	1	1
Optional	Car. & C.	None	Yes	Yes	Yes		3 & 4	45	2 & 1	45	225	Yes	No	Yes	No	No	205	8	12
Optional	M. & G.	M. & G.	Yes	Yes			3	45	2	45	225	Yes	Yes	No	No	Yes	120	8	3
Optional	Hoadley Brief C	Hoadley	Yes	No	No	Original suggestion	3	85	2	85	425 (?)	No	No	Yes	No	Yes	217	17	5
Optional	Mann & Twiss	Coleman	Yes	Yes			2	40	2	90	240	No	No	Yes	(No girls)	Yes	128	8	None
Optional	Car. & C. (Revised)		Yes	Yes			4	40	5	40	360	No	No	Yes	Yes	Yes	96	8	2
Optional	Linebarger	Linebarger		Yes		Optional experiments	3	44	2	88	308	To a limited extent	No	Yes	No	No (?)	304	20	20
Optional	Hoadley	Hoadley	Yes	Yes	Yes		3	40	2	80	280	Yes (?)	No	Yes	No	No	470	15	None
Prescribed	M. & G.	M. & G.					2 & 3	40	2	80	200	Yes	No	Yes	No	Yes	248	21	13
Optional	Car. & C. (Revised)	Loose leaf manual					3	40	2	80	280	No	No	No	No	No	206	9	2
Optional	M. & G.	M. & G.	Yes	Yes			3	40	2	80	200	Yes	Yes	No	No	Yes	135	10	0
Optional	Car. & C.		Yes	Yes	No	None	4	40	5	40	360	No	Yes	No	No	No	417	14	8
Prescribed	M. & G.	M. & G.	Yes	Yes			3	40	2	80	200	Yes	No	Yes	No	Yes	278	22	20
Prescribed	M. & G.	M. & G.					3	45	2	90	315	No	Yes	No	No	Yes	380 (?)	90	None
Prescribed	M. & G.	M. & G.	Coleman, Adams Hoadley, Linebarger	Yes	Yes	Oral directions	At least 3	45	2	90	450	No	No	No	No	Yes	425	19	32

15% fail in part of the work.

Name of the High School	Number of School	Physics, Year Given	Prescribed or Optional	Adopted Text	Name of Bound Manual	Experiments, Various Texts	Written Directions	Typewritten Experiments	Other Methods	No. Oral Discussions per Class Each Week	Length of Period	No. Lab. Periods per Class Each Week	Length of Lab. Period	Total No. Minutes Each Week	Is the Lecture Demonstration a Success With High School Students?	Do all Students work on the Same Experiment at the Same Time?
Logansport	1	3	Prescribed	Car. & C., Gorton			Yes	Yes		3	40	2	80	280	No	Yes
Name withdrawn	2	3	Prescribed	Car. & C.	Chute	Yes			Oral directions	5	40	Average 2½	40	300	No (?)	No
Jeffersonville	3	3	Prescribed	Hoadley		Yes				3 & 4	40	1 & 2	Varies	200 (?)	No	No
Name withdrawn	4	3	Optional	M. & G.	M. & G.		Yes	Yes		4	30	7	42	420	With elective students	As much as possible
Name withdrawn	5	3	Optional	Car. & C.	Chute	Yes	Yes	Yes		Average 2½	40	2	80	260	No	No
Name withdrawn	6	4	Physics or Chemistry	M. & G.	M. & G.					3	80	2	80	400	Yes	No
Bedford	7	4	Physics or Chemistry	Car. & C.	Loose leaf manual					3	40	2	80	400	To a limited extent	No
Crawfordsville	8	4	Optional	M. & G.	M. & G.					1	40	4	80	360	Yes, under the present condition	Yes
Connersville	9	4	Optional	Adams	Adams	Yes	Yes	Yes		2 & 3	40	2	85	315	Yes, as used	No
Name withdrawn	10	3	Optional	Adams	Chute	Yes	Yes			3	45	2	90	315	No	No
La Porte	11	4	Optional	Car. & C.	M. & G.					3	45	2	90	315	No	Two sets
Wabash	12	3	Optional	Hoadley				Yes		3	40	2	80	280	No	Yes
Linton	13	4	Optional	M. & G.	M. & G.	Yes				3	40	2	80	280	No	No
Hammond	14	4	Optional	M. & G.	M. & G.					2	45	2 (?)	90 (?)	270	No	No
Frankfort	15	4	Physics or Chemistry	Hoadley	Hoadley	Yes				5	45	2	90	405	No	No
Wiley H. S., Terre Haute	16	3 & 4	Optional	Car. & C.	Atk. Mentzer & Grover					5	40	4	40	360	Yes	No
Marion	17	3	Optional	M. & G.	M. & G.	Yes				5	40	2	85	315	No	No
Vincennes	18	4	Prescribed	Mumper	None	None	None	None	None	3	40	None	45	200	No	Yes
Michigan City	19	4	Prescribed	Car. & C.	Chute					3	45	3	45	450	No	No
Franklin	20	Physics not offered in this high school								3	45	2	90	315	No	No
Attica	21	4	Prescribed	M. & G.	M. & G.	Yes	Yes	No		3	45	2	90	315	No	No
Rockport	22	4	Prescribed	Hoadley	Use own text	Yes	Yes	Yes		5	40	1	40	240	No	No
Princeton	23	4	Prescribed	M. & G.	None	Yes	Yes	No		4	40	1	40	400	No	Yes
Whiting	24		Prescribed	M. & G.	M. & G.	Yes	Yes			2	40	1	80	400	Yes	No
Delphi	25	4	Prescribed	M. & G.		Yes	Yes	Yes	Yes	3	40	2	40	320	No	Yes
Monticello	26	4	Prescribed	M. & G.						5	45	2	Varies	225	Yes	No
Greencastle	27	4	Prescribed	M. & G.		A few	Yes	Yes		1 to 3	40	1 to 3	80	200	Yes	No
Goshen	28	3 & 4		M. & G.	M. & G.					3	45	2	90	315	Yes	No
Mt. Vernon	29	4	Optional	Hoadley		Yes	Yes	Yes	Loose leaf notebook	2	40	3	80	320	Yes, to a certain extent	No
Kokomo	30	3	Optional	M. & G.		Yes	Yes	No		2	40	3	90	350	No	No
Rushville	31	4	Prescribed	M. & G.	M. & G.	Yes	Yes	No		3	40	2	80	280	No	No
Richmond	32	3	Prescribed	Gorton	None	No	Yes	Yes		6	40	2	80	450 (?)	No	No
Name withdrawn	33	3	Optional with girls	Hoadley	Carter					Not regular	45	2	45	270	Yes	Yes
Rensselaer	34	3	Optional	Gorton		Yes	Yes			5	45	1	90	315	Yes (?)	No
Brazil	35	4	Optional	Car. & C. (Revised)		Yes		Yes		3	40	4	40	280	Not regularly	No
Elkhart	36	3	Prescribed	Linebarger							40	About 3	40	225 (?)	Yes	No
Indianapolis (Shortridge)	37	3 & 4	Optional	Gorton (M. & G., Car. & C.)		M. & G., Chute		Yes		2 & 3, Double periods	90	3 & 2	90	450	No (Not in college style)	No
Mishawaka	38	4	Prescribed in some courses	Car. & C.		Yes		Yes		3	45	3	45	270	Yes (?)	No
Name withdrawn	39	3 & 4	Optional	M. & G.	M. & G.	Yes				3	40	2	80	280	No	No
Union City	40	4	Optional	M. & G.	M. & G.	Yes				3	45	2	90	315	Yes (?)	No
Evansville	41	4	Optional	Car. & C. (Revised)	M. & G.	Yes	Yes	Yes		3	40	2	80	280	No	Yes (?)
Gary	42	1 & 3	Optional	Gorton	Chute	Yes	Yes			3	85	2	85	450, 144 (½ yr.)	No	No
Lafayette	43	3	Prescribed	Hoadley				Yes		3	45	2	90	315	To a limited extent	No
Elwood	44	4	Prescribed	Linebarger	Linebarger					5	40	No regular program	40	200	Yes	No
Plymouth	45	4	Optional	Adams	Adams					2 & 3	45	4	45	180	Yes	No
Name withdrawn	46	4	Optional	Car. & C.	None	Yes	Yes	Yes		3 & 4	45	2 & 1	45	225	Yes	No
Sheridan	47	4	Optional	M. & G.	M. & G.	Yes	Yes			3	45	2	45	225	No	Yes
Sullivan	48	3	Optional	Hoadley Brief C	Hoadley	Yes	No	No	Original suggestion	3	85	2	85	425 (?)	No	No
East Chicago	49	3	Optional	Mann & Twiss	Coleman	Yes		Yes		2	40	2	90	240	No	No
North Manchester	50	3 or 4	Optional	Car. & C. (Revised)		Yes	Yes			4	40	5	40	360	No	No
Huntington	51	3 & 4	Optional	Linebarger	Linebarger		Yes		Optional experiments	3	44	2	88	308	To a limited extent	No
Anderson	52	3	Optional	Hoadley	Hoadley	Yes	Yes	Yes		3	40	2	80	280	Yes (?)	No
Shelbyville	53	4	Prescribed	M. & G.	M. & G.			Yes		2 & 3	40	2	80	200	Yes	No
Hartford City	54	4	Optional	Car. & C. (Revised)	Loose leaf manual					3	40	2	80	280	No	No
Lagrange	55	4	Optional	M. & G.	M. & G.	Yes	Yes			3	40	2	80	200	Yes	Yes
Columbus	56	4	Optional	Car. & C.		Yes	Yes	No	None	4	40	5	40	360	No	Yes
Jefferson	57	3 & 4	Prescribed	M. & G.	M. & G.	Yes	Yes			3	40	2	80	200	Yes	No
Culver Military Academy	58	3	Prescribed	M. & G.	M. & G.					3	45	2	90	315	No	Yes
Bloomington	59	4	Prescribed	M. & G.	M. & G.	Coleman, Adams	Yes	Yes	Oral directions	At least 3	45	2	90	450	No	No

*4% to 6% fail in year's work. 10% to 15% fail in part of the work.

The average number of students in the schools making physics prescribed is 292. The minimum enrollment is 138 pupils, and the maximum number is 630 students.

1. Average per school, 37 pupils.
2. Minimum per school, 8 pupils.
3. Maximum per school, 100 pupils.
4. Average taking physics as a prescribed subject, 12.6 per cent.
5. Minimum taking physics as a prescribed subject, 5.2 per cent.
6. Maximum taking physics as a prescribed subject, 25.1 per cent.

The average number of pupils in the schools making physics optional is 347. (The average becomes 291 if the two large schools, Nos. 16 and 37, are not taken into consideration. This makes a more accurate comparison.) The minimum enrollment is 96 pupils; the maximum 1600. (In the case above, 850 pupils.)

1. Average per school, 33 pupils.
2. Minimum per school, 4 pupils.
3. Maximum per school, 150 pupils.
4. Average taking physics as elective subject, 9.5 per cent.
5. Minimum taking physics as elective subject, 2.9 per cent.
6. Maximum taking physics as elective subject, 36.9 per cent.

3. What is the name of the adopted text used by the student?

Text.	Schools.	Per cent.
Millikan and Gale	23	39
Carhart and Chute	14	24
Hoadley	9	15
Gorton	4	7
Adams	3	6
Linebarger	3	6
Mumper	1	1.5
Mann & Twiss	1	1.5

4. What is the form of the laboratory instructions?

- (a) Bound manual, 66 per cent.
- (b) Various laboratory manuals, 52 per cent.
- (c) Written directions, 38 per cent.

(d) Two schools give oral directions and one offers optional experiments.

5. How many recitations (oral discussions, not demonstrations by the teacher alone) per week are given for each class?

(a) Average number of recitations per week for one class, 3.2.

(b) Per cent of schools below the average of three recitations per week, 19.6.

(c) Per cent of schools above the average of three recitations per week, 32.

6. What is the length of the recitation period?

(a) Average length, 44.5 minutes.

(b) Minimum length, 30 minutes.

(c) Maximum length, 90 minutes.

7. How many laboratory periods does each class have per week?

Periods per week.	Schools.	Per cent.
One	4	7
Two	38	65
Three	5	8
Four	5	8
Five	3	5
Seven	1	2
No regular program	1	2
No laboratory work	1	2

8. What is the length of the laboratory period?

(a) Length of Period.	Schools.	Per cent.
90 minutes	14	25
88 minutes	1	2
85 minutes	4	7
80 minutes	19	34
45 minutes	6	11
42 minutes	1	2
40 minutes	10	19

(b) The average length of the period for fifty-five schools, 71 minutes.

(c) Thirty-one per cent of the schools giving definite reports have only one period (40 to 45 minutes) for individual laboratory work.

9. Give the total number of periods (45 minutes) per week devoted to the subject of physics by any one student.

NOTE.—The answers to this question have been re-arranged by the author to secure a common basis for comparison. Some reports do not take into consideration the study periods in school. The question was intended to include all time regularly arranged for the study of physics in school.

(a) The average time per week for fifty-eight schools is 308 minutes.

(b) The minimum time per week for the study of physics is 108 minutes.

(c) The maximum time per week for the study of physics is 450 minutes.

10. Is the lecture demonstration a success with high school students?

NOTE.—This question was suggested by Professor Robert A. Millikan's excellent discussion of the *Function of the Lecture Demonstration in Secondary School Physics*.⁴

(a) No, 53 per cent.

(b) Yes, 36 per cent.

(c) Undecided, 11 per cent.

11. Do all students in the laboratory, work on the same experiment at the same time?

(a) No, 75 per cent.

(b) Yes, 21 per cent.

NOTE.—In view of the fact that three-fourths of the schools have more than one experiment in progress during the laboratory period, and one-third of the total number reporting have from forty to forty-five minutes for individual laboratory work, the author would like to suggest this question: How many experiments may and can a teacher supervise properly in the short period of forty-five minutes?

12. Do you favor the plan of having different experiments in progress at the same time?

(a) Yes, 50.8 per cent.

(b) No, 44 per cent.

(c) Undecided, 5.2 per cent.

13. Do you give boys and girls different courses in physics?

(a) No, 96.5 per cent.

(b) Yes, 1.7 per cent.

(c) To a limited extent, 1.7 per cent.

14. Would you segregate the sexes?

(a) No, 31 per cent.

(b) Yes, 62 per cent.

(c) Undecided, 7 per cent.

⁴Proceedings of the N. E. A., 1908, pages 985-991.

15. What is the total enrollment in the high school?
 - (a) Total number of pupils enrolled in fifty-seven high schools, 18,889.
 - (b) Average number of pupils per school, 331.
 - (c) Minimum enrollment, 91.
 - (d) Maximum enrollment, 1,600.
16. How many boys take physics?
 - (a) Total number, 1,218 or 6.3 per cent.
 - (b) Average per school, 22.
 - (c) Minimum per school, 4.
 - (d) Maximum per school, 90.
17. How many girls take physics?
 - (a) Total number, 772 or 4 per cent.
 - (b) Average per school, 14.
 - (c) Minimum per school, 0.
 - (d) Maximum per school, 80.
18. What is the per cent of failures in physics?
 - (a) Minimum, 0 per cent.
 - (b) Maximum, 25 per cent.
 - (c) Average, 7.3 per cent.

NOTE.—Although there is no direct evidence to prove the fact, the author believes that many of the reports here are estimates.

19. (a) Do you have a definite plan of caring for failing students?
 - (b) Outline the plan briefly.
 - (c) Do you have a plan for caring for students of different ability?

The reader will recognize the important relation of these questions to the subject of high school physics.

It is important to provide opportunity for the student of exceptional ability and to help the pupil who fails. No attempt will be made to classify these replies, but we hope that the reader will refer to the accompanying table and examine the reports from the various schools.

20. (a) Is there any topic discussed in high school texts which you feel should be dropped?
 - (b) In the light of your experience as an instructor in physics are there subjects not mentioned in the present day text-books that should be treated?

These questions require time and thought for satisfactory answers. Although only a few schools took the trouble to make a detailed report, the reader, by referring to the table of data, will

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find several suggestions that give some light on the general trend of thought along this particular line.

21. Is the average text-book too difficult?

(a) For girls, yes, 60.7 per cent; no, 39.2 per cent.

(b) For boys, yes, 24.5 per cent; no, 71.9 per cent;
undecided, 3.5 per cent.

UNCLASSIFIED COMMENTS FROM REPORTS.

1. "Boys and girls need a different text. They don't get brawn of brain with a diet of pie."

2. "Physics is hard for some pupils because in their experience they have not the knowledge with which to begin."

3. "Failures in physics are failures in other subjects as well."

4. "Rapid workers should not be held back."

5. "I find so much material in the average text that I select the very essential and practical, emphasizing the latter."

6. "Prefer all pupils at once on experiments which develop the subject."

7. "If a pupil cannot do the work we advise him to take up work in some other subject. If he can do anything near passing work, we give him special work and pass him.—We accept thirty-three credits in any line of work done enabling the pupil to do what he is able and in the subjects in which he is best fitted."

8. "Text-books are often written to sell and not to instruct."

9. "I think that a large amount of so-called 'technical part' of physics should be dropped, and the subject be more closely related to the life of the pupil."

10. "Some texts are too long."

11. "If you stay with the text, the girls usually prepare better lessons than the boys. It is only when the text is laid aside, if at any time, that the boys are superior to the girls."

12. "I never use all of any physics text and always supplement by much outside matter."

13. "The number of students electing physics is increasing faster than the growth of the school."

14. "I do not assign all experiments to all pupils. I have a definite number of standard experiments but beyond this I give fewer and more difficult experiments to the stronger."

15. "It would be an excellent thing if more adaptation of principles of physics could be emphasized.—I now have to supplement the average text."

16. "I have too much work to give very much attention to, failing students."

17. "Most text-books would be improved, in my opinion, by a closer and more frequent application of the principles to practical experience, particularly in the problems."

18. "In the eleventh year we cover the subjects dealt with by the text and require forty experiments to be prepared and written up in neat form. Those who have not been able to complete the experiments have their credit deferred until they complete the work in night school, or in the summer continuation school."

19. "If the failure is the result of not studying, I waste no time with them as it is useless to explain to students who do not study."

20. "Nearly all the old style books are too difficult."

prefer to have various experiments in progress simultaneously. (7) Ninety-six per cent of the schools *do not differentiate* the work for boys and girls. Sixty-two per cent would segregate the pupils in the subject of physics. (8) An average "large" high school in Indiana has an enrollment of 300 to 400 pupils. (9) Six per cent of the boys (calculated on the total enrollment) and four per cent of the girls study physics. (10) There is probably no general attempt to keep a regular and definite record of failures in this subject. The average number of students failing in physics is seven per cent.

(11) No general plan to care for failing pupils or to advance those of exceptional ability is in use in the state of Indiana. (12) Sixty per cent report that the average text-book is too difficult for girls and twenty-five per cent indicate that the standard texts are too difficult for boys. (13) This report does not include approximately 500 smaller *commissioned* and *certified* high schools and about 200 *non-certified* high schools, the majority of which have physics in their curricula.

The subject of physics in the great majority of high schools in the state of Indiana might lend itself to modification along agricultural and industrial lines. This might be desirable in view of the fact that a small per cent of the schools have sufficient equipment and enough properly trained teachers to give efficient instruction in the *pure science* of the average text-book.

Facts of interest and importance to science instruction could be obtained if one of the teachers' associations or any other educational organization of the state of Indiana, would secure information from 100 of the larger high schools on the number of classes the day per instructor, the number of pupils in each class, the number of recitations other than science per teacher, the scientific training of the teacher both in high school, college and university, and the number of years of experience in high-school teaching, etc., etc.

THE AGE OF COAL.

Dr. Marie Stopes of London has been interested for nine years in the study of fossil botany, and has in preparation a book that is expected to throw new light on the subject of coal geology. She has visited the interiors of mines in all parts of the world, including a mine in one of the Japanese islands extending out under the sea. She says coal cannot be less than 20,000,000 years old, and that the first plants which entered into its formation were twice as old as that,