THE TEACHING OF SCIENCE

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649718597

The Teaching of Science by John F. Woodhull

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd. Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

JOHN F. WOODHULL

THE TEACHING OF SCIENCE





THE MACMILLAN COMPANY
-MRW YORK - BOSTON - CHICAGO - DALLAS
ATLANTA - SAN FRANCISCO

MACMILLAN & CO., LAMPTED LONDON - BONRAT - CALCUTTA MELSOURNE

THE MACHILLAN CO. OF CANADA, Lyth.

7.3

THE TEACHING OF SCIENCE

BY

JOHN F. WOODHULL, PH.D.

PROFESIOR OF PHYSICAL SCHOOLS TRACEPUS COLLEGE, COLUMBIA UNIVERSET

Note Book
THE MACMILLAN COMPANY
1918

All rights reserved

Mi am

PREFACE

THE addresses and papers collected in this volume were written for special occasions and delivered to various audiences during a period of more than twenty years. They all however bear upon one general theme, science teaching, and indicate a consistent trend of thought. In a measure, they constitute the history of a movement in education.

The title of the book requires a word of explanation. The addresses were, for the most part, delivered to teachers of physics and chemistry. Why then should not the title be The Teaching of Physical Science? Although the illustrations were of necessity chosen mostly from physical science, the addresses were a constant appeal to all science teachers to teach science rather than special sciences.

The addresses are arranged in chronological rather than logical order. Although the same theme is often repeated, the treatment is progressive as befits the history of the growth of certain ideas among teachers.

:



CONTENTS

CHAP	784	LOR						
I.	THE EDUCATIONAL VALUE OF NATURAL SCIENCE	1						
	1. The habit of investigation	1						
	2. The habit of observing relations — scientific observation	3						
	8. Scientific imagination	5						
	4. Scientific conservatism — reason es. authority	7						
	5. Painstaking habits	8						
	6. Science for moral ballast — a basis for religion	9						
	7. The study of science is humanitarian	10						
11.	THE ENRICHMENT OF THE HIGH-SCHOOL COURSE IN PHYSICS	18						
	1. Relation of the high-school course to college requirements	18						
	2. The college entrance course too meager in general infor- mation and in the applications of physics to daily							
	experience	15						
	 The need of prolixity. Tyndall's book of 600 pages on heat is more comprehensible than the few encyclo- 							
	pedic pages of the text-books	16						
	4. Value of lectures	17						
	5. The study of phenomena	19						
	6. Organizing past experiences	21						
	7. The equipment of a modern school building is better							
	than the conventional laboratory apparatus for pur-							
	poses of instruction	22						
ш.	MODERN TREND OF PHYSICS AND CHEMISTRY TRACKING .	24						
	1. More descriptive and less mathematical physics and							
	chemistry	24						
	2. The drift of pupils away from physical science	25						
	3. The requirements are clumsy, illogical, and stupid .	27						
	4. High-school pupils are not lacking in willingness or							
	ability to work. They are patient sufferers with "							
	poor teaching	80						
	5. Public sentiment will settle some questions	31						

viii

CONTENTS

IV.	THE INTENSIVE METEOD IN CHEMISTRY				- 1	PA98 40
74 W.	1. Browsing es. thoroughness	311	¥11.			40
	2. Teachers of chemistry need courses in	, and	lied	Bries	nce.	30
	and in a great variety of sciences		-		~	48
	3. Reasons for teaching principles always	with	refer	ence	to	
	their applications —	***	L	(A)	ine Si	43
v.	SCIENCE FOR CULTURE	, ii	ě	.%	ë.	46
	 Humanism which is not scientific and ac humanistic are worthless. 	ience	whic	h is :	not	47
	2. Thoroughness of understanding is a slo	W EN	wth			48
	3. Exactness comes relatively late .					49
	4. More important to cultivate openmin	dedn	cas 1	than	to	50
	be correct	48	90	946	-	49
	5. Instruction demands simplicity and p	тодт	esto	1-1	not	
	truth			•	25.0	50
22	6. We want to be put in control of our	facul	ties,	not	de-	965
	prived of them by education . 7. Limitations on the inductive method	*				51
	8. Learning by imitation	*		35	8	51 52
	9. Science is not solely for the men of sci	ĕ	·			ĐΣ
	the people	CDOE,	Dut	8150	ior	57
	10. To know any one science, it is necessa	ry to	kno	w m	och.	Tier S
	of the rest		٠.			58
	 To arouse a love of study in any subj first step toward making a man a 			ake	tne	59
	12. Physical science, after religion, the great					99
	world	LUCIAL	powe	тш	LII C	60
	13. Scientific studies fill the mind with loft	e ide	.i	leve	ted	.00
	conceptions, and noble thoughts		*		•	60
VI.	How the Public Will Solve Our Prob	LEMB.	OF S	Senno	(CE	
	TRACHING		*			62
	1. Education abould be an exponent of th	e tim	LCG			62
	2. The public will take greater control of			lano	in-	20
	stitutions and the number of pe					
	increase			8		63
	\$. The public will no doubt require that	t scie	nce	instr	uc-	
	tion shall be practical			26		66
	4. Science teaching will be more humania	od				67

		CONTENTS					İ
MAPTE	38					33	PAGE
	5.	The status of the teacher will improve		•01	•	340	68
	6.	The evils of uniformity will disappear.					71
	7.	Laboratory work will be curtailed an	d z	nore	impo	or-	
		tance will be attached to the lectur	re	•0	*	(*)	74
VII.	Тал	TRACHING OF PRINCAL SCIENCE .					82
	1.	The native and acquired gifts requisite physical science	for	a te	acher	of	84
	2.	The ideas of authors of text-books, as of prefaces of their books, regarding to physics, the use of the inductive management of the physics.	he net	vital hod,	lizing the u	of use	S-240
		of mathematics in physics teachin work, lectures, simplification of	-				
		and of apparatus		٠.	90		87
	3.	The ideas concerning the teaching of	pl	ysic	whi	ch	
		obtained a century or more ago ,			-120 EX 65		99
	4.	"Object lessons"					105
		The best order for instruction is not fro	m	princ	iples	to	
		applications, but the reverse .				30.70	112
	6.	The project of water supply to large cit	tice		9		115
		A sample physics leaflet on the air .		200	22	50	120
		How Ferguson presented the "spring	of t	he a	ir" o	ne	
	7000	hundred and fifty years ago					128
	9.	Arnott's treatment of "action and reac	tio	."		10	184
		Controlling fires		491	100	å	157
		A project concerning eggs		•22		*	148
VIII.	WE	AT SPECIALIZATION HAS DONE FOR PHY	вис	e Tr	ACHI	NG	152
	1.	Early specialisation unfits for research		wel	l as f	or	
		teaching		20000			152
	2.	College instructors ashamed to teach .		400		8	155
		Ninety-four per cent of science teach schools are obliged to teach eve sciences, and seventy per cent teach one-third of all the subjects schools. Why then does the unithem to specialize in one subject in	are tau	one obl ight nity	of tiged in the requi	he to eir ire	
		tion to teach?	12.43 1			8	154

4. The community demands general courses 5. Changing educational theories . . .

154

155 . 155