Teachers College RECORD

Volume XXI, Number 3 May, 192

Edited by JAMES E. RUSSELL

CONTENTS

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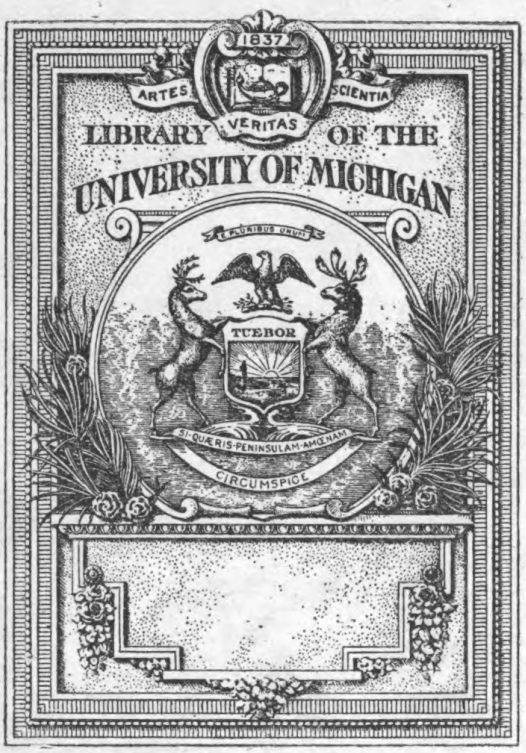

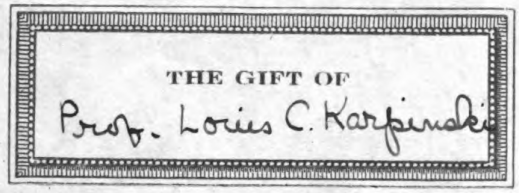

145

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TEACHERS COLLEGE RECORD

Vol. XXI May, 1920 No. 3

Contents

TEACHERS COLLEGE RECORD

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THE EDUCATION OF EMOTIONS THROUGH PHYSICAL EDUCATION

By JESSE FEIRING WILLIAMS, M.D.
Associate Professor of Physical Education, Teachers College

The education of emotions is not one of the usual aims of physical education. Indeed, it is unusual in the literature of physical education to find aims that are directed toward behavior and conduct. The most notable exceptions to this statement and the most ardent advocates of social and moral values in physical education have been Wood (1),* Hall (2), Ehler (3), and Hetherington (4). On the contrary, the history of physical education reveals the prominence of the military ideal, the physiologic ideal, or the anthropometric ideal, in the most conspicuous and well known developments of the art in which we are interested. Brief and relatively unimportant variations in the emotional field have occurred in the case of Delsarte (5) and Dalcroze (6). But the work of Delsarte was, and the work of Dalcroze is, more interested in music and dramatic expression than in the generally accepted program of physical education.

It is with considerable temerity and a real consciousness of the many pitfalls that lie ahead that I venture to discuss the education of emotions in physical education. I am interested, however, in presenting this discussion because of the prevailing general feeling that we are dealing often with emotional elements, because of some very definite assertions made from time to time of the relation of physical education to character training, and because of types of work in this field which have discarded the old chart and compass of aesthetic forms and poses, and have

* See bibliography at end of article.

ventured out upon an uncharted sea of rhythm, with only the feelings and emotions as guides.

The plan of this paper involves a discussion of three statements. The first assertion is: *Physical education in some of its activities is dealing with emotional and behavior series elements.* It seems quite clear and recognized that games, sports, and forms of play and dancing are concerned with activities in which situations constantly arise presenting quick emotional acts. The athletic field and the gymnasium constantly witness different types of behavior in response to stimulating and provoking situations. What the response is to be in any case depends in part upon the original nature of the individual, and in part upon the nurture given the individual by his environment. In other words, it depends upon his individual, hereditary equipment plus his learning or education. That his behavior is influenced little by ideas and very powerfully by acts that have not been annoying, ([7]) is accepted to-day as the very basis for practical ethics; and that physical education, which deals with acts engendered by conditions provoking at the same time emotional tendencies, is in a position to influence and guide to social ends, must be increasingly recognized everywhere to-day.

The second point is: *Physical education affords in its activities an important and, in some respects, an independent and unusual means for character training.*

There have been from time to time, statements made in support of this claim, and so general has been the acceptance among physical educators that the mere participation in our programs has been offered as a warrant of the development of moral and social values. In fact this argument has been so forcefully stated and we have been so docile-minded toward it that it has become almost as generally accepted as the pre-war superiority of the German nation in science, art, health, and even war. We have rather liked to believe that we were soul-making rather than sweat-making. It pleased our vanity to believe that we were working directly with neurones, synapses, optic thalami, and only incidentally with sweat glands, striated muscle, ligaments, and bone.

It seems worth while to inquire into the nature of this belief. The acceptance of character training, the development of moral

and social values in individuals from contact with a program of physical education, requires that the emotions, so basal in the formation of human social behavior, be considered with reference to their modifiability. We have passed beyond believing that morals can be taught; ethical standards must be lived, to belong. Fundamentally, then, we are dealing with original nature, to use Professor Thorndike's phrase, plus an increment of learning. We are to ascertain if possible the modifiability of original nature, the eradication of unmoral and anti-social tendencies, and the laws under which modification and eradication will go on. We ought further to be concerned, at times, with the desirability of modification and eradication by intelligent and social controls.

"Elementary psychology acquaints us with the fact that men are, apart from education, equipped with tendencies to feel and act in certain ways in certain circumstances—that the response to be made to a situation may be determined by man's inborn organization. It is, in fact, a general law that, other things being equal, the response to any situation will be that which is by original nature connected with that situation, or with some situation like it . . . . . The basis of intellect and character is this fund of unlearned tendencies, this original arrangement of the neurones in the brain." (8)

The modifiability of original tendencies or instincts and impulses may be considered by an examination of what an individual will do in the way of action productive of excitement, elation, depression, fear, anger, and the like. The emotional response to situations involving original forces may be developed, corrected, or retarded according to certain laws of psychology that form today the basis of our understanding of the working of the central nervous system. These laws are the laws of Readiness, Exercise and Effect. They may be stated as follows:

1. *The Law of Readiness:* "When any conduction unit is in readiness to conduct, for it to do so is satisfying. When any conduction unit is not in readiness to conduct, for it to conduct is annoying. When any conduction unit is in readiness to conduct, for not to do so is annoying. By a satisfying state of affairs is meant one which the animal does nothing to avoid, often doing things which maintain or renew it. By an annoying state of

affairs is meant one which the animal does nothing to preserve, often doing things which put an end to it."

2. *The Law of Exercise.* This law is stated to comprise the laws of Use and Disuse.

"*The Law of Use:* When a modifiable connection is made between a situation and response, that connection's strength is, other things being equal, increased.

"*The Law of Disuse:* When a modifiable connection is not made between a situation and a response during a length of time, that connection's strength is decreased."

3. "*The Law of Effect:* When a modifiable connection between a situation and a response is made and is accompanied or followed by a satisfying state of affairs, that connection's strength is increased. When made and accompanied or followed by an annoying state of affairs, its strength is decreased." (9)

The response that an individual makes to situations that represent original and instinctive urges is the sum total of his original nature plus his nurture. Learning, training, or environment may, by the operation of the above laws, modify the response to instinct.

Now in physical education in activities of the game type, we are dealing with materials that illustrate the psychologic principles we have quoted. Those who have stood for the moral and social training available in physical education have had in mind the games of competition, the fighting plays. The argument has been variously stated, but the most advanced, perhaps the most complete, expression is to be found in the statement of aims in physical education by Professor Hetherington, as follows:

"To guide the expression of the racially old and character-forming instincts, especially the egoistic, hunting, fighting, and social instincts, in order that sound character habits and moral ideals in the expression of these instinct tendencies in social relationships may develop, are, specifically,

a. To guide the egoistic instinct in the forms of expression essential for the protection of personal rights and for self-esteem, confidence, and personal honor; but to sublimate it from personal conceits and vanities into ideals of achieving worthiness, and to socialize it by tolerance and sympathy.

b. To guide the hunting instinct with its aggressiveness in the full expression necessary for the development of force in realizing aims or ideals; but to bring its power under an habitual expression in worthy causes and under ideals of achievement or service.

c. To guide the fighting instinct in its natural, developmental expression in social contests so essential for the development of fighting power and courage; . . . . . but to sublimate it from teasing, bullying, brawling, vandalism, pugilism, and muckerism, into habits and ideals of fighting, physically, socially, and politically, for personal ideals and social causes." (3)

It is important to examine with some care the thought presented in this statement of aims, especially in the light of the Laws of Readiness and Effect.

The argument has been somewhat like this: If an individual in a competitive game refrains from striking and other pugilistic motor acts in response to provoking situations presented by an opponent, and thereby leaves the control of the game, its discipline, et cetera, to an umpire or referee, he has learned self-control, self-sacrifice, loyalty to the team, and other group values. It is further asserted that such loyalty, self-control, and self-sacrifice represent definite growth in his nervous system, and hence in other situations, having like elements of unfairness or injustice, he will respond in a social way, with intellectual and social guides, rather than by the emotional, more personal, and original guides.

If I have stated accurately the theory, it resolves itself briefly into this: Any player by playing in games will develop moral and social controls by intelligent and social responses to situations that otherwise would be provocative of emotional responses of an instinctive and original nature type.

It is with considerable regret that I am led to state that in my judgment such is not the case. I should prefer to say that a player in games may or may not develop moral and social values; that, as organized and conducted, the chances that he will achieve undesirable results are as great as the chances that he will achieve desirable results. He may improve morally and socially, he may not grow at all, he may be definitely impaired. The following

illustration will state in the main outlines my argument. If an individual in a competitive game refrains from striking and other pugilistic motor acts in response to provoking situations presented by an opponent, and thereby leaves the control of the game, its discipline, et cetera, to an umpire or referee, he has learned self-control, self-sacrifice, loyalty to the team and group values, *only if the response made to the situation presented is followed by a satisfying state of affairs.* The Law of Readiness controls the growth to be expected here. When a modifiable connection between a situation and response is made and is accompanied or followed by a satisfying state of affairs, that connection's strength is increased. When made and accompanied or followed by an annoying state of affairs its strength is decreased."

It does not follow, therefore, that the exhibition of self-control in a game results in greater self-control; it may mean a real loss in self-control. Unless the response is followed in the individual by a satisfying state of affairs the connection's strength is decreased. It must be clear that the playing of games does not in itself bring moral and social values, nor indeed does the playing of games in which moral and social controls are in evidence necessarily result in the development of stronger bonds in these connections. If the official of the game is incompetent and does not punish the player producing the provoking situation, or if the official is not disinterested—if he favors one side—the desirable bonds will be followed by an annoying state of affairs, and hence weakened. If the player who responds by emotional tendencies is praised by the school or captain or team or coach, and the bond made is accompanied by a satisfying state of affairs, that bond is strengthened.

If these contentions were not true, professional ball players who engage during the season in 154 games of baseball, fraught with provoking situations, would be wonderful examples of self-sacrificing, social human beings. The reverse is probably the true statement of the case. No group of athletes in the world give so little evidence of social values and so dominant and powerful expression of personal and selfish ones.

The games and play enthusiast must restate his theory and valuate anew its elements. Such restatement would probably be something like this:

1. Games, play, and sports may aid in the development of moral and social values, in desirable elements of character; but the possibility that they will not do so, or that they will stimulate development of undesirable social qualities, must be considered.
2. Games, play, and sports in which the control of the response to provoking situations is vested in an umpire or referee who is incompetent or unfair, will probably result in the weakening of desirable bonds.
3. Games, play, and sports in which the social and traditional standards of the school or college are negative to high standards of conduct or positively favor anti-social conduct on the part of players, will probably weaken the development of desirable bonds.
4. Games, play, and sports led by a coach who is tricky and unfair, who coaches the player to evade the rules, who sanctions anti-social characteristics, will result in the development of undesirable bonds.

There are those who hold, however, that the response to unfair tactics by anger is right and proper and should be developed. To me it seems like negation of all that history tells us concerning human nature; but it does not seem so to others who have a right to be heard in such a discussion. Hall ([13]) and Burke ([13]) specifically insist upon the infallibility of human nature. A fair presentation is given by Professor McDougall, when he says:

"It might seem at first sight that this instinct (anger), which leads men and societies so often to enter blindly upon deadly contests that in many cases are destructive to both parties, could only be a survival from man's brutal ancestry, and that an early and a principal feature of social evolution would have been the eradication of this instinct from the human mind. But a little reflection will show us that its operation, far from being wholly injurious, has been one of the essential factors in the evolution of the higher forms of social organization, and, in fact, of those specifically social qualities of man, the higher development of which is an essential condition of the higher social life." ([15])

McDougall's contention here is that "the power of subjecting one's impulses to a recognized law arose from fighting within the

family group; that, later on, fighting was a necessary condition for the development of cooperative life; and that, even to-day, energy, independence, and manliness depend upon the presence of this instinct in full strength." (10)

Such argument seems fallacious because, as Professor Thorndike says, "Pugnacious behavior is a symptom, rather than a cause, of energy; and subjection to law and cooperation for the good of the community could have developed, and perhaps did develop, rather from hunting, agriculture, industry, and sport than from combat with other men." (10) I am content to leave the argument where Professor Thorndike leaves it, when he says, "We . . . . must correct pugnacity without putting the men in whom we have directed it toward abstract evils at the mercy of any embryonic Napoleons [to-day he would say Hohenzollerns] in whom we have left its selfish aggressiveness unimpaired." (11)

There are, then, in play and games, opportunities for character development. Such development does not necessarily result from the playing of the game. Definite and careful attention to all the factors entering into the situation, evolved by a game, must be provided if the desirable response is to be secured and if the state of affairs, accompanying or following the response, is to be satisfying and strengthening to the bonds formed, or annoying and weakening.

The importance of recognition of this principle is very great. The school or college athletic team that is coached by an individual unmindful of these values, either through ignorance or for other reasons, is developing in exactly the wrong direction. It is not too much to say, therefore, that from the standpoint of possible influence on character formation in the players on athletic teams, an athletic coach should be chosen with more care than a professor of philosophy, ethics, or social science. It means, further, that teachers of physical education need an appreciation of the factors at work in such activities, a profound conviction regarding the values to work for, and a technique of procedure, in obtaining the desired ends.

The corollary of the proposition that games and play and sports develop moral values relates to the sublimation of these personal values into social ends and causes. Progressive and modern

physical education has held that games and sports, wisely directed and led, would develop moral and social values, and that these values would show in life in other situations involving the type of response given in a game. It is held, for example, that the boy may learn to be fair, just, and honorable in sport, whereas he could not in calisthenic drills, because the one produced situations and called for responses, and the other did not. That such responses go into the very matrix of the nervous system and modify future responses, is indicated by psychology. The general rationale of mental discipline indicates that the type of transfer we are speaking of does occur. On this point Professor Thorndike says, "Of special importance are the connections of *neglect*. Such bonds as 'stimuli to hunger, save at mealtimes,—neglect them'; 'sounds of boys at play, save at playtime,—neglect them.'" (11) Additional illustrations could be given: "Stimuli to foul your opponent—neglect them; stimuli to respond to unfairness by striking back—neglect them."

In speaking of transfer of training, Colvin says, "Transfer of training is, then, favorable in the ways indicated: 1—Where a single element to which a specific response is made functions under various environmental conditions because it is a common element in these various, and otherwise to a greater or less degree, dissimilar environments; 2—When a dominant mood or emotion so colors various environments that a characteristic response is obtained without identity of any one objective condition; 3—When a single response in reality involves other and more general adjustments; 4—It is also possible, as Bagley suggests, through making the end of the activity a clearly conscious ideal . . . . . ". (16) To sum up the view so far presented, we may say that if socially desirable responses are made in games, play, and sports to situations involving stimuli to respond otherwise, and the response is accompanied or followed by a satisfying state of affairs, the bonds are strengthened; and, because the elements are identical in procedure, transfer does occur.

From the discussion so far, it must be clear that the sort of growth we most wish to occur will come only in contests in which provoking situations are present. If the game or contest does not require subjection of the usual and original behavior series to the dictates of intellect, no strengthening of bonds occurs

because no modifiable connections were made. Pursued to a logical conclusion, it may be said that if all players in games were fair, just, and honorable in the attitude and treatment of opponents, the game would lose its value as a training school for character. The immediate realization of such a state of affairs need not greatly interest us. On the contrary, it is exceedingly important to do all we can to improve the conditions under which contests are held.

The effort to improve sport has brought in some undesirable influences, and I am interested especially in speaking of one tendency that is decidedly weakening and subversive of the essential values of the fighting plays. The overzealousness of coaches and players to win games has resulted in severe criticism of all athletics, and there has grown up a feeling often expressed as, "One should not play to win." It is important to examine this phrase with all that it stands for and means. The 'sport for sport's sake' dictum as an expression of the amateur spirit in athletics, or as a connotation of fairness and honesty in sport, is satisfactory and acceptable; but if interpreted to mean that one should not play to win, it is a futile creed. It is lifeless and belongs with that other catch phrase of the poseur and dilletante, 'Art for art's sake.' To hit the line hard, to overcome him who holds the lead, to achieve the victory,—this is the very essence of all that we are striving for in all lines of education. That overzealousness on the part of professional coaches seeking to achieve personal laurels, and leading to winning by unfair means, should not lead to the futility of playing indifferently, any more than the overzealousness of teachers, leading at times to breakdown in health of students under their direction, should lead to studying indifferently is an accepted method. Only by the spirit of 'playing to win,' in the vigorous fighting plays, can other desirable personal and biologic values be secured.

The vigorous fighting games, as contrasted with quiet games, have received the attention of serious and scientific workers who are suggesting, especially from a physiological viewpoint, the possibility of athletics serving as a biologic substitute for war and whatever virtues war engenders. Cannon ([17]) has shown the rational possibilities in this direction. In addition, it is interesting to note that Baron Pierre de Courbetin, the leading spirit in

the revival of the old Olympic festivals as represented in the modern Olympic Games, has been moved in these years of his leadership by an ideal of international peace and good will. But he has never advocated futility in sport. With an idea of emphasizing the vigor, keenness, and *élan* to be sought in competitive sports, he suggested a re-statement of that hallowed phrase of Juvenal's, to read, "Mens fervida in corpore lacertoso."

The third and final thesis of this paper is: *Physical education should select its expression forms, not from preconceived and arbitrarily determined poses, steps, or figures, but in response to situations that are present and stimulating.*

It is clear that we are dealing here mainly with the dance and dramatic forms of expression, such as the pantomime. Before we attempt to discuss this contention, certain generally misunderstood and misstated relations of emotion and expression must be cleared away.

The phrases 'expression of emotions' and 'states of consciousness which are expressed by bodily activities' are common jargon of the terpsichorean school. To some extent they exist in the older psychologies. Such phrases mean to say that original nature of man is a body of feeling or emotion, such as fear, anger, love, pity, and the like, and that certain bodily movements go with these feelings and express them, the essential purpose of the movements being to express or make known the emotion.

I am content to quote frequently from Professor Thorndike in this paper, even at the risk of attributing more of what I say to him than to myself (a calamity from his standpoint). On this point he says, "The more observable bodily movements do not come as expressions of them (feelings and emotions), but as responses toward the outside situation that started the behavior series in question." ([12])

We have in such a statement an amplification and extension of the James-Lange theory of the emotions, which says that emotions accompany, rather than precede, the bodily response to situations that are provocative of emotional disturbance. The emotion as felt results from the same situation that produced the physical response in the body to the situation, and is not a cause of the physical response. Stated graphically, we could say that to any situation x, there will be physical response y. This re-

sponse will vary among individuals, as the situation x is variously interpreted. But, in the main, the response will be that which could be indicated as $y1$, $y2$, $y3$, $y4$, etc. The difference between y and $y2$ represents in a way the difference in the meaning of x dependent largely on training and the difference in the original nature of the individual.

In similar fashion the bodily changes which go on in the body, the totality of which is recognized as emotion, are in the same way a response to x, a situation. This response may be represented as $z1$, $z2$, $z3$, $z4$, etc. We are not to understand, however, that z produces y, or in any sense is an accompanying cause. y and z are effects of x.

We are also led to state that there is no instinct for self-expression, although Kirkpatrick has stated definitely that "man originally expresses his mental states to others of the same species and takes pleasure in doing so." (18) In a discussion of this point, Professor Thorndike says, "What original human nature shows is not a general tendency of self-revelation, but a multitude of special responses by facial movements, gestures, cries, and gross bodily movements, which act as potent situations to evoke attention and various adaptive responses from others of the species." (12)

This re-statement of the relation of emotions to bodily movements suggests several things:

1. The so-called aesthetic dance, with its set forms and preconceived and determined poses and combinations, is nothing more than formal gymnastics performed to music; a waltz series is similar, therefore, to a trunk series, an arm series, or a leg series.
2. The pantomime of the German type which described every movement and facial expression to be learned as expressive of definite catalogued emotions shows the same fallibility as other German ideas and systemizations, and is open to direct criticism.
3. The newer development in the dance, in which the individual responds to situations in part composed of external stimuli, such as music, other dancers, decoration, and the like, and in part composed of the ideational processes at work reproducing a situation made up of the fabric of a

story, drama, and the like, represents a movement that is psychologically correct, and therefore in its procedure educationally sound.

4. Any dance theory that is based upon an instinct for self-expression is on doubtful ground.
5. Any dance practice that attempts to express emotion as felt is proceeding without justification in psychology in general and, specifically, in the James-Lange theory and Thorndike's statement of emotion.
6. Many of the recent and newer developments of the dance are based upon arbitrary art forms, and are properly called artistic or lyric dancing, meaning combinations of rhythm and line harmonies. They lack justification in the absence of any adequate psychologic basis.
7. The folk dance in origin was essentially a response to a situation, and in no sense an expression of emotion. It probably is the only historical illustration of dancing that shows the situation-response relationship.
8. Pantomime must seek the motor expression to a real or imagined situation, and, in the act, it involves bodily movement in response to ideas and in harmony with educational principles. The feelings of the player and the feelings of the observer may be similar; but it is because the former has reproduced in bodily movement the response to a situation so clearly, that the situation is felt by the latter. The idea does not provoke the act like the idea, but the act that has followed the idea without annoyance.

The education of emotions in the dance is not so direct as in the game, nor are the elements so well known and described. It is probably true, however, that the instinct to multiform physical activity of the dance may be met by a response that gives satisfaction on the one hand and valuable by-products, in the form of rhythm, skill, and harmony of movement, on the other, and more especially if used not specifically for these results but because of a satisfying state of affairs accompanying or following a bodily response.

The proper procedure from an educational viewpoint would exact some care in the choice of music, setting, play, and drama

portrayed. It must be clear that nothing very enduring can be achieved until a proper environment is provided. A dance studio with appropriate mural decoration and other elements so essential to 'atmosphere' must be provided in the school, to have the dance mean much more than physiological gymnastics. The educational institutions have much to learn here from the professional artist. Another important principle suggested here would be to choose with care and discrimination the players and parts. To educate in new bonds and to form new conduction units would be the finest opportunity that could come to individuals with undesirable dominant traits. In this way the moody individual might well (from an educational viewpoint) play the coquette and the frivolous one the—tired business woman!

We should, finally, escape from the folly of thinking of the dance as expressive of racially dominant, phylogenetic urges, or of considering it as a satisfying means for the completion of the Catharsis Theory as stated by President Hall. The dance as a motor response to varying situations may mean much or little. What it does for the individual depends on the situation produced and the amount of satisfaction the response made affords the individual who makes the response. The most important need at present is development of the proper 'situation.'

The great opportunity in physical education as regards the education of emotions probably lies in the play and game aspects, although the less well defined field of the dance may have as real and important values. "The exercise of an original tendency is almost always satisfying, other things being equal." (12) The individual wants to do that which gives pleasure. To get him to do what may alter original bonds, and to induce him to act with reference to such general motives as the welfare of society, rather than the more special and emotional ones, is educating him to live in modern civilization rather than in the jungle. There is nothing in the nature of man absolutely to prevent success of such effort. A *laissez faire* doctrine will not achieve results. (19) A traditional, narrow, too highly specialized viewpoint will miss the opportunity here. We must have a vision of physical education as a means for the development of finest character and personal worth; but to this vision we must bring the means and methods for achievement of organic vigor, psycho-motor har-

mony, and control that will serve as effective and important color plans. We do not want anywhere in education a plain white or feeble gray soul; that masterpiece of God must be touched with color—color of the kind that Henry Newbolt saw when he wrote:

There's a breathless hush in the close tonight—
Ten to make and the match to win—
A bumping pitch and a blinding light,
An hour to play and the last man in.
And it's not for the sake of a ribboned coat,
Or the selfish hope of a season's fame,
But his Captain's hand on his shoulder smote—
"Play up! play up! and play the game!"

The sand of the desert is sodden red—
Red with the wreck of a square that broke—
The Gatling's jammed and the Colonel dead,
And the regiment blind with dust and smoke.
The river of death has brimmed his banks,
And England's far and Honour a name,
But the voice of a schoolboy rallies the ranks:
"Play up! play up! and play the game!"

This is the work that year by year,
While in her place the school is set,
Everyone of her sons must hear,
And none that hears it dare forget.
This they all with a joyful mind
Bear through life like a torch in flame,
And, falling, fling to the host behind—
"Play up! play up! and play the game!"

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DRAMATIC INTERPRETATION IN THE TEACHING OF THE CLASSICS*

By GONZALEZ LODGE
Professor of Latin and Greek, Teachers College

When the earliest beings, to whom might have justly been applied the adjective 'human,' made their first attempts to communicate with other beings of a similar kind, it is fair to suppose that they made use of signs, and various grunts and gutterals, even if the precise nature of these sounds has eluded the keenest of linguistic investigators from Psammetichus down. From these rudimentary beginnings were developed the highly inflected languages which were in practically universal use some centuries before the Christian era. The more we study these languages the more astounded we become at the marvelous ingenuity and intellectual resource displayed in devising such instruments of expression. When we think of languages showing ten or more cases for their nouns and verbs fully developed in voice, mood, and tense, all the different forms distinguished by variations in stem or termination or both, with careful measurements of quantity and minute attention to phonetic laws, we rightly wonder whether the human mind has really progressed in intellectual power, since the beginning of human existence upon the earth.

All of those marvelous devices and arrangements were made for one purpose, and only one, namely, the communication of ideas by means of sounds. No appeal was made with them to the eye. Those wonderful distinctions of quantity, which are the despair of modern students and teachers, were to be appreciated solely by the ear. And different languages then, as now, were characterized by different sound effects. Sanskrit, Greek, and Latin were as diverse in their sound effects as German, French, Italian, and English are to-day. And as to-day it may be said that he who knows German only by sight has no real appreciation of German

* An address delivered at a meeting of the Classical Association of the Atlantic States, Baltimore, April 30, 1920.

as the expression of the German mind and nationality, so he who studies Greek or Latin without training his ear gets a very inadequate idea of these languages, not only as means of expression, but as exponents of the Greek or Roman nature.

Of course these languages did not spring fully developed into being; they grew through untold centuries of existence. During this period they were subject to all the laws of the organs of speech, and of psychological distinction. At the beginning of the historical period they were almost at the summit of their development, and the processes of growth were beginning to yield to the processes of decay. At this time a new influence began to be felt. The art of writing was coming into being. This was developed for the purpose of preserving records, or of communication between persons or regions separated in distance. But the art of writing had two effects not contemplated by its inventors. The fixing of the medium of communication involved the employment of standard. Thus for the first time, the idea arose that a language can not be a lawless thing, but must be used according to fixed principles. The free growth of earlier times was greatly restricted, and profoundly modified. In fact language began to divide into two forms, the literary and the colloquial. These followed each its own course, the one being practically dead material, worked over and artistically molded by conscious effort, with a resultant intricate development of what was known as style, and the other like the broad, foaming, often muddy growth of a living stream running often in defiance of the shackles of convention and law, and yet with great influence on the literary form as the great source of vocabulary, and in the last resort of usage. In the hands of a conscious artist, speaking to cultivated hearers, the literary form may itself become colloquial, but in ancient thought, the colloquial never became in any sense artistic. And it is doubtful whether the language of common speech can ever become in itself artistic, although it may well become an instrument for designing an artistic creation of a different kind.

Before the invention of writing, however, the distinction between cultivated and uncultivated people must have long been a vital one, and genius must have directed its attention to artistic composition. Taste had doubtless developed a norm of good versus less good usage and education must have occupied the

minds of those who looked ahead for their children's welfare. But the means of learning and the means of imparting were only oral, and the question of style had to be left almost entirely to the circumstances in which a child was brought up. A child as fortunate as Julius Caesar could have found the well of Latin undefiled in his mother's lips. But less fortunate children had to trust to the idiosyncrasy of the hired teacher. This condition was profoundly modified by the invention of writing. The standard that was thus made possible did much to formulate usage, and teaching could devote more attention to artistic as well as correct speech.

To the Greek or Roman, interested only in the study of his own language and literature, the oral method of teaching was nearly the only one employed, not only because it was traditional, but because it was fully recognized that words are only one means of conveying meaning, and that they have often to be supplemented by gesture and look. The differences between different varieties of language, particularly as indicative of differences of national disposition and psychology, were as yet unknown to them. The Romans were, it is true, familiar with Greek, both from association and study, but it must always be remembered that to a Roman Greek was a kindred tongue, and this kinship was one not merely of syntax and form but of sound as well. When either Greek or Roman came in contact with the northern barbarian, the difference in speech was overwhelming, and struck his amazed consciousness at once. In our modern times we have the same experience, and show our surprise by laughter and jeers. In fact, it is only necessary to utter aloud the modern languages, such as German and French, to discover or at least to think to discover a profound difference in the psychology of the two peoples. Would any one ever expect to find an artistic and sensitive people in the Germans when he had heard their speech? And would any one not expect to find these very qualities when he heard the sonorous Italian? It might be invidious to speak of our own tongue, but so good a critic as Lord Byron speaks of English as

> our harsh northern whistling grunting gutteral,
> which we're obliged to hiss and spit and sputter all

and it would hardly be too much to find in this description a fairly good portrait of John Bull himself. Still it must be remem-

bered that Teutonic is but a minute part of the English language, and that the really expressive part of it has been drawn entirely from the Greco-Roman.

As I intimated just a little while ago, speech by means of sounds has never been regarded by mankind as a medium sufficient in itself for the conveyance of ideas. It has always been supplemented by gesture and facial expression. Words entirely neutral in themselves may have widely different meanings according to the way they are uttered. The well-known western anecdote "when you call me that, smile" is good for the whole human race, and for all time. This introduces the dramatic into speech, and must have dated from the first efforts of expression of the caveman. In Greece the education in language was restricted almost entirely to the great poets, notably Homer, whose works had to be committed to memory. This involved, of course, some practice in declamation, and we cannot imagine that the Greek boys should have declaimed Homer without due regard to the proper expression, that is to the dramatic element. Similarly, when we come to the Romans, after the earlier period, and when education came to be regarded as a worthy aim, we know that they based their training in language on a translation of the Odyssey, which of course the boys were made to learn by heart, to recite. This practice of recitation prevailed long after there were sufficient books for the cultivated classes, and long after the school age, for most literary writers presented their works to the criticism of the world by means of more or less public recitations. Here too the recitations must have been dramatic. Indeed we have actual indication that Vergil himself read his Aeneid aloud to Augustus, and to Octavia with the well-known effect. We are told, in addition, that Vergil's voice, while not very strong, was of marvelous charm.

If then great care was taken in the early training that the boys should not only speak clearly and enunciate accurately, but should also recite effectively, how much more important was this in the later training when all the efforts of education were directed to the making of a good orator. Both Greeks and Romans regarded the ability to express one's self in a public speech as the one indispensable accomplishment of a nobleman and a gentleman. And this expression involved a high degree of dramatic

skill. A speech delivered as a mere series of words would never have had any effect on a Greek or Roman audience. They were used to artistic oratory and they demanded it from all who desired to impress them.

The importance of dramatic form as the form which all communication of ideas would naturally take was so completely ingrained in the Greek consciousness that it seemed only natural for it to be used for didactic composition even when the dramatic form itself contributed little if anything to the elucidation of the subject. It was this feeling that impelled Greek philosophers like Plato to present their philosophical speculations in the form of dialogues. It was this feeling, supported by tradition, which induced Cicero to do the same thing. And it was the similarity to actual class-room experience that led the grammarians to couch their rules in the form of question and answer. One of the most interesting of these grammatical treatises from our point of view is Priscian's Partitiones, or the grammatical analysis of the first twelve verses of the Aeneid, given in the form of question and answer and showing an elaborate minuteness of grammatical technique such as we rarely see in our modern teaching, although it must be confessed that if we could imbue our pupils with half the information which Priscian clusters around the first word *arma*, for example, we would have every right to regard our work as well done. This of course is not the first of these dialogues. Two centuries earlier Donatus had used the same form in his Ars Minor, and it became the regular thing.

This method of presentation was dramatic only in form; there was no real dramatic feeling either felt or intended. It was merely a fashionable way of presenting information, and grew more and more dead as the centuries passed.

Towards the eighth century we find men's minds waking up to a realization of the essential deadness of such educational procedure. The chief educational figure of this period, Alcuin was selected by Charlemagne to inaugurate educational reforms, one of which was the attempt to reintroduce a semblance of life into the old devitalized 'colloquy' or 'disputation,' to make teaching again a mirror of actual experience. The new innovation erred on the side of the fantastic and proved of no permanent value, although

the employment of imagery and metaphor relieved the teaching from the dryness of the earlier drill.

It must be remembered that the aim of Latin teaching during the Middle Ages was primarily to teach people to speak Latin. Hence practice in speaking was essential. The formal grammatical question and answer did not meet the need as the material did not lend itself to any extended dialogue between pupil and teacher or between pupils and pupils. The necessity of dialogue however was never in question, and, following upon the innovation of Alcuin, we find attempts made to produce real dialogues worthy from their subject matter to merit the study of all. The article on Colloquies in Monroe's *Cyclopedia of Education* mentions a colloquy of Archbishop Aelfric and his pupil Aelfric Bata in the tenth century, which is well worth reading to-day. But such efforts as this were merely sporadic until the revival of learning, when owing to a recognition of the great importance of this method of imparting instruction the most famous and accomplished scholars devoted their time to composing colloquies. The article just referred to gives as the first of the series the *Manuale Scholasticum* of about 1476 containing dialogues between university students of Heidelberg. Then follow the colloquies of Peter Mosellanus in 1518, giving very clever conversations of students at Leipzig; of Erasmus in 1519, which are well known to all of us and which have been used in schools since their appearance; of Vives, whose *Exercitatio*, depicting in boy's conversation the life and activities of youth, was published in 1539 and had a great vogue; of Castellion, whose sacred dialogues were published in 1543 on the initiative of the Protestant reformers, and also had a wide use; and finally of Cordier, whose *Colloquia* were published in 1564, and sprung at once into a prominence which they maintained until the last century.

As has been said these colloquies were intended to teach pupils to speak Latin. With the decay of the demand for this accomplishment, the importance of these works also decayed, and the change from teaching a living language to teaching a dead one gradually came about. This change had been completely accomplished in this country by the middle of the last century, although remnants of the old employment of Latin as the language of the highest dignity still survived in places. Thus the Latin

orations at the Harvard commencement persisted until a comparatively recent time, and degrees were still conferred in Latin at Columbia as late as the nineties. In Germany, too, Latin was still heard in some of the seminaries, while the Roman church has never accepted the fact of death in spite of every effort made by philistines and classical teachers themselves to convince her, both by theory and practice.

The fact that Latin was regarded as a dead language led to the natural consequence that the study and teaching of it came to be practically nothing more than a variety of anatomical dissection. Such a study has its value in various ways. It produces accurate knowledge of the structure, and to a certain extent of the functions of the various parts. It serves to train the mind in accuracy of observation and record. But it gives no information as to the living spirit of the organism, it neglects entirely the life-giving element. This was the condition of Latin and Greek teaching during the latter half of the last century.

But there were not lacking discerning souls who perceived that this attitude of mind on the part of teachers of the classics was suicidal. Such beginners' books as Jones' *First Lessons in Latin*, or White's *First Lessons in Greek*, whose sole aim in their own words was to lead the beginner during the first year "to master the inflections and build up a vocabulary," while excellent drill books, seemed to have lost sight entirely of the idea of 'content' and could not fail to rouse opposition at the same time that they deadened interest. And as is always the case, the culmination of the one movement is the starting point of its opposite. Hence the two books that I have referred to were the last as well as the most perfect of their kind. The demand for the infusion of life into classical teaching grew stronger and stronger in the early eighties and ultimately resulted in the appearance of the *Beginners' Latin Book* of Collar and Daniell in 1886. It will come as a surprise to many that the authors state the aim of this book to be "to serve as a preparation for reading, writing, and to a less degree, for speaking Latin." Let me quote another paragraph from the preface to show the form that the reaction was taking:

> The complaint is very common, and its justice must be acknowledged, that first Latin books are often excessively and needlessly arid and barren. Accordingly an effort has been made, while following a rigorously scientific

method in the development of the successive subjects, to impart something of attractiveness, interest, freshness and variety to the study of the elements of Latin by means of the *colloquia*, the choice of extracts for translation, etc.

This book had a great vogue for a number of years. How much use was made of the *colloquia*, however, I do not know, but I am inclined to think that most teachers either did not use them at all, or, if they did, used them simply as new reading matter instead of having them recited, as was undoubtedly the intention of the authors.[1]

The attempt to impart life to the teaching of the classics was continuous for the next twenty years, although it was directed more to content than to method presentation. In fact, the use of oral Latin seemed to have dropped out of sight almost entirely until the beginning of definite experiments in this line in England brought the question up again and made it for a decade the most important question of the hour. Without going at all into the merits of the Direct Method, it will suffice to say that no matter of method has ever had such a far-reaching effect as this experiment in England. Almost all the beginners' Latin books published during the last fifteen years have shown the influence of the movement in the great emphasis laid on oral practice, even when they have not gone to the extent of introducing dialogues.

One of the integral elements in the direct method of teaching is the giving of plays, where the characters are taken by the pupils. This is, of course, not the only form that the direct teaching takes, for the telling of stories is also a part of the duties of the pupils.

Before going, however, into the details of dramatic possibilities, I should like to advert for a few minutes to another side of the question, namely, the performance of the masterpieces of Greek and Latin drama, not primarily for the purpose of instruction, but rather for the sake of propaganda. The full statistics as far as 1913 are accessible in a series of papers by Professor D. D. Hains contributed to the *Classical Journal* (Vol. 9). The first Greek play ever given in America was staged at Harvard on May 17, 1881. It was the *Oedipus Tyrannus* of Sophocles. It is note-

[1] Several distinguished teachers, such as Dr. Sauveur, Dr. Arcadius Avellanus, did valiant work on similar lines but their efforts did not extend to the organized school systems.

worthy that the date of this performance is just at the beginning of the movement to make the teaching of the classics more living, to which I referred a little while ago. This movement has been called the Classical Revival. It rests with us whether it was not really the last kick of a moribund subject. From this time up to 1913, according to Professor Hains, Greek plays had been given by 49 colleges and universities, 6 secondary schools and 8 clubs: total number of plays, 125; of separate performances, 193. Latin plays had been given by 29 colleges and universities and 4 secondary schools; the number of plays was 45, of performances, 48. Also 52 other institutions had given dramatizations from Greek and Latin, Homer, Theocritus, Cicero, Caesar, and Vergil. The grand total was 300 performances of 228 plays and dramatizations by 130 institutions. This did not include professional productions, presentations of Miss Paxson's little plays to which I shall return presently, and such things as Roman dinners and entertainments. Since 1913, according to the reports given in the *Classical Journal*, 17 Greek plays and 12 Latin plays have been presented, while there have been 93 or more performances of school plays, dramatizations, and entertainments. The sharp distinction between the regular performances of the ancient plays, requiring elaborate training and equipment, and the school performances, which in many if not most cases involved comparatively small expenditures of time or money, is striking. These latter were also in the nature of propaganda, to be sure, but rather among the pupils themselves than to the outside public. And the direct result must have been to teach Latin, to interpret the authors read, and to give some study of Roman and, to a much smaller degree, Greek life and institutions. During the last four years there has been a steady decrease in the number of 'regular' performances, as was to be expected in war times, but the increase in the minor efforts is all the more remarkable.

While the performance of the great plays of antiquity must always attract the attention of the discriminating and cultivated, this rather remarkable record of the last forty years seems to have had little or no effect in mitigating the hostility of the philistines, or of stirring up to the defense of the classics in our schools any considerable support. It has been a *succès d'estime*, and little else. On the other hand, the work in the schools has unquestiona-

bly had the effect for which it was intended, and has done much to meet objections on the part of critics as to the lack of coördination of ancient life and institutions with our own.

It remains now to return to the subject of the actual use of the dramatic form as an aid to teaching. It must be premised, however, that I am speaking of conditions as I should like them to be, not as they are. That is, I believe thoroughly that the individual teacher should be free to use any method or read any kind of Latin that he desires on condition that he gets his pupils to the point of knowledge of Latin demanded.

It is a matter of common knowledge that the younger the pupil, the more interested he is in action. Action forms the almost exclusive training of the kindergarten, and is at the basis of most of the handwork that is to be found in the curriculum. It would be regarded as the height of folly if pupils did not *do* things in the shop or the laboratory. Now from what I said a while ago as to the origin and development of speech, it follows that from the beginning of teaching, pupils should use the instrument they are studying. For language is an instrument of speech and always has been. This means that the two pedagogical principles of action and use have a prime place in the teaching of language. Teachers can interpret this demand in different ways. They may regard practice in a language in the first year as sufficiently provided for if the pupils recite aloud the lessons assigned to them. The forms can be thus recited and such sentences as the pupils are asked to render, may be rendered in the same way. This is as far as most teachers go. There is, as you see, no action in this. The lesson is learned and recited. It is a task, and in very many cases an unrelieved task. Such devices as are employed to rouse interest are at the expense of the language, and are usually successful to the extent that they are removed from Latin itself. It would seem natural that if the pupils were required to impersonate somewhat, they would take a much greater interest in learning. Suppose, for instance, that after ten lessons there was a short dramatic scene in which a number of the class took part. What would be accomplished by this? In the first place the pupils so occupied would have learned some Latin perfectly. This might well have been set for the lessons of the whole class and only certain of the pupils chosen to render. The pupils chosen would

be intensely interested. Latin would seem a dead language neither to them nor to their fellows. The spirit of rivalry would be stimulated, and a subsequent group would strive in its turn to show what it could do. In fact, it might be made a regular part of the Latin course and might well constitute the regular recitation for the day when it took place.

Such a plan would obviate several objections. First, it would not interfere with other work of the school, for the things learned would be the regular daily lesson, and not something extraneous and requiring additional time for learning. Then it should require little or no elaborateness of preparation. The necessity of longer or shorter preparation is one of the serious difficulties under which such performances lie. The drilling in expression, in proper enunciation and proper deportment should be approved rather than disapproved by the principals, for the training in all these things ought to be a part of the school work in every school. It is not necessary that this performance should be always in the form of dialogue. The simple recitation can be made to serve the same purpose, and the material can be used for the regular lessons in the same way. In fact, there is some advantage in this, because a single short piece of literature may be taken from something that is really somewhat remote from the pupils' reading at the time. In work of this kind, it is not absolutely necessary that the vocabulary should be only that found in the prescribed lists. I do not understand that these lists are advocated as being rigidly exclusive. If so, many a common motto, nay some of our state mottos, would be ruled out of the beginning pupil's range.

Whence is the material to come, some will ask. I must admit that the *colloquia* which I have seen in various beginners' books leave a good deal to be desired in this regard. The dialogue is usually arid and jejune in the extreme, and a resurrection into life would be pretty difficult. But a capable teacher could easily make up some short playlets that would take for presentation but a few minutes, from the material that is to be found in most text-books, provided that the teacher has no pride of authorship, and is not afraid to make mistakes. The pupils will not be critical, and I doubt whether the principal or any chance comer will be able to pick flaws. If he can and does, his judgment may be safely discarded. Such work as I have described should have

the appearance at least of spontaneity, and should never be allowed to become a burden to the class or the school. It is unfortunate that for the early part of the first year, scarcely any material of this kind is in print. But as I said, if the teacher is not too ambitious, he may supply this gap.

After the pupil has progressed further in his study, that is, toward the end of the first year and the first part of the second year, the material available is much larger. It is, however, largely English, because English teachers have devoted more attention to this kind of teaching.[1]

In general it may be said of all these playlets that the Latin while comparatively simple has a much larger range of vocabulary than pupils with only a year of Latin could be expected to be acquainted with. At the same time they have the great advantage of maintaining interest and, when acted, of stimulating active effort.

The plays written in this country are all for pupils of a longer training, though the "Schoolboy's Dream" by Miss Sunderland in *Classical Journal* (Vol. 7) obviates this difficulty by being a mixture of Latin and English. This melange has been performed a number of times since its appearance, and, if the accounts may be trusted, with excellent effect. The pioneer in this movement was Miss Paxson's little volume of two plays, *A Roman School*

[1] In a little book prepared by Miss E. Ryle, under the name *Olim* (London: Bell) we have a collection of six short plays, varying from two to thirteen pages in length, the shorter of which could be used with profit earlier in the course, while the longer ones might well be deferred for another year. The subjects are Lesbia's Sparrow, the stories of Virginia and Pyramus and Thisbe, the episode in Cato's life concerning the repeal of the Lex Oppia, and two short pieces entitled *Ludi Magister*, introducing the poet Martial, and *Imber Impendet* entirely fictitious. In the *Perse Latin Plays* (Cambridge: Heffer) are eight playlets, most of which are about four pages in length. In *Decem Fabulae* (Oxford: Clarendon Press) we have treatments of classical myths, such as Pyramus and Thisbe, Polyphemus, Circe, Ulysses and Theseus, as well as Roman themes such as Horatius Cocles and Verres. Since I am on the subject of the English books, I might add *Easy Latin Plays*, by M. L. Newman, (London: Bell) two playlets, *Mater Gracchorum and Gemini*, and *Cothurnulus*, (London: Bell) or three short Latin historical plays by E. V. Arnold, one, the *Idus Martiae*, having to do with the death of Julius Caesar. F. Granger's *Via Romana* (London: Bell) is made up of *colloquia* of a page or more in length, some of which might be used with very young pupils, although the book is somewhat fantastic taken as a whole. *Initium*, the beginners' book of Appleton and Jones (Cambridge University Prsss) has several short plays at the end, the last of which, the *Boy Who Stayed away from School* (*puer qui a ludo se abstinuit*) is nearly eight pages in length.

and *A Roman Wedding* (Ginn and Co.), which in spite of their English titles are written in Latin. This little book appeared in 1911 at the psychological moment. The plays are bright and clever and have been acted time and again. It was rumored that Miss Paxson was at work on another volume but this has not yet appeared. It is to be hoped that we shall soon see it. This book was followed in 1916 by Professor Schlicher's *Latin Plays* (Ginn and Co.), a collection of seven pieces beginning with a fanciful "Sack of Apples" and covering in other plays Caesar's army, the Helvetian movement, Cicero's candidacy for the consulship, Catiline's conspiracy, the story of Dido and of Andromeda. As is evident from the list of titles, the book can be spread over the whole four years. The plays are in simple language and lend themselves readily to acting. An interesting little play was contributed to the *Classical Journal* in 1915 by Professor Nutting, entitled *Passer*. In the same periodical (Vol. 13), may be found the more elaborate play *Dumnorix* by Dr. Max Radin.

There remains to be mentioned the plays in English. The most important of these is the *Two Dramatizations from Vergil* by Professor Miller (University of Chicago Press). These have been deservedly popular and have been produced again and again. In many of these productions the public has been admitted and in some cases the plays, especially *Dido*, have been produced in a public theatre. Such productions hardly belong to the sphere of the high school, even if the actors have been regularly high school pupils. They are no longer pedagogical but of the nature of propaganda, and while doubtless valuable do not contribute particularly to a greater knowledge of Latin.

As has appeared from the foregoing, Caesar has furnished material for at least two regular plays, and doubtless many more could be made, especially short playlets covering incidents in the narrative. For as I have elsewhere shown, and shall later speak of more in detail, the two works of Caesar are full of picturesque scenes, which could readily be made to arouse much more interest than they usually do. But the dramatic element is not confined to dialogue. From the ancient point of view history was but a department of rhetoric, and the laws of the latter were to be observed in the composition of the former. Partly but not wholly

owing to this view we have the speech as an integral part of ancient history. In Caesar the speeches are for the most part in the form of *oratio obliqua*, but they are none the less speeches, and subject to the laws of speeches. They should be recited wherever possible. The setting is sometimes very superb. Look at the picture of the meeting of Ariovistus and Caesar between the two armies. Gurlitt has a large wall-chart of this scene, which has been reproduced in some of the school editions. It is a pity that we could not hear as well as read the verbal interchange. It must have been heated at least on the side of Ariovistus, or his cavalry would hardly have gotten the cue to move upon Caesar's horsemen.

But the place for speech recital is in the study of Cicero. "What!" you will say, "should the Catilinarians be recited?" Certainly and with all the skill that can be obtained. It is hardly to be expected that all the members of a class can be made to learn these speeches or even one speech by heart, though it would be very good for their Latin if they could be induced to do so. But if we are to really know what Cicero meant, what effect he intended to produce, we can not be content with the mere reading of these speeches. Catiline would not have left the city if the speeches had merely been published, any more than did Antonius later. It was the overwhelming effect of the spoken word that brought about his flight. To translate "open stand the gates: depart," with no magnificence of intonation and no majesty of gesture is to lose the best of Cicero. And yet that is what is usually done. "But did Cicero devote so much attention to his manner?" some one may ask. Yes, not only Cicero but every great ancient orator from Demosthenes down. The story goes that Demosthenes practiced on the seashore with pebbles in his mouth, to give himself a voice and an enunciation that would sway the great multitude gathered in the Athenian Pnyx to deeds of daring beside which our entrance into the great war fades into insignificance. And he succeeded. You know the other story of Aeschines his rival. "Aeschines," as Cicero relates, "is reported to have read, at the entreaty of the Rhodians, that excelle oration which he had spoken against Ctesiphon, in opposition to Demosthenes; and when he had concluded it, he was asked to read, next day, that also which had been published by Demos-

thenes on the other side in favor of Ctesiphon; and when he had read this too in a most pleasing and powerful tone of voice, and all expressed their admiration, 'How much more would you have admired it,' said he, 'if you had heard him deliver it himself.' " "By this remark," continues Cicero, "he sufficiently indicated how much depends on delivery, as he thought the same speech would appear different if the speaker were changed." To get Cicero's own opinion on the matter of delivery I shall quote from the concluding paragraphs of the *De Oratore* where he discusses the qualifications of an orator.

All these parts of oratory succeed according as they are delivered. Delivery, I say, has the sole and supreme power in oratory; without it, a speaker of the highest mental capacity can be held in no esteem; while one of moderate abilities, with this qualification, may surpass even those of the highest talent. What was it in Gracchus that was so highly extolled when I was a boy? 'Whither shall I, unhappy wretch, betake myself? Whither shall I turn? To the Capitol? But that is drenched with the blood of my brother. Or to my home, that I may see my distressed and afflicted mother in all the agony of lamentation?' These words, it was allowed, were uttered by him with such delivery as to countenance, voice and gesture that his very enemies could not restrain their tears. . . . . For every emotion of the mind has from nature its own peculiar look, tone and gesture; and the whole frame of a man, and his whole countenance, and the variations of his voice, sound like strings in a musical instrument, just as they are moved by the affections of the mind.

Then follows a discussion of the different tones of voice that are to be used in expressing anger, lamentation and wailing, violence, pleasure, trouble, with appropriate examples culled from earlier tragedies. "On all these emotions," he says, "a proper gesture ought to attend, not the gesture of the stage, expressive of mere words, but one showing the whole force and meaning of a passage." He continues

But all depends on the countenance: and even in that the eyes bear sovereign sway. All the powers of action proceed from the mind, and the countenance is the image of the mind, and the eyes are its interpreters. This, indeed, is the only part of the body that can effectually display as infinite a number of significations and changes as there is of emotions of the soul. . . Great care in managing the eyes is therefore necessary . . . for action is, as it were, the speech of the body, and ought therefore the more to accord with that of the soul. . . For these reasons,

in our oratorical action the countenance is next in power to the voice, and is influenced by the motion of the eyes. . . . . To effectiveness and excellence in delivery the voice doubtless contributes most.

On the voice Cicero quotes the practice of G. Gracchus, who used to have a skillful person with an ivory pitch-pipe stand concealed behind him when he made a speech, who was in an instant to sound such a note as might either excite him from too languid a tone, or recall him from one too elevated.

The precepts of Cicero must have been the basis of his own practice, and must have been responsible in no small degree for his astonishing success. For although the speech itself might have been a masterpiece, it would, according to him, lose half of its effect if not properly delivered. How often has the attempt been made in our Cicero class rooms to give even an inkling of the figure Cicero presented when he turned upon Catiline in the First Catilinarian? Skill in delivery such as Cicero demands is unfortunately beyond the power of all but a very few. But at least some effort might be made, if not by members of the class, then by the teacher, to save something of the magnificence of Cicero's speeches from the fate that all too often befalls them.

When we read a speech of Cicero with a view to its recitation we find that part of his utterances is the mere exposition of facts, another the expression of his emotional reaction to these facts. The exposition itself is also not simple. In it we may find a mere narrative of the sequence of events, a mere logical organization of the material, given without intention to touch the heart but only to inform the mind. Or again, we may have a vivid description of an action or scene, given with all the abandon that seems to belong to the southern temperament. Of these three elements in the speech, the first, that is, the mere narrative, demands little more of the student, than the ability to read correctly. On the other hand the description of a scene requires considerable histrionic ability, even if this need not be shown in gesture. The highest element is the emotional reaction. Thus, in the first Catilinarian, when Cicero breaks out upon Catiline with his indignant question, we have an appeal from Cicero's emotion to that of the senate. The greater part of the first Catilinarian is made up of this emotional appeal. It is in fact an attempt on the part of Cicero to drive Catiline, by the force of his invective,

to leave the city and resort to open insurrection. It is thus a splendid, if that much the more difficult, opportunity for genuine acting. In the second speech, we have a different tone. Cicero gives here, for the most part a formal exposition of the whole situation. It requires good reading, but involves little emotional reaction. Here and there Cicero shows fire, but it rather smolders than flares. Occasionally, also, there occurs a keen piece of description. We must go to the third Catilinarian and elsewhere for descriptions of movements, such as the fight at the Mulvian bridge. In these Cicero unfolds the events before our very eyes, and we see as vividly as if we had ourselves been on the spot.

All these considerations are inextricably connected with the question of style, and also with the structure of the Latin sentence. In emotional appeals the sentences may be, and usually are, short, direct, and overwhelming. When we have a logical exposition of narrative, the occasion arises for extended organization. The all-inclusive conception is analysed into its various subordinate elements, the relative value of these is carefully estimated, and a period developed in which the orderly progress of the thought is completely mirrored. The third element in the speech, which I have referred to as descriptive, appears in two forms. These have one thing in common: they are couched in a fluid, and not a fixed form. That is, the different ideas are not expressed in the order of their relative importance, but are merely thrown together, without analysis. In one case they are expressed in independent, asyndetic, finite clauses. In the other, we have a single verb with the other ideas merely attached to it, by fluid forms, participles, ablative absolutes, or verbal nouns

Now man can not exist on excitement alone. And the Romans possessed to a high degree the logical mind. Hence we may not expect descriptive scenes to abound. But they do frequently occur, indeed, much more frequently than we imagine, especially those of the first type. Nor must we expect always that a description must be extensive. The vast majority of the descriptions pertain to a single movement, and it often happens that a single descriptive element occurs as one element of a carefully organized complex sentence. We must watch for them, for here are the pictures.

Nor should I fail to emphasize that the current conception of the order of words in Latin is inclined to neglect the fundamental principle that the Latin sentence is in reality the moving picture that the idea presents as it develops in the mind of the writer. I will dwell on this a few moments at the risk of emphasizing the obvious.[1]

Just as the period shows a complex idea as it develops, so the single sentence. Let us take one of the simplest examples: the opening sentence of the Helvetian Campaign in Caesar: *Apud Helvetios longe nobilissimus fuit et ditissimus Orgetorix.* The first thing to notice here is that *fuit* follows *nobilissimus*. It does not stand at the end of the entire sentence. In view of Caesar's care as a stylist this must not be ignored. It makes the additional words *et ditissimus* what they really are, an addition, though not an afterthought. *Orgetorix* stands at the end. This is usually interpreted as being due to the desire to emphasize him. This is an error, as will be evident if we follow Caesar's thought as it unrolls. He is entering upon the account of a campaign which was known to be his first business in Northern Italy. The place therefore is the first in order. The movement in Helvetia was started by a man, of course. What was the first quality essential for this man's success? A Roman like Caesar could make but one reply or conceive of but one answer—rank. So the sentence starts "Among the Helvetians there was a man of rank superior to all others." But Caesar's own career has taught him by bitter experience that rank must be accompanied by wealth. Shall we ever forget Caesar's debts? Shall we ever forget the lavish use he made of money from the beginning? Shall we ever forget Caesar's extravagances as aedile? The mob will only follow a noble. Then only if that noble can buy them. Thus the addition *et ditissimus*. The qualities for the successful leader of a revolution are now at hand. This combination we summarize under the name *Orgetorix* for convenience. The same combination in Rome went under the name Caesar. One of the most recent translators of Caesar, F. P. Long (Oxford Press, 1911) renders this sentence thus: "Among the Helvetii at the time our narrative opens, the most conspicuous figure, both as regards wealth and family descent, was a chieftain named Orgetorix." Is this the

[1] A similar view is developed by Professor McCrea in a recent issue of the *Classical Journal* (Vol. XV, No. 8, May, 1920, pp. 482–93).

modern view? Has wealth become the first requisite? It would appear so. But as you see, he has missed the Roman note.

But I am not so much concerned with the mental 'movies' as with the physical. So I will pass to one or two illustrations which must suffice as types. My first is the picture of activity at the end of the eighth chapter. The Helvetians after waiting inactive for some two weeks in the vain hope that Caesar would permit them to cross the Rhone were finally told by Caesar that they might not cross. They then tried to force their way across and failed. This is the bare fact, but not so barely stated by Caesar. He was on the spot and saw, as well as directed. Here is the Latin: *Helvetii, ea spe deiecti, navibus iunctis ratibusque compluribus factis, alii vadis Rhodani qua altitudo minima fluminis erat, nonnumquam interdiu, saepius noctu, si perrumpere possent conati, operis munitione et militum concursu et telis repulsi, hoc conatu destiterunt.*

This is a vision, not a narrative. There is only one verb, that at the end; the clause *si . . . possent* is pictorial, a question. Let us visualize it: The Helvetians, dashed from their pinnacle of hope, here on a bridge of boats; here on a lot of rafts, they had built, here in the shallows where the river was lowest; busy in the day time, more active at night; they are across: can they break through? they are trying; they are up against the earthworks; soldiers have run together here; the spears are falling upon them; they cannot make way, they have been beaten back, they have ceased. There is no exaggeration in this rendering. It is the scene as Caesar actually saw it. The ablative absolutes, the participles, the verbal nouns are all there, they do not relate the details to the main verb, they add them. The difference between vision and narrative cannot better be exemplified than by citing Long's translation, which is graphic, to be sure, but not vision:

> Disappointed in this expectation, the Helvetii next turned to the desperate expedient of forcing the Roman lines. For this operation every device was exhausted. Pontoon bridges, rafts improvised by the score, the fords of the Rhone where the river was shallowest, were all tried in turn: sometimes by day, though more often by night, until, finding themselves always and everywhere rolled back before the solid strength of the obstructions, the rapid mobility of the defence, and the ceaseless discharge of spears, they finally abandoned the attempt.

As I have said Caesar does not very often give us such visions; he is much more inclined to appeal to the mind by organized narrative than to the spirit by description. A good example of his habit may be found in the middle of Chapter 10, where Caesar narrates his movements to checkmate the Helvetians. I shall quote further only the remarkable passage in Chapter 25 of the Second Book. I shall give it literally first; Caesar from exhorting the tenth legion went straight to the right wing; where he saw his own men hard pressed; standards massed in one place; soldiers of 12th legion crowded together, keeping each other from fighting; every officer of the fourth cohort dead; standard bearer down; standard lost; other cohorts with almost all their officers killed or wounded; Sextus Baculus too, a mighty man, so desperately wounded that he could not stand; resting hesitating; some on the rear stopped fighting; getting away, trying to escape the spears; enemy on the front coming up all the time; never stopping; on each flank too pressing hard; case desperate! no reserves! This is the order of the affair; participles, ablative absolutes, infinitives, a wonderful picture. Here again Long fails, for he turns it into a narrative, a thing which Caesar could easily have done, and which he does do in the close of the paragraph, where he does not see but narrates his own measures to avert defeat. Listen to Long:

Meanwhile Caesar had passed, after rallying the men of the Tenth, to the extreme right of the line, where the peril was now most urgent. There the Twelfth legion had been driven in upon itself, and with the standards of its different companies all crowded together, had lost so much of its formation that the men were hampering one another in the free play of their weapons. One battalion, the 4th, had lost all its six centurions, a standard-bearer had been killed and his standard lost; in the others a large majority had been either killed or wounded. Amongst these was a very gallant soldier named Publius Sextius Baculus, one of the first centurions of the legion, who, wounded severely in several places, was now so exhausted that he could no longer keep his feet. Disheartened by this loss of officers, the rank and file already showed signs of wavering, and there were even cases in the rear of men leaving the ranks in their efforts to avoid the hail of spears. And all the while the attack never weakened; but round the centre thick masses of the enemy were still surging upward from the lower slopes, and on either wing the pressure was constantly maintained. It was the moment of supreme crisis: for of reserves that might have pushed up to the front there were none.

If we were to meet such visions in any English author, we would respond to them at once. And it is almost inconceivable to suppose that our pupils would not also respond if their imagination could be touched. They respond to similar scenes on the screen. Is it then true that they do not respond to Caesar and Cicero, because they do not see? Then our duty is to open their eyes. The first requisite to this is that our own eyes should be opened. This we can accomplish ourselves, but there must be a conscious effort involved. We must start our own imagination, we must bear in mind what the ancients believed, namely, that words were but the images of things, moods but the expression of the mind or soul. The problem to-day is to bring back the spiritual in education, and this must carry with it the search for it in what we read with our pupils. Cicero says that Caesar's style gives us pictures set in a good light. The same can be said of Cicero himself. Then let us draw aside the curtains which have so shrouded these pictures and let the beauty of the pictures shine forth.

I forbear to say anything about Vergil, not because the same interpretation is not valuable there, but because, being poetry, we have been accustomed to interpret the Aeneid with more emphasis on the dramatic side. Every one can see that Vergil wrote poetry. What I have been trying to show is that Caesar and Cicero wrote poetry as well.

THE NEW STATUS OF THE PRACTICAL ARTS IN THE PROBLEM OF EDUCATION*

By FREDERICK G. BONSER
Professor of Education, Teachers College

In his *Applied Sociology*, Lester F. Ward makes the statement that "One winter without art would suffice to sweep the whole population north and south of the thirtieth parallels of latitude out of existence." The growing consciousness of our dependence upon the intelligence and efficiency of our people in the pursuit of the practical arts and in the use of their products has brought about most fundamental and far-reaching changes in our educational systems. From kindergarten to university, the position, the educational value, and the appropriate treatment of practical arts subjects have come to occupy a place among the questions of primary importance. Through the appropriations of cities, state legislatures, and the federal government millions of dollars have been applied to the development of the practical arts subjects in the schools of every state. Thousands of teaching positions have been created for the promotion of greater intelligence and efficiency in these fields. Not only have the schools added the studies of household arts, industrial arts, fine arts, music, and physical education as parts of their curricula, but these subjects are also in process of making most substantial changes in the content and method of other subjects as well. These changes are coming as a result of the rediscovery of the vital relationships between number, geography, and science and their applications and relationships in the practical arts from which they derive their values; between history and the origins and development of practical arts interests which so often gave rise to the events and social changes resulting from their cumulative influences; and so on, between all of the conventional subjects and the workaday and playtime activities from which they have been derived, and from which they have often become so completely divorced.

*Address given at the General Session, Annual Alumni Conferences, Teachers College, February 20, 1920.

Among the most potent and fundamental contributions to the educational thought of the present generation is this rediscovery of the relationships and interdependence of the practical and spiritual activities of man, and the principles, formulas, and other generalizations which have so largely constituted the academic subjects of study. When Comenius used pictures of the real world, and counted the knot holes in the ceiling and the cracks between the boards in the floor of the school house instead of counting in the abstract, he felt that he had largely solved the problem of unifying the theoretical and the practical in education. But from Comenius down to the very dawn of the twentieth century, the progress made in dealing with this problem of the practical arts in education was slow and disappointing. When work with materials and work in music, art, and physical education were introduced into the schools as subjects they were under the blighting handicap of an almost purely disciplinary conception. The aims set up for them were vague, general, and abstract. There were no means of measuring the degrees of attainment in terms of such values. There were no means of knowing how far a given line of activity contributed to the development of honesty, or character, or culture, or other general qualities set up as the purposes which justified the activity.

Gradually, however, through the combined influences of common sense, educational psychology, and a pragmatic philosophy, our thinking and our practice have led us to search for objectives that are tangible, methods that are direct, and results that are measurable in the conduct of daily life. The stress and pressure of war-time needs which forced us to get down to direct life-death values made us more conscious of the needs of a definitely purposive, direct selection of aims and methods. The war-time situation made its contribution, not by creating new needs, but by revealing with unmistakable clearness needs that are just as important for the fullest realizations of life in times of peace.

From the complex variety of aims offered as reasons for the study of the practical arts in the schools, four inclusive life objectives emerge as the bases of endeavor for educational effort. These stand out as aims of direct, everyday importance. They are so immediate and so vitally related to personal and social

well being that no defence through scholastic logic-chopping and no appeals from the fog enshrouded heights of transcendental philosophy are necessary to establish their validity. These objectives have to do with health, with keeping alive and well; with the efficient use of the material blessings of life by all, and the efficient productive work of those who produce material supplies; with the social relationships, responsibilities, privileges, and duties which we call citizenship; and with the restoration of body and mind and the elevation of mind and spirit through wholesome recreation. In the realization of each of these objectives—health, economic efficiency, citizenship, and recreation—the practical arts subjects have direct and fundamental values. The maintenance of life and health rests upon the intelligent use of foods, clothing, shelter, and upon the application of further health knowledge and health habits developed through the study and practice of physical education. Practical efficiency in the use of the supplies which minister to our material needs is possible only by a knowledge of the factors which make up values—economic, hygienic, and aesthetic—in the selection and use of foods, clothing, household furnishings, and other material supplies. Good citizenship depends to a very considerable degree upon the clear, appreciative understanding of the vital interdependence of ourselves and others shown by the economic, hygienic, and social relationships revealed by an appropriate study of the practical arts. Recreation derives large contributions from the content in music, physical education, and fine arts, and the interests awakened through the household and industrial arts.

All of these stated relationships between the problems of a rich and satisfying daily life and the practical arts subjects are direct and relatively immediate. But there are other relationships, perhaps a little less direct, but no less fundamental. Through the avenues of these studies in the practical activities of life lie the approaches to the values in most of the subjects which have for so long been dissociated from the situations out of which they have grown. Our arithmetic of daily life has largely to do with measurements of quantity and measurements of value in the production, exchange, and use of material supplies. Three-fourths of our needs for the facts and principles of geography

relate to the sources, production, and exchange of material commodities. Quite as large a proportion of our science derives its interest and value from its application in the arts and industries. Much of our most cherished literature, art, and music, and many of our most familiar plays and games are the idealized expressions of the practical and social relationships of workaday life with its hardships, its joys, its penalties, and its rewards. In history and in a cross section of the world to-day we see the unity of all of these interests and activities, material and spiritual.

The study of the evolution of the practical arts and the social changes resulting from the discoveries and inventions which gave man increased comfort, increased freedom, newly awakened desires, and new opportunities for richer spiritual life is leading to a new organization and evaluation of history. Until recently we may well say that our histories have been little more than a "superior kind of gossip."

The present can have its full meaning only when viewed as the cumulative summation of the whole past. Between the poverty of food, clothing, and shelter of our primitive ancestors and the abundance and variety of twentieth century utilities and luxuries lie many epochs of slow growth. Between the early attitude of enmity toward all save those of the immediate family or clan and the attitude of universal amity inherent in the conception of a world embracing league is a story of age-long struggle. Through learning of the steps which have meant progress in these two forms of activity we learn the method of progress itself. By example upon example we see emerge the great principles of human conduct which must be employed to-day, to-morrow, and forever in maintaining the values we have achieved and in progressing to higher levels. In the history of the practical arts we see the history of man's conquest of nature as a record of the discovery of natural law and conformity to it through adjustment and inventions in using its materials and forces. In the development of means for more fully using the resources of nature through the invention of tools for production and manufacture, and of vehicles for transportation, we see the growing need for coöperation among men in using these inventions and profiting by their aid. We see the growth of economic interdependence and from this in turn the need for political and other forms of coöperative

and regulative action. In general, the subject matter of history should include the three closely related lines, namely: (1) the discoveries of the resources of nature, and of inventions for the conquest and use of these resources; (2) the development of means for coöperation in securing and using the resources of nature and in other activities of man for the common good; and (3) the evolution of the human spirit as it expresses itself in literature, art, music, play, science, philosophy, and religion.

Such a study of history as this is coming, and, in part, this is a result of the growing place and meaning of the practical arts in education. Such a study of history in direct relationship to the projects in the respective practical arts fields themselves will do more to reconcile the scientific and the humanistic spirit than whole libraries of academic discussion could do.

The practical arts subjects are thus seen to be taking their place increasingly in the curricula of the schools, thereby yielding their own direct and intrinsic values for the common good. We see also that they are indirectly making great changes in other subjects by serving as avenues of approach and by providing a means of correcting educational perspective. In this twofold service, the practical arts subjects are most vitally significant for the project method of instruction. The practical arts activities are among the vital, initial interests which lay hold upon children, identifying their purposes with those of the surrounding social life. By following the accessory interests growing out of these practical projects they may lead on into the related fields of almost every other significant human interest. Many children not responsive to the appeals of the so-called academic subjects are stimulated to the best use of their capacities through the leads of these more concrete and common interests. Many indeed may escape mediocrity if their capacities for practical endeavor are enkindled into creative productivity.

In industry there yet remains to be accomplished that organization which will elicit from every worker the expression of the creative impulse that is inherent in some measure in all. There is the problem of a development of attitude which interprets work as not only a means to the end represented by the wage reward but a means to some degree of joy and satisfaction in the work itself. American industry is to-day suffering more from unstable

and low morale than from unskill. Social perspective and a wholesome balance of experienced values are essential to a sense of tranquility and to steadfastness of endeavor. The development of mere mechanical skill in the practical arts without the opportunity for any degree of initiative in the organic life of an industry, and without any appreciation of the social significance of the work done tends to foster unrest and an anti-social attitude. No study of the practical arts can be rated as satisfactory or complete which substitutes for education mere training; nor which subordinates education to training. The elements of social purpose and human value must ever serve to encourage individual initiative and effort.

In the more immediate past and at the present time, there seems evident a tendency to humanize the practical arts studies, both as they are used as a part of a democratic liberal education and as they are pursued for specific vocational purposes. The intellectual and emotional turmoil stimulated by the conditions of war and readjustment has awakened men's minds to a new evaluation of the relationships of the practical and the spiritual. While the general tension is great and the struggle is a fight to the death on numerous occasions, yet we have the faith and the hope that it is the hour of darkness just before the dawn of a new day, brighter in the spirit of neighborliness and humanitarianism than the race has hitherto experienced.

All over our country, and even in many countries beyond the borders of our own, are the graduates of Teachers College promoting the broader values of the practical arts. To list the most progressive leaders in household arts, fine arts, industrial arts, music, physical education, and public health work would be but to list the former progressive students of Teachers College in these departments. Indeed, Teachers College was the pioneer in these several fields. It began at a time when its stated purposes for the subjects were rated as visionary, impractical, and even impossible. But our peerless leader to whom the word "impossible" is but a challenge and a tonic, surrounded himself with men and women who had faith in the vision, courage in their faith, and professional spirit and loyalty to the last degree of service.

Yet, in retrospection, the achievements of the past look relatively simple. The really hard problems lie ahead. We may well

take satisfaction in what has been achieved, but we cannot rest upon achievement in a world so passionately bent upon a more stable and humane adjustment of social values. With all that has been accomplished, standards in both the use and the production of practical arts values are deplorably low among our people. Wastefulness, extravagance, selfishness, and exaggerated class consciousness are widespread. The low morale of both employers and workers is a constant menace. The law of the jungle emerges as the mentor of conduct while the thunders of Sinai and the appeals of Galilee are silenced and forgotten. We have but laid the foundation upon which to build in this great problem of socializing and humanizing. We have contributed much to make the more selfish and evident values of the arts common to our people, and we have tried not to neglect that broader interpretation of the arts which reveals their service in ministering to the higher social and spiritual life. But that our work has only well begun is but too clearly demonstrated by passing events.

In terms of larger aims, Teachers College nears the completion of her first great objective in the fields of the practical arts. The problem of over twenty years has been to build up a subject matter in these fields, prepare teachers for the schools, and to develop leaders to establish work for preparing teachers in other institutions. In a considerable measure this has been done. The problem which now lies ahead, the second objective, is to develop an advanced type of leadership for the supervision, administration, and lifting of standards in the work of the schools and colleges. All signs begin to point unmistakably to the time when the School of Practical Arts will become largely a graduate school where the chief work will be along lines of productive scholarship. By productive scholarship is meant, not only researches which will yield new and valuable subject matter but also those which derive and test new forms of organization, method, and adaptations of subject matter making for more efficient teaching and supervising.

Bright as is our past, therefore, it is but a background for endeavor to meet the pressing problems of to-day and to-morrow. For you and me, the Alumni of Teachers College, the afternoon of our little day moves toward its close. Our contribution must soon be made. Never in all the world's history has there been a time

when the possibilities for service were greater, never a time when personal effort could be as far-reaching in its influence. It may not be extravagant to hope that we are on the threshold of a new era, an era characterized by a new spirit of worldwide brotherhood. The wholesome personal and social virtues which have made America have not been lost. They will reassert themselves as the frenzied, feverish emotionalism of a world at war passes away and impartial reason gains control.

We may do much to hasten the coming of a better day. The challenge is clear and strong to stand firm to the convictions of our professional purpose. There is but one thing that we *can* do, and that is to remain steadfast and true to the spirit and tradition of our College and our calling. If we do so serve until our little day is done, whether we are interpreting the spiritual values of the practical arts or of the philosophy of the poets, we shall be satisfied.

For what you have done as Alumni of Teachers College, we thank you. For the challenge and the opportunity of the future we congratulate you.

VALUES IN HIGH SCHOOL ALGEBRA, AND THEIR MEASUREMENT

By TRUMAN L. KELLEY
Assistant Professor of Education, Teachers College

PURPOSE OF THE STUDY

The inspiration to this study lay in the desire to measure the success of a course in mathematics specifically planned to realize certain very much broader values of the subject than are ordinarily sought. To answer the question of whether these values were being obtained, and if so, at what expense in terms of other values, the writer was asked to devise and give a test which would throw light upon the question. In doing this, he has been entirely unfamiliar with the specific subject matter or values striven for in this special algebra class—knowing only in a general way that less emphasis was placed upon the drill and mechanical features of the subject, and more upon the inspirational and cultural features. The values of algebra which he has endeavored to measure have not been contributed by any one connected with the experiment, but have been proposed by men and women of affairs, and by mathematicians away from the College. Precautions have been taken at every turn to prevent the loading of the experiment in favor of the type of work given in the new class or of that in the old established class. In brief, then, the present study attempts to answer the questions, "What are the values of high school algebra, and how are they to be measured?"

It is clearly recognized that our conceptions of values change with social needs, with our understanding of child psychology, and with knowledge of the actualities of attainment. The first step in this study was the obtaining of statements of value from various judges. This was followed by the derivation of a test to measure these values, and finally the test was given to two sections of high school pupils, yielding certain very significant results.

DESCRIPTION OF THE CLASSES STUDIED

In the spring of 1917, the girls of the Horace Mann Junior High School who were about to enter the Senior High School were

given the Rogers Mathematical Ability Tests and, upon the basis of the test results, were divided into two sections, A and B, equally capable, as they had equal variability and differed in mean score by but one-seventieth of the quartile deviation of either class. Section A was given the regular college preparatory algebra, and the other, Section B, an algebra which can not be described by the writer as he is unfamiliar with the specific subject matter and method of the course, but which it is understood had as its general aim the realization of very much broader values than are involved in mere college preparation. In the case of Section B, no attention was given to college preparation, provision having been made for additional study in a subsequent year should it be needed. Differences in the achievements of the two groups will be attributed to differences in the courses of study; but it must be kept in mind that the course of study is not independent of the individual qualities of the teacher. Accordingly, all differences found must be thought of as due to the difference in Section A work as given by Teacher A, from that of Section B work as given by Teacher B. Both Teacher A and teacher B are superior teachers; but it would be impossible to say that they are just equally superior. Teacher A had the advantage of a course well organized and capable of being given with little lost motion, while Teacher B had the advantage of the personal enthusiasm which comes from working in uncharted fields.

In the spring of 1918 both sections were given three tests which, for the lack of more descriptive terms, will be called:

1. Mathematical Values Test (drawn up by the writer).
2. Mathematics Test A (devised by Teacher A to measure success in the work of his course).
3. Mathematics Test B (devised by Teacher B to measure success in the work of Section B).

The scores in full for the Mathematical Values Test and summaries for the other two tests are given later.

It is apparent that the adequacy of the measurement of the relative merits of the A and B types of instruction depends in the main upon the excellence of the Mathematical Values Test. The questions of this test were carefully devised by the writer, with assistance from Mr. J. G. Meyer and Dr. F. C. Touton, with

the object of measuring the values attributed to high school mathematics reported in questionnaires filled out by men and women in sundry walks of life, and by mathematicians.

THE VALUE OF SECONDARY MATHEMATICS

The real values of mathematics are those which become apparent due to such favorable effect upon subsequent performances as can be shown to be due to the study. If all possible subsequent performances could be investigated, it would not be necessary to have a preliminary list of values; but, as this is out of the question, a list has been drawn up by a method which seems to be the soundest one available at the beginning of a study—that of a consensus of opinion of competent judges. Having ascertained the extent to which these are realized, by experimental investigations such as the present one, a revaluation will take place leading to the determination of a still more valid appraisal of the subject. The findings of this study, though insufficient in certain respects because of the small number of cases involved, nevertheless substantially contribute toward a more adequate evaluation of the subject.

A questionnaire was sent to ninety-two men and women of affairs whose names were suggested by some dozen colleagues. As a group, these ninety-two represent a sampling of capable and successful Americans. The questions asked were:

What do you consider to be the chief values that should be derived:

1. from high school mathematics as a whole?
2. from high school algebra?

Thirty-four replies to this questionnaire were received. In addition to the questionnaire, a letter was sent by the head of the department of mathematics of Teachers College to a number of high school and college teachers of mathematics, asking in addition to the two questions just quoted the following supplementary questions:

3. Do you believe we can justify the teaching of a subject like factoring when we extend it beyond the case of monomials and the case of the difference of two squares?

6. Do you believe we can justify the complicated cases in fractions that we ordinarily demand?

7. Would you leave ratio and proportion in algebra further than to show what proportion is?

8. Do you believe we should leave cube root in our algebra?

9. Do you believe it is wise for us to treat fractional exponents as fully as we do, and then leave it in the air without following it up by logarithms?

10. Do you believe we have a real satisfactory justification for requiring quadratic equations of all girls in the high school?

The replies from a number of the men and women of affairs and from the mathematicians are so suggestive that the significant points of certain letters are given in the following quotations:

FROM A LITERARY MAN:

My theory of education leads me to believe that if children are not befooled into thinking that their instinctive "Why?" is somewhere answered by their educators, every normal child can be developed into (1) a creator in the finer arts, (2) an inventor in mechanics, or (3) an investigator in original research work, whether in scholarship or the sciences. I am not entering into the desirability of such education; I merely consider it as a possibility.

By the same token, excluding the exceptional cases where there is no mathematical aptitude—more exceptional, I think, than cases of tone deafness and lack of sense of rhythm—I believe mathematics is of the spirit of poetry and the finer arts, essential in mechanics and the sciences, and of the first importance in orderly scholarship. . .

Personally, I got a very great deal from the solution of problems in quadratics, for instance, which I believe is high-school algebra, and it was in the nature of inspiration—by which I mean that, as happened last night when I was puzzling for an argument for a masque I am engaged to write, on a sudden, from no known source at command, used to come the key to the mathematical problem before me, just as the idea for the masque flashed into my mind last night. I think algebra has more of this than geometry, but that the difference is in degree rather than in kind, and that both are essential and important in (1) carrying on the answer to the eternal "Why?" another step; (2) accurate and orderly thinking of every sort; (3) making possible a rational basis for the finer arts through understanding of the metrical, rhythmical, and geometrical bases for them; (4) preparing for logic, whether deductive or inductive; and (5) in opening vistas, however brief, into the nature of that Law which I think synonymous with many aspects, if not all, of what we call, for lack of a better term, God.

FROM THE PRESIDENT OF A NORMAL SCHOOL:

First, as to No. 1, I am vigorously opposed to the doctrine of formal discipline. I regard it as a baneful superstition in education, and I therefore am at once limited to the view that mathematics must be taught for the uses which mathematics will serve; that is, must be taught for specific value. If a young woman is going into engineering or drafting or any mechanical or scientific line in which she will have occasion for mathematics, I think she should be taught the mathematics which she will have occasion to use; and if she is eager to know how the world works and how things are done just for the sake of information, some study of mathematics may serve her to that end.

Replying to your second question, I cannot see that high school algebra is of very great value to girls who will not have occasion to use it specifically in their after life. Personally, I am convinced that it has a deadening effect upon most of the girls who study it. It gives them the conviction that there is something that they cannot learn and cannot understand, and they are apt to conclude that their minds are poor minds because of that fact.

FROM A DEAN OF A COLLEGE OF EDUCATION:

(1) Simple applications to needs of everyday life. Appreciation of value of exact methods.

(2) Experience in abstract reasoning. A little knowledge from this source may be of some use, but not all girls (or boys either) can profit from this kind of work as much as from some other kind. I approve the aims as usually stated for mathematical studies, and believe that they should be attained in every rational scheme of education; but I am more interested in the results than in the means or methods employed. I fancy that most of the general and formal results can be attained by some persons in some other way. I am disposed to believe that mathematics (beyond the elementary and practical stage) is not an essential subject of instruction.

FROM A SOCIAL WORKER:

Despite the fact that I made mathematics a major at Bryn Mawr College, I feel sadly incompetent adequately to answer your two questions. The principal benefits, it seems to me, which might be derived from the study of mathematics are, first, a certain type of mental discipline; second, persistence in grappling with problems, real or theoretical; and, third, a comprehension of the fact that a basic sort of law and order prevails in the universe.

In point of fact, I have often asked myself the questions which you put to me, but I have never been able to arrive at a satisfactory conclusion as

to the practical value of training in mathematics—that is, whether it is an efficient aid in character building.

FROM A DIRECTOR OF SALESMANSHIP:

For the average woman who is to fill a useful place in society, there seems little use for high school mathematics. . .

The only value of the study of algebra, it seems to me, is the mental training that such an exact science gives. But, if taught by a good instructor, that same mental training can as easily be obtained from the study of any other subject, the content of which is of use in daily living.

FROM A DIRECTOR OF A VOCATIONAL BUREAU:

. . . Close, accurate thinking—the ability to distinguish between presumption or opinion, and well established fact—seems to me to be fostered by dealing with problems in mathematical terms. There is a close relation between mathematics and logic.

To state it more generally, mathematics seems important to me as fundamental to all scientific method. I do not see how any one can have a good grasp of the scientific view of the world unless he understands to some extent mathematical formulations of phenomena. This period seems to be increasingly one of science. We are all trying to reduce even the enormously complex problems of sociology and of psychology to mathematical treatment. The more successful we are, the more scientific, and, consequently, the more useful we seem to be. To understand mathematics as the final instrument of science, seems to me to require work of high school grade. Algebra has value in that it presents a more generalized and abstract statement of mathematical principles than arithmetic. . .

Housekeeping has notoriously suffered for lack of business management which in the analysis means lack of mathematical formulation.

I hope the course of training you are planning has reference to producing a knowledge of mathematics which has a stronger tendency to be functional than that of the past.

FROM A TEACHER OF WORKING GIRLS:

Theoretically, the development of the reasoning faculty; very skeptical on the point both from personal experience as a student and as a teacher. The only kind of mathematics that I have any respect for is vocational mathematics. Women sew, cook, paper rooms, buy carpets, etc. They should be taught to figure these problems exactly and scientifically. Then, of course there is the specific training for dressmakers, nurses, bookkeepers, etc. We have been altogether too theoretical to my mind.

In my opinion, time spent on algebra by girls in the high school is usually wasted. I would substitute some form of scientific work.

FROM A HOUSEWIFE:

Thank you for giving me an opportunity to express an opinion on the immensely interesting and important subject you have under consideration.

I regret that I must express my only possible answer in a form which has become a truism without having ever been treated as a truth—that is, acted upon. May I beg you, however, to believe that I agree with it not because it is a truism, but in spite of that? And that my conviction of it is the product of ten years of increasingly serious reflection over the question, "What did my schooling do for me?" I was always an honor student, thus showing that I received from my courses the maximum of what the institutions expected me to receive. I am ready to assert now, and to defend the assertion, that my eight years of higher schooling, in high school and college, were, considering the cost and the value received, a monstrous extravagance.

As to mathematics specifically—I arrive at the answer to your question "What should it be worth?" via the question "What has mine been worth?" The latter I have considered under two aspects: (*a*) Practical use of knowledge of mathematical operations since graduation; (*b*) mental development derived from study of mathematics.

(*a*) The "average girl" student, whom you are considering, has little occasion to use, in later life, anything but the simplest mathematical operations, mastered supposedly in grammar school, unless she follows a science or profession involving such a use—and then she is not the average girl.

I can speak with judgment because my career since college has covered, sketchily, almost all the ordinary occupations of average women except office work. I have been successively a social idler, a teacher, a traveller, a married housekeeper who kept a budget and a day-book, a social secretary, a suffrage organizer, and I am a mother. In the course of this rather comprehensive female career, I have never once, so far as I can remember, had occasion to use my algebra or geometry. The study of these throughout four years that should have been precious was, from this point of view, therefore, distinctly a luxury.

(*b*) On mental development received, then, the presence of mathematics in the general curriculum must rest its case.

Personally, I am certain, by careful self-analysis, that the amount of mental development I received from it is negligible. Being an optimist, however, I feel that it need not be negligible; but that for it to be anything else requires an entirely different conception of aim, proper

subject-matter, method, and text-books—especially aim, which would regulate the rest.

Briefly, to express my truism: The sole value, which is also the greatest value and the most practical value it could have, of mathematics in a general curriculum, is to send into the world thinkers-out.

This implies that (1) it shall have taught them to recognize a problem when they meet it—to extricate the essential problem from irrelevant and confusing matter. This obviously necessitates a bonfire of the obliging old text-books that present your problems cut and dried and ready to work. Life invariably throws its problem at you all wrapped and tangled up with irrelevant things from which they must be incisively separated and comprehended before they can be solved. The text-book, being assumed to be a training for life, should imitate life's conditions as closely as practicable. Why not? (2) It shall have taught them, once they have established the premises clearly, to think out the problem, by exact and purposeful thought-processes, to a logical conclusion. Not necessarily the conclusion, always, that someone else would arrive at, but a conclusion that they are satisfied with, and can justify, even if there is somewhere a going-astray. (3) It shall have seen to it that they have experienced the thrill of thinking-out, so that all the rest of their lives they will be eager on the trail of problems, like a game dog after a rabbit, instead of, like the average lazy mind, a fat poodle on a cushion.

I hope that you do not think this aspect of the case unpractical. What could be a more practical aim than the turning into the world of numbers of persons who will, as they mature, be capable and eager to cope with the human problems which must be thought out if the race is to progress any more intelligently ever than it has done so far? The next generation is not going to be able to live quite as haphazardly and sheepishly as ours. The "women of influence" (to quote your letter) will be those who are able to think out the new problems (and old ones grown imperative) to conclusions in which they have confidence; i.e., confidence in the mathematical integrity of their own thought processes, sufficient to give them the courage necessary for basing action on their conclusions.

The quotations given present but a partial view, and are not typical. The most typical answer would be one betraying but slight conviction in the matter. The following table supplements the quotations.

A summarizing by the writer of the points of view in the letters leads to the following:

1. The most significant fact is the dearth of conviction as to values of high school mathematics;

TABLE I

RESPONSES TO THE QUESTIONNAIRE

	Number of Questionnaires Sent Out	Number of Replies Received	Number of Replies Betraying No Personal Conviction
Writers, editors, and men in law, medicine, and divinity	17	2 (both from literary men)	
Educators, general	11	7	2
Presidents and deans of women's colleges	7	5	3
Educators connected with corporation schools and vocational bureaus	15	5	2
Women engaged in philanthropic, suffrage, trade union, and other social work	25	12	8
Men and women engaged in business	9	2 (from auditor and banker)	
Unclassified	8	1 (from housewife)	
Total	92	34	15

2. The next most common note is the iteration of a belief in the wide disciplinary value of the subject; and next,

3. The iteration of the belief that the subject has utilitarian value only; for example, business mathematics, shop mathematics, etc.

4. A belief in rather wide values, disciplinary in a limited sense, and utilitarian in a broad sense (especially represented by the sundry groups of educators); and finally,

5. The belief that high school mathematics should be radically changed in method (probably also in subject matter), to permit of realizing its broadest possibilities as a tool in creative endeavor.

The expressions of opinion coming from mathematicians were more definite and richer in detail than those from the men and women of affairs. Space does not permit of giving quotations, with the exception of the one below, written by one whose opinion must be held in high esteem.

FROM MAXIME BÔCHER:

. . . I suppose that the chief value of high school mathematics for girls (and also for such boys as are not to make direct use of it later) is that it teaches them to concentrate their attention. It is chiefly in this capacity for concentrated attention that the mathematical mind differs from most others, and, however imperfect the results of high school teaching of mathematics in many cases, the pupil can hardly fail to see the importance of such concentration and to perceive wherein is her own deficiency; and this is the beginning of wisdom.

It would not be incorrect to say the value lies in the training it gives to correct reasoning (or, as I should prefer to call it, thinking straight) or, on the other hand, in the habits of accuracy which it forms (this last particularly in the case of algebra); but, after all, both of these qualities are merely results of the concentration of attention, and follow necessarily from it.

The answers to the supplementary questions sent to the mathematicians yielded the following table in which the numbers in the columns are the frequencies with which the answers indicated were given. Table II (pp. 256-57).

For each question the answer has been starred which seems to best represent the consensus of opinion. The answer to question 10 shows that it is decidedly the opinion of this group that all girls should take algebra and proceed to a very considerable distance with it. The answers to questions 4, 6, and 8 show that there is some inclination to lighten the work by omitting the harder phases, but on the whole they indicate that these teachers of mathematics think that algebra, as usually taught, covers a field that should be covered and that it is good for all high school pupils. (It is possible that this same group would advocate adding topics outside the usual field; the questionnaire does not answer this point.) Is it overstepping the evidence to conclude that since opinion is rapidly crystallizing to the effect that all pupils should be kept in school through the high school period, these mathematicians consider that high school algebra, but slightly simplified from what is now in vogue (though possibly having new topics) is a study which it is appropriate to require of all children? The values of mathematics as seen by mathematicians are varied and positive, and without doubt they consider them capable of being realized to such an extent by the rank and file of high school children as to be eminently worth while.

TABLE II

REPLIES TO QUESTIONNAIRES RECEIVED FROM MATHEMATICIANS

Question	Failure to answer	Answer unfavorable to the teaching of the item mentioned	Answer in the main unfavorable to teaching of item mentioned but qualified in some manner	Answer in the main favorable to teaching of item mentioned but qualified in some manner	Answer favorable to teaching of the item mentioned	Answer favorable to teaching of the item mentioned and advocating still further instruction along the same line
3. Factoring beyond monomial and difference of two squares		1	2		2	*8
4. Present extended work in multiplication and division	2	5	*	*4	2	
5. Linear equations with three or more unknowns		4	1	*3	4	1
6. Complicated fractions ordidinarily demanded	2	*7	1	2	1	

7. Ratio and Proportion beyond showing what proportion is	2	2	2	*4	3
8. Cube root	1	*9			3
9. Fractional exponents without following it up with logarithms	1	6	*2	1	3
10. Quadratic equations for all girls in high school		1	1	1	*10

It is difficult to summarize the varied statements of values obtained from the mathematicians. The most persistent emphasis is laid upon the value of algebraic training in establishing a method of dealing with the varied problem situations of life. This value is at times stated in such general terms that it can be described as a general disciplinary value, and at other times so definitely as almost to constitute a training in specific reaction. To certain mathematicians the method seems to be predominately one of concentration; to others, of proof; to others, of exactness, etc., etc.; and probably to all, to involve all of these things. The stated importance of the algebraic method is such that there is no doubt that mathematicians generally would readily admit that "for such as are not to make direct use of it later," algebra study would be worth while if it instilled or developed a method, and would be nearly a total failure did it not do so. In brief, the most important appraisal of the subject depends upon the extent to which it is found to insinuate the virtues of algebraic reasoning into the handling of the more general problems of life. If, therefore, a test can be devised to measure the extent to which the algebraic method is used in non-algebraic situations, it will be a test of the most important feature of the subject (except only in the case of those individuals who have large utilitarian need for specific algebraic operations).

Summarizing all the values reported by the mathematicians gives the following table.

TABLE III

VALUES RESULTING FROM STUDYING HIGH SCHOOL MATHEMATICS AS REPORTED BY MATHEMATICIANS

Table is to be read, "One person out of 17 reported high school mathematics as developing one's powers of abstraction," "Six people reported high school mathematics as developing one's accuracy in thinking," etc.

In Answering Question I: What do you consider to be the chief values that should be derived from high school mathematics as a whole?

No. of Responses	
1	Abstraction
6	Accuracy in thinking
2	Analysis
1	Analysis of association processes, leads to
3	Applications, knowledge of
2	Apply, ability to
3	Clearness

1 Community of interest in family—mother's appreciation of problems of husband and children
5 Concentration and attention
3 Constructive imagination—coordination of imagination and reasoning ✓
2 Culture
2 Disciplinary value
3 English, power of expression in
3 Generalization
1 Geometry—inference
2 Geometry—perception of form
1 Geometry—spatial relationships
1 Guidance—self-discovery
1 Honesty
1 Ideals, stimulation of
1 Inference
1 Mathematical ideals
1 Memory
6 Method
2 Neatness
3 Originality—self-reliance
1 Pleasure—recreation
5 Preparation for advanced science and mathematics
1 Proving results, habit of
3 Quantitative relationships, appreciation of
7 Reasoning
1 Recognition of known when found in a problem
1 Selection
3 Symbolic reasoning ✓
1 True associations are finite and generally few in number, i. e., modes of solution are few in number
1 Truth, respect for
1 Visual imagination

In Answering Question II: What do you consider to be the chief values that should be derived from high school algebra?

1 Abstraction
2 Accuracy
1 Concise statement
1 Contribution to understanding of arithmetic
1 Differentiation between known and unknown
2 Formulas, appreciation of, use of
1 Formulas, interpretation of
2 Formulas, and equation, use of
1 Graphs
1 Method, algebraic
10 Same as answer to Question I
1 Selection
1 Tables, use of—logs, etc.—interpolation

Combining such values as seem most similar, and adding such others as are mentioned in the replies from men and women of affairs, gives the following lists, every item of which, down to number 25, is sponsored by two or more individuals. Item 26 was added in the attempt to ascertain the extent to which training in mathematics transfers to broader fields. In reading this list of values, no particular significance is to be attached to differences in the introductory words.

TABLE IV

MATHEMATICAL VALUES

1 Provides entertainment for recreational hours.
2 Prepares for advanced sciences.
3 Prepares for advanced mathematics.
4 Leads to an understanding of ancient and modern accomplishment of mankind.
5 Establishes algebraic method of solving problems.
6 Establishes the habit of reasoning in terms of symbols.
7 Leads to an understanding of formulas.
8 Leads to use of formulas in solving scientific and social problems.
9 Leads to an understanding of graphic methods.
10 Leads to use of graphic methods.
11 Establishes the habit of proving results.
12 Establishes the habit of considering situations from their quantitative (instead of merely qualitative) aspects.
13 Establishes the habit of differentiating between the known and unknown elements in a situation.
14 Develops religious sense and appreciation.
15 Develops high ideals of life.
16 Develops mathematical ideals.
17 Leads to self-discovery and guidance.
18 Develops respect for truth (honesty).
19 Develops self-reliance.
20 Develops originality.
21 Develops powers of clearness in statement (definiteness).
22 Develops powers of concentration (sustained attention).
23 Develops powers of generalization.
24 Develops powers of inference (constructive imagination).
25 Develops powers of analysis.
26 In addition to the assigning of each problem to one or more of the preceding 25 values the judges were asked to indicate such of the questions as test transfer of training.
27 Measures accuracy in fundamental operations.
28 Measures knowledge of arithmetic.
29 Measures accuracy in thinking.

30 Leads to knowledge of necessity of accurate and sufficient data.
31 Leads to increased interest in and appreciation of mathematics.
32 Measures closeness of relationship between theory and practice.
33 Leads to habit of examining life practices.
34 Leads to appreciation of mathematical law.
35 Leads to study of geometry.
36 Leads to familiarity with fundamental mathematical concepts, wide reading, etc.
37 Tests information obtained outside of class—general information.

Having described the classes tested and determined the values which are to be measured, we will proceed to:

THE UTILIZATION OF THE VALUES REPORTED, IN MAKING A MATHEMATICAL VALUES TEST

This list of 26 items was given to certain authorities who were asked to grade questions upon the basis of which of the 25 values they measured. Some authorities considered that certain questions measured values not listed. In such cases they were asked to state the value which they considered the question to measure. As a result of this, values 27 to 37 have been added.

In attempting to devise a test which would measure the first 25 values listed, some 300 problems were originally drawn up, each with the view to measuring some one of the values. The most promising 150 of these were divided into three sets so that questions measuring each value are found in each set. Set 1 only has been further worked with. The 50 problems in this set were given to five mathematicians, one high school teacher of mathematics, two university professors of mathematics, and two statisticians, with the request that for each problem ten points of credit be assigned (divided if necessary) to the value or values which the problem might be expected to measure. The credits for a number of problems were divided among two or more values. By noting the values thus considered to be measured by the same problems, it was possible to pick out those which were most closely related to each other. These related values have been combined and given a designation which represents the entire group as shown in the next table, and are taken as best representing the replies to the questionnaires regarding the objectives which should be realized by the study of high school algebra in that they (1)

give the essential values claimed for high school algebra, and (2) are as independent of each other as possible. (The answers to question 1 and 2 indicate that there would be but small change if the values to be drawn up covered all of high school mathematics. The answers also warrant the statement that except for those having specific utilitarian need for algebra, the same things should be realized by boys as by girls.)

THE MATHEMATICAL VALUES TEST AND THE SCALES FOR USE IN GRADING ANSWERS

The logician will be acutely aware that the items listed are not completely independent of each other. This, unfortunately, must be admitted; but judging by the gradings of the fifty problems by the five mathematicians, they are more independent than would result from any other set of thirteen values.

The fifty questions drawn up in the original instance, each to measure one particular value, and graded by mathematicians upon the basis of the values which they considered them to measure, were finally allocated to certain single values. In doing this it was found that some half dozen of the questions did not stand out as measuring any single one of the thirteen values. These problems were, therefore, dropped. Those that were left were given to Sections A and B at the end of their first year of algebra instruction, and scales for the grading of them were drawn up. The accompanying directions were given to the judges who had previously graded questions for the values which they measured, and from their rankings scales were drawn up, following with minor modifications the method used by Hillegas in drawing up his English Composition Scale.

DIRECTION SHEET GIVEN TO JUDGES:

It is purposed to measure thirteen different fundamental mathematical values by the accompanying thirty-eight problems.

Sample answers are given for Problem 1 which you are requested to rank in the order in which they reveal SELF-RELIANCE AND INDIVIDUAL MASTERY OF MATHEMATICAL CONCEPTS (1 the best, 2 the next, etc.). Attempt to disregard all other values or merits of other sorts in grading these answers. If 0 = just not any degree of ability of the above trait, and 10 = the median ability of girls in general who have had one year of high school algebra under a capable teacher who has definitely tried to cultivate

this and all the other capacities here listed, what, according to your judgment, is the merit of the answer which you have ranked highest? Of that which you have ranked lowest?

Problem 5, 6, 17, 18	Similar assignment. Value here measured is: Utilization of Mathematics in Recreational Activities.
Problem 9, 20, 21	Knowledge and Appreciation of the Momentous Mathematical Accomplishments of Mankind.
Problem 2, 12, 28	Mastery of the Algebraic Method in the General Attack of New Problems. i.e., Algebraic Attitude toward Problem Situations in General.
Problem 23	Facility in Reasoning in Symbolic Terms.
Problem 10, 24	Facility in Interpretation of Formulas.
Problem 13, 14, 15, 16	Facility in Using the Formula as a Tool and Appreciation that It May Be so Used in Solving Scientific and Social Problems.
Problem 11, 29, 31	Facility in Interpretation of Graphs, Tendency to Use Them as Tools, and Appreciation that They May Be so Used in Interpreting Scientific and Social Phenomena.
Problem 3, 19, 22	Power of Analysis, Especially Mathematical Analysis of an Elementary Sort.
Problem 8, 30	Ability to Make True Inferences, Especially Mathematical Inferences and Deductions of an Elementary Sort.
Problem 4, 25, 26	Religious Sense and Appreciation, High Ideals of Life, Honesty, etc.
Problem 27	Ability to Generalize, Especially Mathematical Generalizations of an Elementary Sort.
Problem 7	Appreciation of Utility of Mathematics in Other Walks of Life than Those of the Mathematics Class Room.

As indicated, a request similar to that for problem 1 was made for each of the problems, the value, or basis upon which the ranking was to be done, being changed from problem to problem.

It was found very difficult to rank for merit the answers to some of the questions. By statistical analysis it can be inferred that the

reliability coefficient of the grade given to a problem by one judge using an established scale must be .17, if the difference between two classes of twenty-five each, between which there is actually a difference in ability equal to one probable error of the distribution of either of the classes, is to be determined with such a validity that the chances are five to one that the true difference is in the direction shown. Taking this as the minimum reliability which can be considered satisfactory in dealing with single classes, it was found that a number of the problems would not yield satisfactory results. Accordingly, problems which have a reliability coefficient less than .51 have been omitted from class comparison calculations and from the test as printed below (reliability coefficient $= \frac{nr}{n + (n - 1)r} = .51$ when number of judges is 5 and correlation between judges is .17). As a consequence, it is claimed for this test that four times out of five it will reveal the direction of difference in ability between two classes of twenty-five if graded upon any single question by a competent judge, using scales to be reported later, provided the true difference between the two classes is equal to one P.E. of the distribution of either class. The method is that of comparing the class averages of scores given by a judge as competent as a first class teacher of mathematics. In fact, most of the questions have a much greater reliability than the minimum just described.

MATHEMATHICAL VALUES TEST ALPHA

1. How would you find the value one year hence of a W. S. S. for which you now pay $4.16?
2. It has been claimed that there is an algebraic type of thinking. What does this mean to you?
3. A certain professor gave a lecture in a town some distance away, for which he was to receive $100 and his expenses. The note-book in which he kept track of his expenses read as follows:

Feb. 2,	Ticket	$19.10
	Dinner	1.00
	Cab	1.50
	Hotel Bill	18.20
	Liberty Bond	50.00 paid first installment
Feb. 5,	Couple dollars of tips and Pullman	2.00
	Return fare	17.10

One morning the professor tossed this note-book to his wife and asked her to make out a bill covering all moneys due him. She did her best.
(*a*) Express your opinion with reference to each item in the note-book as to whether or not it is complete and satisfactory.
(*b*) Make out the best statement or bill that you can from the note-book.

In your mind how is algebra related to

4. Religion?
5. Life in the home?
6. Life out of doors?
7. Other school subjects (*a*) home economics? (*b*) sciences? (*c*) history? (*d*) any other school subjects?
8. Write down just what you have been told higher mathematics deals with. Who told you this?
   Now think of mathematics that is still more advanced than this that you have just described. Make a good guess and describe what you think it deals with.
9. Where did our present numerals originate and about when were they first used in Europe?
   What system of numerals did people in Europe generally use before they used our present one, and how did they perform such operations as addition, subtraction, multiplication, and division?
10. The area of a circle is πa^2. What does π stand for? a^2 ?
11. Suggest three or four problems other than those discussed in your algebra class that could be made clear by means of a graph.
12. The algebraic method is one of supposing the unknown quantity known, making a statement (an equation) which relates this to the known quantities, and then determining the unknown in terms of the known (solving the equation). Can you think of some problems suggested by your other school work, or your life outside of school, in which this method applies? Explain.
13. In the solution of what kind of problems is it desirable to use logarithms?
14. The expression of a physical law by means of a mathematical formula is probably the most powerful tool in modern science for the interpreting of scientific facts. For example $S = \frac{1}{2}gt^2$; in which S = the space passed over by a falling body, g = the force of gravity, and t = the length of time that the body is falling. The simple formula

$S = \frac{1}{2}gt^2$ tells more about the law of gravity than a whole volume could tell without it.

Write down any other formulas that you know.

Write down for each of the following fields two relationships which you think have been, or are capable of being, expressed by means of formulas:

15. Electricity (Sample answer: There is probably a formula which gives the relation between the amount of current which can flow through a wire and the size of the wire.)

16. Air (Sample answer: There is probably a formula which gives the relation between the temperature of the air and the rapidity with which sound travels through it.)

17. Mention some recreational activities in a person's life that algebra can make more enjoyable.

18. Do you know any game in which algebra is used? If so, describe it.

19. Two men meet and the one says to the other "My father is your father's son." What kin were they?

20. What do any of the following names suggest to you in connection with mathematics?

    Pythagoras; Newton; Euclid; Pascal; Archimedes; Leibnitz; Leonardo of Pisa; Descartes.

    Add the names of any others whom you know who have made important mathematical contributions, and tell what they did.

21. Certain great concepts or ideas have been discovered as humanity has evolved. Some of these are listed below. Number them 1, 2, 3, etc., in the order of their momentousness or importance. *Consider that one which has revolutionized procedure most to be the most important;* for example, (*a*) below is of tremendous importance, for the present number system displaced the old cumbersome Roman system composed of X's, L's, C's, V's, etc., and it is extremely difficult to do so simple a thing as to multiply in the Roman system.

    a. The present number system.

    b. The idea or concept of the letters x and y as unknowns in an equation and of a and b as knowns.

    c. The concept of o, zero.

    d. The concept that $a^2 a^5 = a^7$.

    e. " " " $x^2 - y^2 = (x + y)(x - y)$.

f. The concept that an equation can express the path of a comet or planet around the sun.

g. The concept that an equation of this type, $4y-x=7$, is a straight line.

h. The concept that \$1.00 at 5% interest compounded annually = \$1.10¼ at the end of 2 years.

i. The concept that if $2x^2-10x=28$, then $x=7$.

j. The concept that in many problems the unknown quantity can be dealt with as though known, in building up equations, the solution of which gives the value of the unknown.

k. The concept that $ax^2+bx+c=o$ is the same as

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

22. If a man 5 ft. tall weighs 110 lbs., a man 6 ft. tall should weigh how much?
If a dwarf 3 ft. tall weighs 30 lbs., a man 6 ft. tall should weigh how much?
If a new born baby 20 inches tall weighs 8 lbs., a man 6 ft. tall should weigh how much?

23. The area of a triangle equals one-half the product of the base and altitude. If the area of a triangle = ab, what does a stand for, and what does b stand for?

24. If F represents *force* of attraction, G is a constant, M represents the *mass* of one body, m the *mass* of a second body, and D the *distance* between the two bodies, what does $F=\frac{GMm}{D^2}$ mean?

Is there any mathematical symbol or operation that makes you think of, or seems in some way similar to:

25. God's all pervading power—that is, his presence in nature around us?

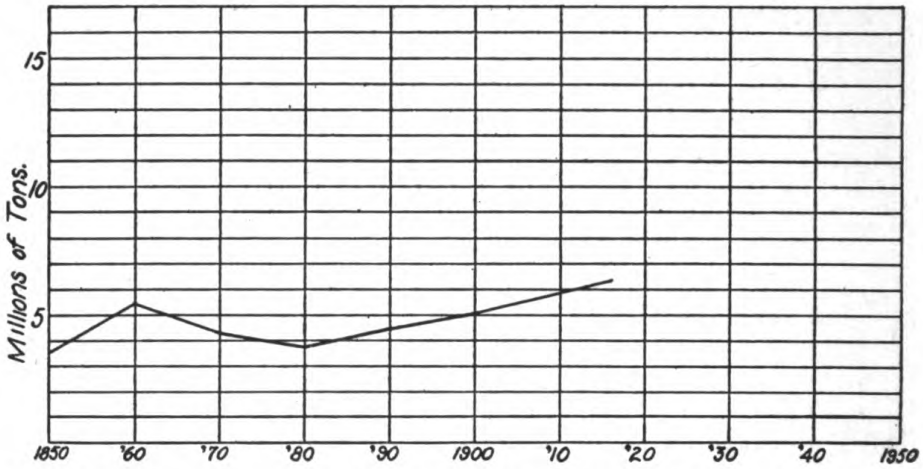
26. The intimacy of God's power—that is, his presence in our own natures?

27. Living creatures can be divided into two fundamental groups, male and female. Mention all the mathematical symbols or operations that show an equally fundamental division into two aspects. There are many illustrations, so give more than one.

28. $R=\frac{nr}{1+(n-1)r}$ $\quad R=.90$ $\quad r=.45$

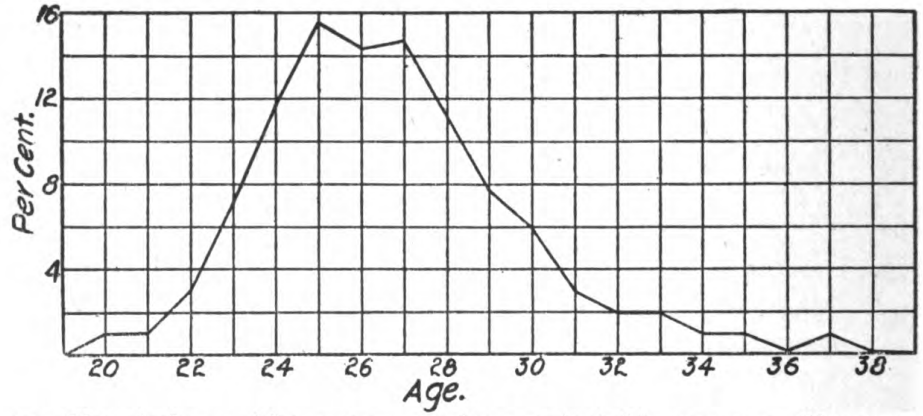
What is the unknown in this equation? Solve for it.

29. The accompanying graph gives the amount of U. S. tonnage for a number of years. How do you account for the low spot in the curve?



30. In January, 1918, the U. S. expected to build about 3 million tons during 1918 and 6 million in 1919. It was feared that submarines, storms, etc., would sink 1/6 as much as was built. Assuming these estimates to be correct, draw the curve from 1918 on to 1920. Make a guess and draw it from 1920 on to 1950. What effects have the important wars of the U. S. had upon tonnage?

31. The accompanying graph gives the percentages of married graduates of a certain girls' college who married at different ages. At what age did the most marriages occur? At what ages were there just 10% of marriages?



32. Mrs. A. has a skirt pattern cut for a 40 inch hip measure. Her own hip measure is 44. The pattern is in two parts, one measuring 25 inches at the bottom and the other 30 inches at the bottom. What should be the bottom measures for the two parts in order to conform to Mrs. A's hip measure?

Scales are to be used in grading the answers to the test questions. Each question is graded for the extent to which it gives evidence of the specific value that it measures, which is indicated at the top of each scale. The reliability coefficient recorded measures the extent to which the scale values would correlate with a second set of values derived from the rankings of other equally competent judges.[1]

VALUE: Mastery of Algebraic Methods

RELIABILITY COEFFICIENT = .58

PROBLEM 2: It has been claimed that there is an algebraic type of thinking. What does this mean to you?

0 No answer.

2 An algebraic type of thinking means a clear headed mind, entirely devoid of imagination. The mind that sees at once a type of problem and can apply this formulae to it.

3 I think that an "algebraic type of thinking" means that when you think of something you think of it in a general way.

4 I think that an algebraic type of thinking means an easier way of finding unknowns for pupils old enough to comprehend it (the method). It is in many ways too complicated to be taught in the lower grades.

5 I think that the algebraic type of thinking is merely the use of common sense and the application of the power of reasoning.

10 An algebraic type of thinking is by thinking of something in the easiest way possible and that when a harder thing comes up of the same kind why it is possible to use the same way as you used for the easier one. It won't take you as long for the harder as it did the other one.

11 I think that an algebraic type of thinking is a way of thinking when you try to think some one thing out by means of facts you know nearly related to it.

13 An algebraic type of thinking brings to my mind the idea of figuring things out through substitutions. This is only the technical side, however. The other side reminds me of putting algebraic methods into everyday work—questions in other subjects—letting one argument follow another in succession with the thought.

[1] Scales for each question have been drawn up, but the entire scale for Question 2 and parts only of the scales for Questions 4, 6, 12, 15, 20, 22 and 25 can be given here. (The entire set of scales, twenty-nine in number, may be purchased from the Bureau of Publications, Teachers College.)

14 I should think that an algebraic type of thinking was thinking with the unknown as letters—a reasoning by trying to make these letters fit into the problem.

15 I think that the algebraic type of thinking is thinking in the most compact form. Also thinking somewhat symbolically.

16 It seems that this is thinking out in a systematic manner what is unknown to you, and finding these unknown subjects by means of things which you already know.

VALUE: Religious Sense and Appreciation, High Ideals of Life, Honesty, etc.

RELIABILITY COEFFICIENT = .68

PROBLEM 4: In your mind how is algebra related to religion?

4 I don't think it has much to do with it, unless you have algebra problems which might arise. For example in handling of collections at churches, though I don't know whether you would call that a part of religion.

11 Yes, I think algebra is related to religion because you should prove what you learn.

20 It might help you to see straight—consequently to see both sides of a question. The two might make you tolerant.

VALUE: Utilization of Mathematics in Recreational Activities

RELIABILITY COEFFICIENT = .97

PROBLEM 6: In your mind how is algebra related to life out of doors?

0 It isn't.

10 Buildings, trees, distances of all sorts may be measured by algebra, no buildings are made, or bridges constructed without its aid.

14 In lots of ways that interest me but that I don't know much about. There is a formula about throwing a ball and when I see big birds flying and water running I wonder if there are formulae for them too.

VALUE: Mastery of the Algebraic Method

RELIABILITY COEFFICIENT = .74

PROBLEM 12: The algebraic method is one of supposing the unknown quantity known, making a statement (an equation) which relates this to the known quantities, and then determining the unknown in terms of the

known (solving the equation). Can you think of some problem suggested by your other school work, or your life outside of school, in which this method applies? Explain.

11 In translation of languages by knowing some words you are able to know the meaning of sentences even if you really would not know all the words.

19 This really ought not to be but is sometimes. When I don't know my lesson, I sometimes pretend I do, and it works, if I can reason out from what is said before what the answer should be. Also outside when one does not wish to show their ignorance it is better to just not speak first but find out from what other people say.

20 In geographical work. For instance the determining of climatical conditions, from vegetation and animal life, the length of the days of an unknown land by considering those known lands that surround it. Also in historical research work one traces peoples, customs, animals, by patching up gaps of the unknown with logical suppositions based on known and proved facts. It is the putting of two and two together to get the unknown few.

VALUE: Facility in Using the Formula as a Tool and Appreciation that It may be so used in Solving Scientific and Social Problems

RELIABILITY COEFFICIENT = .83

PROBLEM 15: Write down after each of the following fields two relationships which you think have been, or are capable of being, expressed by means of formulas: (*a*) Electricity.

(Sample answer: "There is probably a formula which gives the relation between the amount of current which can flow through a wire and the size of the wire.")

0 Electricity can't be put down that way.

10 The force of the power going thru a wire and the size of the electric bulb to which it runs should have some formula.

17 There is probably a formula which gives the relation—between how fast an electric fan goes and the current of electricity.

VALUE: Knowledge and Appreciation of the Momentous Mathematical Accomplishments of Mankind

RELIABILITY COEFFICIENT = .95

PROBLEM 20: What do any of the following names suggest to you in connection with mathematics?

Pythagoras; Newton; Pascal; Euclid; Archimedes; Leibnitz; Leonardo of Pisa; Descartes.

Add the names of any others whom you know who have made important mathematical contributions, and tell what they did.

0 Euclid wrote the first book ever written.

9 Euclid—Geometry.
Pascal—Pascal triangle.
Newton—Law of gravitation.

23 Euclid lived about 300 B.C. and wrote the first book of geometry. Lived in Alexandria, Egypt.

Pascal, a French philosopher and mathematician, who invented the Pascal triangle.

Pythagoras—the Pythagorean proposition.

Archimedes lived 250 B.C. in Syracuse, Sicily. He found out that $(a + b)^2 = a^2 + 2ab + b^2$

Descartes, 1637, a Frenchman, whose name signifies "of the maps." To him we owe our graphs and better knowledge of negative numbers.

Bhaskara (1150) had a daughter named Lelavatis, and he named his arithmetic after her. To him we owe $a \div 0 = \infty$

Mohammed iba Musa al Khowarizni wrote a book which he called Al-jabr.

Ahmes in 1700 B.C. recopied a book written in Egypt over 4000 years ago. One of the problems which it contained was "Haan, its seventh, its whole, it makes 19." We would write this to-day—

$$\frac{1x}{7} + x = 19.$$

In India, at Bagdad, there were many fancy problems one of which was, "A pile of apples divided among, 1, 2, 3, 4 or 5 persons, has a remainder of 1. Oh you who know arithmetic tell us the numerical value of the pile." They had to write out all their problems.

VALUE: Power of Analysis, especially Mathematical Analysis of an Elementary Sort

RELIABILITY COEFFICIENT = .92

PROBLEM 22: If a man 5 ft. tall weighs 110 lbs., a man 6 ft. tall should weigh how much?

If a dwarf 3 ft. tall weighs 30 lbs., a man 6 ft. tall should weigh how much?

If a new born baby 20 inches tall weighs 8 lbs., a man 6 ft. tall should weigh how much?

1 132
60
$26\frac{4}{5}$ pound

10 A man 6 ft. tall would weigh 138 lbs.
" " " " " " 69 "

That is if they all had the same no. of lbs. of flesh in comparison with their height.

14 If a man 5 ft. tall weighs 110 a man 6 ft. tall should weigh whatever is the average weight for a man 6 ft. tall. It's not his fault if the 5 ft. man is under or over weight. It has nothing to do with him at all. Neither would the little dwarf affect the 6 ft. man's height—nor yet the baby.

VALUE: Religious Sense and Appreciation, High Ideals of Life

RELIABILITY COEFFICIENT (4 judges) = .92

PROBLEM 25: Is there any mathematical symbol or operation that makes you think of, or seems in any way similar to, God's all prevading power—that is, his presence in nature around us?

2 The only way God is related in my mind to algebra is that it makes me take his name in vain.

6 Mathematics in itself does not seem, to me, to have anything whatever to make me think of God.

14 The formulae because they show that there is some law for almost everything.

TEST RESULTS AND CONCLUSIONS

The following tables give the detailed scores received by the members of the two classes on the Mathematical Values Test, the differences between the mean scores made by the two sections on each of the questions, and the probable errors of these differences. The formula used for calculating the probable errors is that for the difference between correlated measures, the correlations in this instance being determined by rough methods. A plus difference means that Section B is better than Section A.

The results of the Mathematical Values Test show that for a number of problems the differences in the mean accomplishments of the two sections are less than their probable errors, and,

TABLE V

Score Sheet.....Section A. Pupils A.....T.

Pupils A.....T.

Problem Nos.	17	18	5	6	21	20	9	2	12	34	23	10	24	13	14	15
A	1	0	6	9	6	15	7	10	0	11	20	11	16	1	4	15
B	0	0	7	8	4	5	10	14	14	6	14	11	13	1	16	10
C	10	0	5	6	4	6	4	2	7	1	8	11	3	1	6	11
D	1	2	5	2	1	1	10	12	4	5	0	15	1	1	7	7
E	0	0	4	3	6	20	4	5	0	10	0	1	12	1	8	0
F	0	3	2	0	5	3	4	1	18	6	8	5	9	1	0	10
G	5	2	2	5	8	11	5	11	4	1	2	8	11	1	8	15
H	1	2	5	4	12	3	3	4	0	4	8	11	5	0	7	12
I	7	0	0	13	5	11	9	15	16	7	3	11	5	1	6	2
J	0	0	5	7	4	4	6	15	5	6	4	9	13	1	6	6
K	4	0	0	3	4	2	5	0	0	4	0	1	13	1	1	0
L	1	2	7	2	3	1	4	5	11	1	0	3	3	0	9	3
M	1	2	5	2	5	7	9	13	0	1	8	1	3	1	6	3
N	1	2	4	6	6	1	4	3	11	4	2	6	14	1	1	6
O	8	15	0	2	1	3	4	12	0	1	4	0	3	0	3	0
P	1	0	3	6	1	1	0	3	0	1	5	11	11	1	10	3
Q	3	16	5	4	0	3	3	3	1	3	5	1	13	1	6	6
R	2	0	6	1	13	5	5	2	0	3	5	2	8	1	9	3
S	2	0	0	0	3	6	7	8	0	1	5	1	2	1	6	11
T	0	2	0	2	2	1	5	0	0	1	1	11	13	1	11	3
	48	48	71	95	93	109	108	138	91	77	102	130	171	17	130	126

Problem Nos.	16	11	29	31	3	19	22	8	30	4	25	26	32	27	7
A	22	0	15	3	14	15	3	22	16	1	11	2	1	5	17
B	0	2	13	6	16	13	11	4	13	1	4	0	14	14	3
C	18	0	6	8	14	13	0	6	6	1	5	13	1	4	7
D	4	15	13	10	5	15	4	1	11	1	5	2	1	5	14
E	0	0	4	12	8	13	4	0	10	11	10	2	0	8	2
F	8	13	5	13	14	5	1	19	11	20	4	0	14	3	10
G	13	4	4	4	1	13	0	8	1	20	4	0	1	7	5
H	8	10	11	12	3	13	0	10	8	4	5	2	8	3	9
I	0	12	5	4	12	5	8	0	6	1	2	13	1	7	5
J	11	10	8	1	2	13	3	16	6	8	10	5	1	7	10
K	6	0	10	12	8	13	8	10	12	1	10	2	1	1	8
L	0	0	5	2	4	2	2	0	9	1	5	2	1	9	0
M	0	0	3	6	12	2	1	2	8	1	5	0	1	15	0
N	0	14	7	13	3	13	9	16	10	3	5	1	1	1	0
O	0	0	9	8	11	13	14	17	19	0	2	14	4	6	0
P	0	11	2	1	4	12	2	17	6	7	4	0	1	5	4
Q	4	2	4	7	11	12	0	0	4	4	5	2	5	5	4
R	0	0	6	6	7	13	6	6	5	1	8	0	1	0	10
S	0	0	12	7	3	13	11	18	7	3	5	0	1	5	6
T	0	0	2	5	8	13	0	0	0	1	5	2	1	1	6
	94	93	114	140	160	224	87	172	168	90	110	62	59	111	120

TABLE VI

Score Sheet.....Section B. Pupils a.....t.

Problem Nos.	17	18	5	6	21	20	9	2	12	28	23	10	24	13	14	15
a	11	2	16	5	5	13	0	14	0	10	8	15	13	1	13	3
b	1	2	2	2	2	11	6	13	0	11	8	8	10	1	13	10
c	1	0	0	2	0	9	0	3	0	12	8	5	9	1	14	10
d	1	9	1	0	1	14	7	15	4	3	8	11	3	1	10	7
e	1	2	3	12	6	23	0	12	0	5	2	9	13	1	12	8
f	1	2	13	10	3	12	6	4	0	5	5	6	13	1	14	12
g	1	2	3	7	3	1	3	6	0	5	5	3	3	1	8	13
h	7	0	10	6	9	15	7	13	19	6	6	16	13	11	22	15
i	2	2	8	4	2	12	5	5	0	5	15	13	13	1	5	11
j	4	2	1	2	8	14	0	8	0	6	5	7	14	1	11	3
k	1	2	7	2	13	6	6	11	2	7	5	11	13	3	15	12
l	1	0	1	2	3	11	3	3	0	1	2	10	0	1	14	7
m	1	2	8	2	2	9	6	4	0	4	5	11	9	1	8	13
n	9	0	8	10	1	3	3	7	4	7	8	11	13	1	8	8
o	3	0	8	5	4	16	9	15	0	1	5	11	3	1	8	10
p	1	2	5	6	2	16	3	16	0	5	2	11	13	1	3	3
q	1	0	2	3	1	11	7	5	0	4	8	4	13	1	1	3
r	1	2	10	6	13	5	5	10	6	5	8	11	3	1	12	6
s	1	2	2	11	0	9	6	1	0	5	2	10	13	1	11	3
t	1	2	14	13	4	1	5	6	0	8	2	11	13	1	13	8
	50	35	112	110	82	211	87	171	35	113	117	194	197	32	215	165

Problem Nos.	16	11	29	31	3	19	22	8	30	4	25	26	32	27	7
a	11	13	6	6	6	0	2	11	17	17	10	0	1	1	7
b	5	1	14	9	9	3	1	2	13	12	14	23	8	3	0
c	0	7	14	10	5	5	6	5	10	13	10	2	1	8	0
d	5	12	6	12	8	13	1	13	7	12	10	2	2	3	0
e	10	4	7	12	5	0	2	1	4	18	5	2	1	5	0
f	0	0	4	4	2	13	0	0	4	18	10	2	1	5	3
g	9	7	7	12	5	15	10	0	13	18	6	2	1	11	9
h	5	12	9	5	15	13	1	14	15	22	10	8	6	7	7
i	6	6	12	9	3	13	5	7	4	15	10	2	1	0	4
j	0	4	7	6	8	13	2	0	14	18	11	2	1	6	2
k	0	6	5	6	4	12	1	16	5	1	5	3	1	5	9
l	3	0	2	3	2	15	3	1	2	1	5	2	1	1	6
m	4	6	8	6	5	13	10	18	4	2	10	11	1	6	6
n	10	8	4	12	0	13	3	2	5	8	11	2	0	6	7
o	12	5	6	12	12	13	1	15	5	1	5	2	1	1	0
p	0	0	5	3	8	0	0	21	5	9	10	2	1	5	5
.	0	0	4	12	8	12	3	17	6	13	12	2	1	5	7
r	0	5	8	6	7	13	0	7	1	24	11	0	1	5	0
s	0	5	2	10	0	0	3	19	7	18	10	2	1	0	10
t	0	15	4	11	6	13	0	21	4	23	13	2	1	1	4
	80	116	144	166	118	192	54	190	145	263	188	73	32	84	86

TABLE VII

MEAN SCORES OF THE TWO SECTIONS FOR EACH PROBLEM OF THE MATHEMATICAL VALUES TEST

	Recreation, etc.				Mathematical Accomplishments, etc.			Algebraic Method, etc.			Symbolic Reasoning
Problem Numbers	17	18	5	6	21	20	9	2	12	28	23
Standard Deviations of scores of the 40 pupils	2.88	3.46	3.89	3.77	3.60	6.96	2.64	5.00	5.40	3.10	4.14
Mean Scores—Section B	2.50	1.75	6.20	5.50	4.10	10.55	4.35	8.55	1.75	5.65	5.85
Mean Scores—Section A	2.40	2.40	3.55	4.75	4.65	5.45	5.40	6.90	4.55	3.85	5.10
Differences	.10	−.65	2.65	.75	−.55	5.10	−1.05	1.65	−2.80	1.80	.75
Probable Errors of Differences	.57	.69	.77	.75	.72	1.38	.52	.99	1.07	.62	.82

	Interpretation of Formulas		Use of Formulas, etc.				Graphs, etc.			Analysis, etc.		
Problem Numbers	10	24	13	14	15	16	11	29	31	3	19	22
Standard Deviations of scores of the 40 pupils	4.40	4.73	1.62	4.59	4.40	5.53	5.12	4.20	3.60	4.29	4.91	3.74
Mean Scores—Section B	9.70	9.85	1.60	10.75	8.25	4.00	5.80	7.20	8.30	5.90	9.60	2.70
Mean Scores—Section A	6.50	8.55	.85	6.50	6.30	4.70	4.65	7.20	7.00	8.00	11.20	4.35
Differences	3.20	1.30	.75	4.25	1.95	−.70	1.15	.00	1.30	−2.10	−1.60	−1.65
Probable Errors of Differences	.87	.94	.32	.91	.87	1.10	1.02	.83	.72	.83	.98	.74

TABLE VII—(*Continued*)

	Inference, etc.		Religious Appreciation, etc.			Self Reliance, etc.	Generalization	Transfer	Transfer—2, 4, 5, 6, 7, 11, 12, 14, 15, 16, 25, 26, 27, combined
Problem Numbers	8	30	4	25	26	32	27	7	
Standard Deviations of scores of the 40 pupils	7.58	4.57	7.89	3.43	4.78	3.26	3.44	4.14	
Mean Scores—Section B	9.50	7.25	13.15	9.40	3.65	1.60	4.20	4.30	6.57
Mean Scores—Section A	8.60	8.40	4.50	5.50	3.10	2.95	5.55	6.00	5.12
Differences	.90	−1.15	8.65	3.90	.55	−1.35	−1.35	−1.70	1.45
Probable Errors of Differences	1.51	.91	1.57	.68	.95	.65	.68	.82	Less than .3

accordingly, a tendency for one class or the other to be superior is but doubtfully indicated. These problems are numbers 17, 18, 6, 21, 23, 16, 29, 8 and 26.

For problems 19, 27, and 30, Section A is superior to Section B by from one to two probable errors of the differences; and for problems 2, 24, 11, 31 Section B is superior to Section A by from one to two probable errors.

In the traits measured by problems 9, 12, 3, 2, and 32, Section A is superior to Section B by 2.0, 2.6, 2.5, 2.2, 2.1 probable errors respectively, so that with some reservation, due to the differences not being larger multiples of their probable errors, it may be stated that the training of Section A is superior to that of Section B in the establishment of these traits.

In the traits measured by problems 6, 20, 28, 10, 13, 14, 15, 4, and 25, Section A is superior to Section B by 3.4, 3.7, 2.9, 3.7, 2.3, 4.7, 2.2, 5.5, and 5.6 probable errors respectively, so that with some reservations as to problems 13 and 15, it is very evident that the training of Section A is superior to that of Section B in the establishment of these traits.

Problem 1 was used as an illustrative example and does not enter into the class comparisons.

Test A, devised by Teacher A to measure the work of his section, and Test B, devised by Teacher B to measure the work of his section, not printed here, were given to the pupils of both sections. Comparing the mean scores of the two sections upon Tests A and B, it is found, as would be expected, that Section A does better upon Test A, and Section B better upon Test B; but it is noteworthy that Section B does much better with Test A than does Section A with Test B. With the exception of one problem of Test B (involving substitution in the formula, $d = vt - 16t^2$), Section A is entirely unable to handle the problems proposed for the examination of Section B; but no comparable incapacity is found on the part of Section B in handling the problems devised to test Section A; in fact, Section B slightly excels Section A in three problems of Test A (a problem involving removal of parentheses, a simplification problem involving fractions, and one requiring the solution and verification of an equation involving fractions), and is equal to Section A in a problem demanding the solution of simultaneous linear equations. Section B is definitely

poorer than Section A in Test A problems calling for factoring, handling fractional exponents, the simplification of radicals, and in two written problems.

Judging by Tests A and B, the most significant superiority of Section A is in factoring, and its inferiority is in the things presumably not touched upon at all in the work of the class. Section B is superior in the entire content of Test B, particularly in problems involving elementary analytic geometry, understanding and use of formulas involving depreciation, elementary surveying and trigonometry, and in one written problem. Its inferiority lies in things presumably but little touched upon in the work of the section (e. g., involved factoring, fractional exponents, certain types of written questions, etc.).

The questions of the Mathematical Values Test, endeavoring to measure the child's acquaintance with ancient and modern mathematical accomplishment (problems 21, 20, and 9), deal with a purely cultural value, and one which is realized by the possession of certain historical knowledge. Success in answering these questions is presumably due to specific training, and the resulting knowledge is of itself worth while, even though there be no demonstrable transfer to other fields. Sections A and B do approximately equally well in answering question 8 (arrangement, according to importance, of items dealing with various mathematical concepts); Section B is decidedly superior to Section A in problem 17 (knowledge of mathematicians); and Section A is slightly superior to Section B in problem 18 (knowledge of games involving algebra), also a factual question. No significant difference between the sections is established by this question. Though the values aimed at in these questions may be highly important, nevertheless, since they are realized by knowledge of specific items, the writer does not think any conclusion is warranted from the findings just mentioned, except that one teacher discussed certain facts which were reported by his pupils, and the other teacher certain other facts. For this reason, these four questions will not be involved in the considerations concerning the transfer to broader fields of knowledge or power obtained from algebra study.

The most clearly established superiority of Section A over Section B is that in the problems measuring powers of algebraic

analysis, problems 3, 19, and 22. In each of these three problems a certain rigor in thinking is demanded and a certain concentration in holding to the details of the situation. Though the differences between the sections are not marked, being for the three problems 2.5, 1.6, and 2.2 probable errors respectively, the three taken together give cumulative evidence that the training received by Section A has resulted in an attitude or ability which is distinctly beneficial in problems of this sort. It is a matter of speculation as to just wherein this benefit lies. It may be in (*a*) a greater willingness to cling to detail, (*b*) a greater ability to do this, (*c*) a more vivid and accurate self-presentation of the facts which are given, (*d*) a keener power of analysis in separating the relevant from the irrelevant, etc., etc. Specific training in the handling of such material as in problem 3 (dealing with a poorly kept and itemized expense account) or in problem 19 (involving lineal relationships), is altogether improbable. It is nearly as much out of the question to consider that such an analysis as that demanded by problem 22 (relationship between dimensions of small and large people) could have been specifically taught. Furthermore, the differences between the sections found on these three problems cannot be attributed to chance, for, as a matter of chance, three such differences would occur only about once in two hundred times.

The very significant conclusion is therefore drawn that the work of Section A was superior to that of Section B in training to solve problems taxing powers of analysis.

The evidence of superiority in other capacities strengthens the conviction established by these three problems that the difference between the two sections is genuine and of the general nature described. For Section A is slightly superior in the two problems measuring powers of inference, problems 29 and 32; is superior by 2.0 probable errors in power of generalization, as shown by problem 27 (division of mathematical operations into two fundamental groups); and is superior, by 2.6 probable errors, in problem 12 of the three problems measuring mastery of algebraic method. This problem measures ability to state in general terms the procedure involved in statement and solution of algebraic problems.

The problems in which Section A shows superiority support each other quite consistently in establishing the nature of the

superiority; namely, in analytical power and in powers of generalization. To attribute differences in such fundamental and general capacities to difference in training may well cause one to hesitate and re-examine his premises. The individuals composing the two sections were paired at the beginning of the course upon the basis of the Rogers Mathematical Ability Tests, and the writer can propose no better method; but it is possible that pairing upon this basis did not result in pairing upon the basis of ability to draw inferences and to make generalizations, and that, therefore, as a matter of chance, Section A possessed brighter individuals along these lines than Section B. The data are as conclusive as that from two comparable classes of twenty each could very well be; but it is granted that more such studies are necessary to establish as far-reaching conclusions as are indicated by the present study. It is hoped that other investigators will avail themselves of the Mathematical Values Test here given to ascertain the accomplishment of various mathematics classes conducted according to different methods.

Section B shows itself to be superior in a larger number of problems than Section A, and, in the main, more pronouncedly superior.

The most clearly established difference between the two sections is found in the measures of religious sense and appreciation. Three problems measure this trait, problem 4 ("In your mind, how is algebra related to religion?"), problem 25 (mathematical symbols and operations suggesting God's all-pervading power), and problem 26 (mathematical symbols and operations suggesting the intimacy of God's power).

Section B is superior to Section A in these three problems by 5.5, 5.7, and .6 probable errors respectively. The difference found in the case of problem 26 cannot be considered significant, for practically no child made any attempt to answer it, but the answers to problems 4 and 25 clearly establish the superiority of Section B.

It will be recalled that certain mathematicians and laymen definitely expressed the belief that high school mathematics should develop religious sense and appreciation. The writer was very skeptical of the possibility of drawing up questions which would measure this, and one of the judges claimed in substance

that differences between individuals were not revealed by answers to these questions. Nevertheless, the other judges saw differences in merit upon the basis of religious appreciation, and agreed sufficiently in their ranking as to result in a very satisfactory degree of reliability for the scales used in measuring these three questions. Reliability coefficients are: .68 for problem 4, including all five judges; .92 for problem 25, including four judges only. The reader who will refer to the scales in question, may or may not agree with the four judges in finding differences in religious appreciation. But if it is not a deeper religious sense that secures a higher rating, it is, at least, a freer attitude, a greater willingness to see, and a greater expectation of finding religious significance in mathematical phenomena. There may be no great subtlety of association of an ethical nature in the idea that "Algebra is related to religion in numbers going down, and also up, to infinity," but the belief on the part of a child that there is in this a religious element is indicative of broad concepts of the fields of religion and mathematics. This attitude is promissory of a desire to find a common ground in the two subjects, and may be taken as being an attitude which is favorable to the functioning of mathematics in other fields.

It will be noticed that a merit of 10 in the scales for these three problems constitutes a very small amount of the trait. This is expressive of the fact that the judges expected but little in the way of answers to these problems, since 10 equals that degree of merit which judges expected would be obtained in one year by average pupils under competent teachers who were striving to obtain the value under consideration.

The next most clearly established superiority of Section B is in a somewhat related field—the use and understanding of formulas, and appreciation of the fact that formulas can express social and physical phenomena. Section B is 3.7 probable errors above Section A in problem 10 (understanding the formula for the area of a circle in which a is used to designate the radius); 1.4 probable errors above Section A in problem 24 (interpretation of the meaning of a formula); 2.3 probable errors above in problem 13 (use of logarithms); 4.7 probable errors in problem 14 (number of formulas known); 2.2 probable errors in problem 15 (imagining a relationship dealing with electricity capable of being expressed

by means of a formula); and Section B is .6 probable errors below Section A in problem 16 (imagining a relationship dealing with air capable of being expressed by a formula). Practically no significance is to be attached to the difference in problem 13, as almost every one of both sections failed completely on this question.

The scores received upon these problems amply warrant the conclusion that Section B is better acquainted with and more keenly alive to the uses of the formula in scientifically dealing with phenomena.

In mastery of graphic methods, Section B is probably slightly superior, being 1.1 probable errors above in problem 11 (suggestions of problems amenable to graphic interpretation); exactly equal to Section A in problem 29 (interpretation and plotting of a graph); and 1.8 probable errors above in problem 31 (interpretation of graph).

In the most important value of high school algebra—the understanding of the algebraic method and the differentiation between known and unknown elements—there is no uniform tendency, Section A being 2.6 probable errors superior in problem 12 (transfer of algebraic to other than mathematical fields), and Section B being 1.7 probable errors superior in problem 2 (understanding of what constitutes the algebraic method), and 2.9 probable errors in problem 2 (differentiating between known and unknown in a problem and in solving an equation.)

Likewise there is little difference in facility in symbolic reasoning, for Section B is only .9 probable errors above Section A in problem 23 (expressing the area of a triangle in symbols different from those ordinarily used).

The four questions designed to measure the recreational value of high school mathematics yield inconclusive evidence. Sections A and B are equally poor in problem 17 (recreational activities made more enjoyable by a knowledge of algebra); Section A is .9 probable errors superior to Section B in problem 18 (knowledge of games involving algebra); Section B is 3.4 probable errors superior to Section A in problem 5 (connection between algebra and life in the home) and Section A is 1.0 probable error superior in problem 6 (connection between algebra and life out of doors).

Problem 7, regarding the relation between algebra and other school subjects, has been included in the belief that the more

intimate this connection, the greater the transfer from algebra, not only to these specific subjects but to life in general. Section A is 2.1 probable errors superior to Section B in this question. However, it would not be fair to judge of the extent to which there is in general a transfer of mathematical knowledge by this one question, in view of the fact that many other questions also give evidence as to the extent to which transfer has taken place. The judges have considered that the following questions in particular yield evidence upon this point: Problems 2, 4, 5, 6, 7, 11, 12, 25, 26, 27, 14, 15 and 16. The mean score of Section A upon these thirteen questions is 5.12, and that of Section B, 6.57, or 1.45 above (1.45 is estimated to be a difference of at least five times its probable error). Problems 3, 19, 8, 29, 17, and 30 are considered by the same judges to be next in importance as giving evidence of transfer. The mean score of Section A upon these questions is 7.63, and of Section B 6.99, a difference of .64 (this difference is estimated to be at least 1½ times its probable error).

Having attempted to discover by these objective tests what the children in the two sections have accomplished, it is very illuminating to read their answers to question B4 (Spend 10 minutes in telling what of pleasure and of profit you have derived from the study of algebra this year), and thus find out what they think they have gained. Space does not permit of quoting every reply, but the replies of each class separately have been ranked for general merit by two judges, and in the following parallel columns are given the replies of the poorest, 5th, 10th, 15th, and best, in each class.

"What of pleasure and of profit have you derived from the study of algebra this year?"

Best Answer

Section A	Section B
Profit. To accomplish anything in algebra one must have entire concentration. This year algebra has given me the ability to concentrate on problems. Pleasure. A feeling of satisfaction when a problem is solved correctly and the	I have had a great deal of profit out of algebra this year. Before, I never tried to think out things for myself. I always learned by heart how to do an example, but never understood it. When the teacher turned the example around, I couldn't do it. I've gotten over that to a great extent, for I sit

Section A

knowledge that I have the ability to do it.

Section B

down and try to think it out. I never understood interest before this year. It has made me think out a lot of things, and sometimes I feel I could do anything in the world with it. Of course I know I couldn't, but it gives me a victorious feeling. I can't think of any real pleasure but that, that I have gotten out of it. It has made me feel how big infinity and space are, and it has given me a bigger outlook on life in that way.

Upper Quartile Answer

When I first studied algebra I had a great deal of difficulty in understanding it, and I was obliged to take extra lessons in order to keep up with my class. After these extra lessons I got along lots better, and I did fairly good work this year. I became very fond of it, and, if necessary, willingly pondered over it for a longer time than any other subject. If I had not failed my final exam., I could say that algebra gave me more pleasure than any other subject.

I really think I have begun to think, only begun, but that's a start. I often see something in the street, and wonder how it would come out in algebra. I don't mean I spend all my time that way, of course. Another thing, I've always hated problems, and this year, I've been really interested in them.

Median Answer

I don't believe I got any pleasure to speak of. I think it made me familiar with certain necessary equations, and it may have made clear thinking more possible.

From the study of algebra this year I have gotten more pleasure than in any preceding year, because it hasn't seemed so mechanical as before. We have studied things more as they really are. We have seen the relation between the algebra that one studies in school, and the algebra that is really used.

Lower Quartile Answer

In studying algebra this year there has not been much pleasure for me. At times some of the silly questions asked by some of the girls have been amusing. But all amusing things are

When I hear people talking about formulas, and $a^2 + 2ab + b^2$ etc., I understand what they mean, and I can join in the conversation. The Mathematicians are of more interest

Section A	Section B
not pleasures. As to the profit, I have learned many kinds of algebraic expressions and equations, and how to solve them, but I have as yet to find a use for them. The only profit I know of is that I have completed a part of the work necessary for college.	and I like to look up their lives, and see what they have done. Also many problems I did not understand before have become clear through the use of algebra.

Poorest Answer

I regret very much to say, that as I look back over the past year, I can think of very little in the way of profit or pleasure derived from algebra. The only savior in that subject was my teacher. If I had not had a teacher I liked and who made things plain, I would never have lived through the year. My teacher is the only bright spot in my algebraic career. I do not see any profit I have derived from this study, unless as my parents have told me, it may have "developed my mind"—but only to a small degree. Pleasure I have had none—profit? I doubt it! And I still have two more years of algebra. Is it not sad?	I do not think that I myself can do justice to this question. I have not had very much pleasure from algebra this year. Nevertheless I can appreciate what a hard time you are having (as all pioneers in anything have), to change the ideas and methods of teaching algebra.

Having read these replies, surely no doubt can exist as to which class received the greatest inspiration, as to which class established more freely the feeling that mathematics is a key to life, and that its laws are the laws of social being. The child who writes, "I don't believe I got any pleasure to speak of. I think it made me familiar with certain necessary equations, and it may have made clear thinking more possible," has finished a featureless chapter and contemplates the next one with listlessness and misgiving; while the child who states "From the study of algebra this year I have gotten more pleasure than in any preceding year, because it hasn't seemed so mechanical as before. We have studied things more as they really are. We have seen the relation between the algebra that one studies in school, and the algebra that is really used," has had a door opened to him and

anticipates with pleasure that which the future holds for him along these lines.

Bearing in mind that, personally, both of the teachers are capable, enthusiastic, and very likable, it seems warranted to conclude that the great difference between the two sections in the attitudes established is chiefly due to difference in the content of the courses.

SUMMARY AND CONCLUSION

1. Since, in the main, the mathematicians questioned consider it essential to keep the present content of high school mathematics, it seems apparent that, in their judgment, this tends toward the realization of the wide values which they see in mathematics.

2. The benefits which the men and women in social, educational, professional, and business positions profess having received from their own mathematical study, are so indefinite and scant as to occasion the doubt as to whether any real or tangible values have been derived. This conclusion is based upon the sum total of replies received to the questionnaires and not upon evidence here given in full.[1]

3. It follows that higher mathematics (except vocational) must find justification, if it is to be found at all, in the more effective development of the reasoning power, a broader teaching of the cultural aspects, and the more ubiquitous use of mathematical methods and concepts in daily life than has resulted from usual high school mathematics courses.

4. A test for measuring the broader values of mathematics has been drawn up, and scales for the grading of its problems established. The test has been given to two sections, yielding results of such reliability as to show that it is possible to measure differences in attainment in these important values.

5. Upon the basis of the test results it is found that course A, the regular college preparatory algebra course, was the more successful in developing rigorous powers of analysis and generalization in dealing with both mathematical and semi-mathematical material.

[1] For a limited length of time copies of all replies to questionnaires may be obtained at cost of duplication from the Bureau of Publications, Teachers College.

6. Course B was more successful in cultivating (1) a knowledge of the function of the formula in interpretation of scientific and social phenomena; (2) a broader realization of the place of mathematics in religion, in history, and in social application; and (3) a greater interest in and a desire for further mathematical training.

7. The pupils in the two sections showed little difference in their mastery of the algebraic method. In view of the generality of other functions demonstrably affected by algebra study, this is probably due to an equal, not to a zero, development in the two classes. The examination of comparable groups pursuing courses differing more widely than did the two here studied would reveal the extent to which the development of an algebraic method is possible.

8. The demonstrated differences between the two sections are in such fundamental traits as to support the view that all the varied and important values claimed for high school algebra may largely be realized under definitely aimed instruction. In other words, the fact of transfer of very broad values to situations not at all, or but slightly, mathematical in their nature has been demonstrated. That one is able to measure the development through a certain training of such powers as ability to carefully and accurately analyze a new situation, ability to generalize, ability to use the formula and symbolic notation in interpreting new scientific and social phenomena, etc., is a very encouraging finding, making possible a testing of the efficacy of instruction in a manner hitherto unattempted.

9. This study indicates that the instruction necessary to develop in pupils many of the very important values of algebra is radically different from that of the usual high school algebra course, though adhering to it in matters of rigorous analysis and generalization.

COLLEGE NEWS AND DEPARTMENTAL NOTES

BIOLOGY

During the coming Summer Session a program of courses, conferences, and exhibits in social-hygiene education will be conducted by Teachers College, with the coöperation of the United States Interdepartmental Social Hygiene Board, the United States Bureau of Education, the United States Public Health Service, and the American Social Hygiene Association. The program is designed for all high school and college teachers and supervisors of the subjects that contribute to social-hygiene, workers in social-hygiene societies, professional social workers, public health nurses, and parents.

Among those who will have prominent places on the program are Professor A. W. Dow, Professor E. K. Fretwell, Professor Leta S. Hollingworth, Dr. Josephine H. Kenyon, Dr. Jesse F. Williams, and Professor R. S. Woodworth. Professor John J. Coss, director of the Summer Session of Columbia University, Professor Paul Monroe, director of the School of Education, and Professor Maurice A. Bigelow, director of the School of Practical Arts, are members of the administrative committee. Professor Bigelow is chairman of this committee.

Professor Jean Broadhurst, of the department of biology, has been reelected a member of the Council of the Society of American Bacteriologists.

There has been an unusually large registration of graduate students in advanced bacteriology the past semester. Twenty-five students are doing individual research problems.

EDUCATIONAL ADMINISTRATION

Professor N. L. Engelhardt and Dr. Frank W. Hart, of the department of educational administration, have been making a school building survey for the city of St. Johns, Newfoundland. St. Johns has a population of about thirty-five thousand, and is

the most easterly city on the American continent. The report of the survey will be ready July 1.

The department of educational administration has been coöperating with the State Education Department of New York in an educational survey of the city of Amsterdam. The phases of the survey developed by the department of educational administration were the school building program and the measurement of the achievements of pupils. The report will be published under the auspices of the State Education Department. The following members of the practicum in educational administration assisted the staff in this survey: F. T. Brewster, B. C. Douglass, Roy McDougall, C. C. Ross, G. C. Gamble, A. O. Heck, C. L. Thiele, L. L. Lounsbury, George McCarty, H. C. Morgan, Jeanette B. Riefling, Edward Freeman, W. A. Graham, J. E. Haifleigh, Mercy J. Hayes, William Slade, C. E. Moore, C. B. Vernon, and W. J. Williams.

The National Committee for Chamber of Commerce Coöperation with the Public Schools, of which Dr. George D. Strayer is chairman, is now receiving complete returns to Inquiry Number I in the "Know and Help Your Schools Campaign." This inquiry covers fully the training, experience, and salary of teachers in American city schools. It also includes reports on the salaries paid to all classes of school employees, other than teachers. Salary distributions are given for the years 1913–14 and 1919–20, so that an exact determination of the advance in salaries for teachers and other school employees for those years may be determined. Teachers are classified with respect to sex and kind of school in which employed.

In addition, the inquiry asks for information with respect to teachers' pension systems, the practice with respect to granting pay to teachers on account of sickness, the regulations relative to tenure, the number of teachers who left the teaching profession during 1919, and the percentage of increase in teachers' salaries which has been determined upon for the year 1920–21. The information called for in this first inquiry is being tabulated by Mr. M. G. Neale, and the report will be ready for publication by July 1.

The National Committee for Chamber of Commerce Coöperation with the Public Schools is composed of thirty-three secre-

taries of chambers of commerce and thirty-three superintendents of schools representing sixty-four cities. This committee plans to make the following other inquiries with respect to education in American cities: Inquiry Number II—How well do you house your school children? Inquiry Number III—What is your educational program? Inquiry Number IV—How adequately do you safeguard the children's health? Inquiry Number V—How much does education cost your city? How will the rising costs be met? In addition to the survey made by means of these inquiries, the National Committee will provide special articles for use in the local publicity campaigns in education, and will furnish chambers of commerce with suggestions of procedure for rallying public support to the schools. The American City Bureau is coöperating with the National Committee in carrying out these measures and is acting as the center of communication for the inquiries.

The Greensboro, N. C., school building survey, the report on which was made to the citizens of Greensboro by Dr. Strayer at a public meeting on April 23 has gone to press and will be ready for distribution about August 1. The report was approved by the citizens of Greensboro and a resolution offered at the meeting that $2,250,000 for new school buildings be raised by a bond issue. The vote on the bond issue will take place soon. The survey recommended that Greensboro develop a new high school plant and also provide high-grade facilities for the elementary children, both white and colored.

ENGLISH

Miss Clara L. Rhodes, assistant in the department of English during the past year, has accepted the position of regent and head of the English department in Coker College, Hartsville, S. C.

Mrs. Mary C. Colver, of the Manual Arts High School, Los Angeles, Cal., will have charge of the courses in Junior High School Literature and Composition in Teachers College during the Summer Session.

The annual English Dinner of Columbia University was held this year on May 21.

On May 12, Beerbohm Tree's moving picture production of *Macbeth* was given before a large audience in the Horace Mann auditorium.

FOODS AND COOKERY

Professor May B. Van Arsdale has organized in New York City a Consumers' Committee in connection with her work on the Council of Farms and Markets of the State of New York. On the committee are representatives from thirty New York organizations. The committee is issuing a series of pamphlets called "Marketing Hints for the Housewife" and is also instituting a campaign in New York against the practice of fraudulent weights and measures.

Instructors and students from the department of foods and cookery are coöperating in the Milk and Child Health Exposition.

Cookery 4, under the direction of Miss Peacock and Miss Stone, have prepared a very interesting contribution of canned food materials for the American Committee for Devastated France. The class held an exhibit of its products at the close of the semester. The exhibit is to be taken to France by Mr. Lund, of the Federal Department of Agriculture, and is to be added to contributions from other American institutions for permanent exhibits for stimulating interest of the French schools in the preservation of food.

The department of foods and cookery gave two luncheons for the Administration Club following excursions through the School of Practical Arts. Four teas were given for the residents of Bancroft Hall, in the household arts dining room, by the temporary house committee of which Professor Van Arsdale is chairman.

MUSIC AND SPEECH

Professor Charles H. Farnsworth is conducting an experiment in connection with the phonograph. Musical numbers, such as would be presented on a disk, are classified according to the mood they indicate rather than according to the composition, or the persons or instruments by which the music is produced. Further experiments have also been conducted with Mr. Alon Bement's class in the department of fine arts, to find how far a class skilled in design will produce pictures in a mood appropriate to four

types of music ranging from the gay at one extreme to the sombre at the other. These same pictures have afterwards been presented to a music class to see how far the picture would indicate the mood of the music.

Recent lectures by Professor Farnsworth include one before the Pictorial Photographers of America on May 3, on "Some Reflections on the Experience of the Beautiful"; another, on May 19, before the Scudder School, on "The Value of Camping." A third lecture will be given June 3 at the Ethical Culture School on "Education for Enjoyment." At the annual meeting of the Music Supervisors' National Conference in March, Professor Farnsworth was made chairman of the board of directors.

In a recent closing trial for singers and players of the department, before students and a committee of the music faculty, seventy-two students gave piano, violin, and violoncello numbers as well as songs. With only one exception the numbers were given from memory without a single case of breakdown.

Mr. William J. Kraft, associate in the department, has written the music for a pageant called "The Seeker," given in connection with the Methodist Centenary. He is also writing the music for another pageant on Americanization.

RURAL EDUCATION

Dr. Warren H. Wilson, who is closely and actively identified with the Interchurch World Movement, spent the month of March lecturing and conducting county conferences for this organization through the Pacific States.

Professor Mabel Carney has filled lecture engagements recently before the Kentucky Educational Association, the Normal School at Fredericksburg, Va., Pennsylvania State Agricultural College, and the University of Pennsylvania on the occasion of the seventh annual Schoolmen's Week. Miss Carney was also reelected secretary of the Department of Rural Education of the National Education Association at the recent meeting in Cleveland and reappointed to the chairmanship of the Committee on Rural Teacher Preparation.

Miss Dunn spent three weeks in March visiting suggestive centers for rural supervision in the Middle West, including Ran-

dolph County, Ind., Cook County, Ill., and Sheboygan County, Wis. On the return trip Miss Dunn gave a series of lectures on rural education in the normal schools of Michigan at Mt. Pleasant, Kalamazoo, and Ypsilanti.

A new unit course on Junior Extension Work was offered by the rural department for the first time this spring. To make this work thoroughly practical field workers were asked to participate, the last two lectures of the series being given by Mr. O. H. Benson, director of the Junior Achievement Bureau, Springfield, Mass., and Mr. George E. Farrell, national leader of Junior Extension Work, Washington, D. C.

Work is developing nicely in the two New Jersey counties (Hunterdon and Warren) affiliated with the department of rural education of Teachers College for purposes of observation and demonstration. In January the Second Annual County Conference was held in each county under the joint auspices of Teachers College and the public school and agricultural forces of the county. In reporting these meetings in the *State Education Bulletin* for March, 1920, Commissioner C. N. Kendall, of New Jersey, to whose helpful guidance and coöperation the success of the affiliation is very largely due, says:

> That these conferences and this affiliation with Teachers College have proved beneficial to both the College and the counties is apparent to all concerned, and is further corroborated by the following summary of advances which have been made in Warren County during the brief eighteen months of the relationship.
>
> 1. A permanent farm agent has been employed.
> 2. An additional leader of boys' and girls' club work has been employed.
> 3. A coöperative committee of boys' and girls' club work has been formed.
> 4. Vocational courses in agriculture have been put into three high schools and an additional home economics teacher has been employed in one school.
> 5. A farmers' coöperative association has been formed.
> 6. Public health service has been extended throughout the county during the last year by the employment of three additional public health nurses.
> 7. A county development council has been formed, and a county program of progress adopted.

VOCATIONAL EDUCATION

Professor David Snedden gave an address on "Problems of Physical Education" before the National Physical Education Association on April 9.

A bulletin on "Proposed Projects for Vocational Homemaking," prepared by a Practicum on Vocational Homemaking (Summer Session, 1919) will soon be issued by the Bureau of Publications of Teachers College. Detailed analyses of some twenty projects are included, as well as two hundred titles of possible projects in major and minor departments.

The extensive call for men and women experts in vocational education in the fields of private industrial and commercial concerns to serve on the personnel and training forces has given to the second term work classes in vocational education new angles as to opportunities opening for trained vocational school people.

Members of the practicum group in vocational education have been assigned to attend various conventions which meet in New York City where the discussions have contained material useful to vocational directors. The class delegate reports to the full group on the suggestive things which were said and shown. The National Retail Dry Goods Association, the National Committee on Prisons, the New York City Conference on Charities and Correction, and the Industrial Research Institute were some of the meetings attended.

A special seminar room for vocational education classes has been fitted up and the practicum class meets there for six hours a week in what students call a "big family group."

Professor Arthur Dean has devoted practically all of his free time this year to a study of business and industrial organizations to see how they organize their training systems and to discover their established connections with the public school system or to find out where such connection is impossible or impracticable and how the concerns do their own training.

Professor Dean's practicum in vocational education has visited practically all of the public and private industrial schools in or about New York City, including the Industrial School, Bayonne, N. J., Faucett Industrial Art School, Newark, N. J., Baron de Hirsch Schools, and vocational schools in Newark and Jersey

City. The head of the school always gives the class a descriptive talk on the spirit and methods of the school before the students visit the class, and afterwards answers questions in a round table discussion.

The Vocational Club, under the leadership of Mr. Earl Rosenberry and Miss Hamilton, has conducted a series of informing and decidedly useful discussions of practical problems in vocational education. Such men as Alvin E. Dodd, ex-secretary of the Retail Research Association, F. C. Henderschott, of the National Corporation Schools, and William Ingersoll, of the Ingersoll Watch Co., have brought to club members a point of view regarding practical business situations and the way they focus on problems in industrial education.

Professor Dean served this year on a Prison Survey Commission for New York State and participated in making recommendations for a wage payment scheme for prisoners working in prison shops. He also outlined a plan of vocational training through production and a reorganization of the prison schools. His report has been submitted to the Governor for action.

MATHEMATICS

At a meeting of the New York Section of the Teachers of Mathematics of the Middle States and Maryland held at Teachers College on Friday, May 7, the College was represented on the program by Professor David Eugene Smith, who gave an address upon "Recent Developments in Secondary School Mathematics." The chairman of the meeting was Mr. William S. Schlauch, who is on the teaching staff in the Columbia University Summer Session. Two of the other addresses were by Miss Matilda Auerbach, of the Ethical Culture School, and Mr. Koch, of the High School of Commerce, two former students of Teachers College.

A general meeting of the Association of Teachers of Mathematics of the Middle States and Maryland was held at Teachers College on Saturday, May 8. Professor Smith addressed this organization on the question of "Junior High School Mathematics." The president of the organization is Mr. William E. Breckenridge, of the department of mathematics.

Professor Smith's review of Cajori's *History of Mathematics* appeared in the *American Mathematical Monthly* for March.

At a meeting of the National Committee on Mathematical Requirements held in Chicago, April 23, among the thirteen members of the committee present were Professor Smith, Miss Vevia Blair, of the Horace Mann School for Girls, and Mr. Raleigh Schorling, of the Lincoln School. Among the new subcommittees appointed was one on Mathematical Terminology and Symbolism, of which Professor Smith is chairman.

The International Commission on the Teaching of Mathematics, which has in the last twelve years made a very extensive survey of the teaching of mathematics in the various countries of the world, will make its final report at the International Congress to be held at Strasbourg next September. Professor Smith is vice-president and acting-president of this commission, and president of the American Branch.

THE Y. W. C. A.

Much of the work of the Y. W. C. A. is in coöperation with the three other religious organizations of the College. The interreligious activities this year included the Blue Books, the letters to new students, the "Ask Me" work in the fall, the excursions and trips to points of interest, the reception to new students, the weekly teas, and participation in such philanthropies as the Red Cross Membership Drive, Sale of Red Cross Seals at Christmas, the filling of one hundred and fifty Christmas stockings for poor children, the collection of clothing for Near East Relief, and a campaign for funds for the Henry Street Settlement and an Orphanage for Armenian children.

The outstanding event in the coöperation of the four organizations, however, was the Chapel service held in Horace Mann auditorium at which Father Wynn, Rabbi Krass, and Dr. Harry E. Fosdick spoke on "Present-Day Needs Which Religion Must Meet."

The Y. W. C. A. held its weekly forums on Thursdays. During the first semester a series of discussions on Christianity and Our National Ideals included the following subjects: "Our International Relations," "Capital and Labor," "Women in Industry," "Political Ideals," and "Child Welfare." Personal Religious

Problems during the first semester were discussed at forums in Earl Hall, to which the C. U. C. A. invited Teachers College students.

During the second semester a series of discussions involving personal religious problems was desired. Dr. William Merrill and Dr. John Kelman were two of the speakers. The crowded and responsive audiences at these meetings were an eloquent proof of the students' vital interest in religion.

Teachers College sent twenty-five delegates to the gathering of 8,000 students at the Student Volunteer Convention in Des Moines at Christmas time. This year's convention stands out in several ways. There was a new demand on the part of students for a wider representation in the control of the program and policies of the movement, which was recognized by the leaders. The movement has since been entirely democratized.

The deeper interest of the Teachers College delegation in international problems was evidenced in the excellent series of Forums on World Problems held at Milbank Chapel during the second semester. The general subjects and speakers were as follows: President Bliss, of Beirut, Syria, "The Near East"; Dr. T. T. Lew, "China"; Mr. Penningroth, "Russia"; Mr. Sydney Gulick, "Japan"; and Dr. Minton "Mexico."

Teachers College also sent three delegates to The National Biennial Convention of the Y. W. C. A. This convention represented a cross section of American society. Women from colleges, factories, shops, business offices, and homes, wage-earning women, and women of extreme wealth met together in a legislative body, speaking from the floor with equal effectiveness, contributing not only to the solution of the problem in hand but to a better understanding of each other. College and industrial women stood together on all problems and many women of great conservatism and wealth confessed a new confidence in young women as leaders in the movement because of the evidence given that they were not merely seeking a new freedom, but were ready for new responsibility.

THE Y. M. C. A.

The Y. M. C. A. has had a profitable year. A sufficiently large number of men turned out to make it extremely worth while to call in experts to discuss subjects of special interest at the bi-monthly luncheons.

The following subjects and speakers were of special interest: Dr. Randall, "The Outlook for Religion"; Dr. George A. Coe, "The Changing Conception of Religion"; Professor Hugh Hartshorne, "The Place of Religion in the Public School"; Chaplain Raymond Knox, "The Educator's Attitude Toward the Bible"; Mr. L. E. Bowman, "The Educational Administrator's Relation to Community Problems"; Dr. Benjamin R. Andrews, "Economic Citizenship"; and President Arthur C. McGiffert, of Union Seminary, "Personal Implications of Christianity."

THE JEWISH FORUM

The Jewish Forum was organized in 1915 to coöperate with the other religious organizations of the College in serving the students in every possible way.

The program of activities for the College year of 1919–1920 consisted of a series of eight lectures under the general head of Jewish literature. Aside from this two meetings were devoted to a talk on and a discussion of the very vital problem "What can the Jewish College Student do to Help in the Work of Reconstruction?" This resulted in the Jewish Forum booth at the War Sufferers Bazaar held on February 22 and also the subscription of one hundred dollars by the Jewish Forum which was donated to the Non-Sectarian Fund of the War Relief Campaign.

It has been the custom of the Forum in the past to celebrate the holidays which come during the school year. This year a dinner was given for Chaunkah (the Feast of Tabernacles), a large formal dance in celebration of Purim (the Feast of Esther), and an "Evening of Jewish Music" for the Passover. Miss Rose Rabbach, with the assistance of Miss Chasins and Miss Sadie Cheifetz, gave a program of Jewish folk and art songs.

For the first time this year the Jewish Forum has coöperated with the other Jewish organizations of the University. This has resulted in a better understanding between the groups and has eliminated some duplication of activity.

THE NEWMAN CLUB

During the past year, the Newman Club increased its membership to one hundred and ten members as compared with sixty-nine members for the previous year. Two membership drives

were held, one in September and one at the beginning of the second semester.

Along the line of social welfare work, the club has been interested in the Big Sister movement under the inspiring leadership of Mrs. H. Gloster Armstrong, president of the Catholic Big Sisters of New York City. Visits have been made to the Children's Court and to the homes of the different organizations devoted to child welfare. Several of the members have undertaken to "big sister" some of their less fortunate "little sisters."

As in former years, the club has coöperated with the other religious organizations of the College in giving teas, receiving new students, and assisting in the various charity drives. The club wished to become better acquainted with the Newman Clubs of Columbia and Barnard, and with this purpose in mind held an informal dance in Earl Hall, Columbia University, on December 11.

Early in the second semester it became apparent that a large percentage of the members belonged to the graduate group. To interest these students a study club has been formed under the direction of Dr. Carleton J. H. Hayes to discuss social problems of special interest to Catholic students.

It has for several years been the opinion of those especially interested in the welfare of the club that it was not meeting the demand of the large number of Catholic foreign students in our college. They come every year from France, Italy, the Philippines, Porto Rico, and South America. Many of our customs are to them incomprehensible, and even some of our ideals inexplicable. During this semester the Newman Club has organized a club for foreign students, in which they can meet not only other foreign students but also representative American Catholics. Their advisor is Miss Alice Conway, president of the Newman Club during 1916 and 1917, and now one of the faculty advisors of the club. Through the courtesy of Mrs. Evelyn Tobey, the foreign students hold their meetings at the Carroll Club for Catholic Girls, 120 Madison Avenue, of which Mrs. Tobey is director.

Two Bible study classes are held at St. Regis' Cenacle with Dr. Nelson, of St. Joseph's Seminary, Dunwoodie, N. Y., as instructor. A retreat given at the Cenacle on February 28 and 29 was well attended.

THE ADMINISTRATION CLUB

On March 29 the Administration Club held its annual banquet, at which about one hundred and fifty were present. A program, consisting of humorous and instructive numbers, was presented under the leadership of Mr. R. G. Reynolds, chairman of the committee. The meeting was in the form of the following unit courses:—Unit 1: Syncopated Jazz. Unit 1323: Maladministration in Democracy. Unit C21: School Surveys. Unit 14: Harmonious Revenge. Unit 24X: A Study in Contemporary Drama. Unit 7850035: Principles Undermining Progressive, Standardized, Scientific, Pseudo-Surveys of the Taxable Public. Unit 20: A New Revelation. Unit 1000: The Desirable Scope of Banquets, by Professor George D. Strayer.

The final regular meeting of the club was held on April 17 at the home of Professor Strayer. It took the form of a report and discussion of the school survey of the city of Acheron which had been arranged earlier in the year. The Survey Staff presented their findings and the School Board and prominent citizens of the city of Acheron subjected them to careful analysis and somewhat caustic criticism. The surveyors were Messrs. W. W. Curfman, M. W. Longman, P. R. Stevenson, W. S. Hertzog, and R. G. Reynolds.

The year's program was concluded on May 8 by a picnic held at the home of Professor Strayer. Because of rain, the festivities were held inside the house but with undampened enthusiasm. The club presented Professor and Mrs. Strayer with a large brass bowl. The committee in charge of the picnic consisted of Messrs. E. V. Hollis, William Slade, Jr., C. L. Thiele, R. G. Reynolds, Paul G. Chandler, and Leo Horst, and Misses Hileman, Martha Shea, Etta Christensen, and Miriam Mansfield.

THE ELEMENTARY CLUB

The Elementary Club has met primarily for social purposes during this year and the members have enjoyed a great many "get together" parties. No one who toasted marshmallows or had his fortune told by the witch at the Hallowe'en party, or spent an evening with Alice in Wonderland on the other side of

the Looking Glass, or helped build a fire for the picnic supper on the Palisades, will ever forget the Elementary Club.

The equally enjoyable, though more serious, meetings should not go unmentioned, especially Dr. Frank M. McMurry's film and his discussion of the "Educational Possibilities of Motion Pictures," and Mr. Van Auken's talk on "Pupil Organization for Self-Government in Elementary Schools."

THE RURAL CLUB

Seldom, indeed, has a Teachers College audience been so charmed by any speaker as were the members and friends of the Rural Club on the occasion of Mr. Hamlin Garland's recent lecture on "Songs and Seasons of the Old-Time Middle Border." This delightfully human, humorous, and reminiscent talk on April 27 marked the culmination of an active and successful year for the Rural Club, which closed the term with a membership of one hundred and sixteen students and several very profitable and enjoyable meetings to its credit.

Among other rural speakers presented to college audiences by the club during the year were Superintendent Lee Driver, of Randolph County, Ind.; Professor C. J. Galpin, of the Office of Farm Management, Washington, D. C.; Miss Amalia Bengtson, superintendent of Renville County, Minn.; Professor E. C. Lindeman, rural sociologist, Greensboro, N. C.; and Dr. A. E. Winship, of Boston. The club took an active part, also, in the rural section of the Annual Alumni Conferences in February, being largely responsible for the appearance of Dr. George E. Vincent as chief speaker on the evening of February 20, who discussed the question of rural health. A Rural Club dinner on the same occasion in honor of Dr. Vincent was attended by one hundred and ten club members and several staff representatives.

ALUMNI ACTIVITIES

TEACHERS COLLEGE CLUB OF CONNECTICUT

In Connecticut the Teachers College Club has been thriving. In 1919 there was an increase in the membership of fifty per cent over the preceding year. Thus far this year the membership has more than doubled the number in 1918.

The club has made special efforts to keep informed in regard to graduates and former students of Teachers College in the state. A very successful registration was carried on at the State Teachers' Convention in October, in Hartford, New Haven, Norwich, and Norwalk.

The eighth annual meeting was held in Hartford on February 13. Dr. George D. Strayer, the guest of the club, gave a splendid talk. The officers elected for the coming year are: President, Mr. Wilson S. Dakin, of Hartford; vice-president, Miss Elizabeth Allen, of New Britain; secretary-treasurer, Miss Marion C. Sheridan, of New Haven.

MARYLAND TEACHERS COLLEGE CLUB

On December 29 a dinner was arranged by the Teachers College Club of Maryland in honor of Professor Paul Monroe, director of the School of Education, Teachers College, who was in Baltimore to address the Maryland State Teachers Association. Professor Monroe gave the club a very interesting address, speaking chiefly about the work of the School of Education. Mr. Clarence G. Cooper, president of the club, was toastmaster.

The annual business meeting of the club was held at the Towson Normal School on Tuesday evening, April 27, when the following officers were elected: President, Mr. J. L. Dunkle; vice-president, Mr. William J. Holloway; secretary-treasurer, Miss M. Annie Grace.

The year closes with two aims realized: the club deficit has been met through increased membership and a special tax; and

the club has decided to devote part of every meeting to study and discussion of a state educational project.

MR. HUDELSON APPOINTED TO WEST VIRGINIA UNIVERSITY

Mr. Earl Hudelson has been appointed professor of secondary education in West Virginia University, and will assume his new duties in September.

Mr. Hudelson graduated from Indiana University in 1911, and received his M.A. degree in 1912. He was for two years an instructor in English at The Tome School, Port Deposit, Md. After a year abroad he was for four years critic in English in the Indiana University Training High School and an instructor in English and education at Indiana University. During the summers of 1914, 1917, and 1918 and during the last two years he has pursued graduate work in Teachers College. In 1918–1919 he was part-time instructor in English in Teachers College. Mr. Hudelson will also give courses in the department this summer.

MR. KING GOES TO ALABAMA UNIVERSITY

Mr. Leo H. King, who has during the past year been state expert in secondary education for Alabama, has been appointed professor of secondary education in the University of Alabama.

Mr. King is a graduate of the 1901 class at Holy Cross College. He received his M.A. degree from the University of Wisconsin in 1906. During 1918–1919 he pursued graduate study in Teachers College. He was principal of public schools in Humbird, Wis., 1903–1905; principal of schools, Newport, Wash., 1906–1910; superintendent of schools, Granesville, Idaho, 1910–1911; superintendent, Newport, Wash., 1911–1914; principal of the Washington Junior High School, Butte, Mont., 1915–1916; and principal of the Boys High School, Louisville, Ky., 1916–1918.