mean to say a school is doing well?" represents an effort to suggest alternatives that educators might consider. These alternatives admittedly complicate educational life rather than simplify it. But some things need to be appropriately complicated, lest we over simplify what it is that we are trying to do and accomplish.

The most recent evolution of my thinking pertains to the question, "What can education learn from the arts about the practice of education?" With this question, I try to turn the tables. The current educational policy push in the United States is highly mechanistic and based on the assumption that subject fields such as the arts are mushy and that their improvement requires becoming "rigorous," a widely used term for both evaluation and educational research. The position that I have taken is that the arts need not come to look like the way some people believe academic fields should function, but rather academic fields would do quite well to try to look more like the arts when the arts are well taught. Put another way, I am trying to develop the view that artistry could serve as a regulative ideal for the ways in which we think about the means and ends of education. The arts should not look more like the academic fields; academic fields in practice and conception would do well to look more like the arts. My paper, "What can education learn from the arts about the practice of education?" is intended to articulate the grounds for such a view.

This tour of my work should give the reader a fair sense of how it has evolved over the years. It has changed, but it has also stayed the same in very significant ways. It has been – and is – rooted in the arts and the lessons they have to teach to both individuals who work with them and to policy makers who need to make decisions about how schools should operate. The field of education will always have problems to deal with. Thank heavens! They make inquiry possible and through inquiry, one can feel the tingle of a mind at work. Not a bad aspiration, not only for us who work in education but for our students as well.

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CHAPTER 1

CHILDREN'S CREATIVITY IN ART
A study of types

Introduction

Through research, the conception of creativity has undergone an important change. Once considered an elusive, almost mystical gift belonging to a special few, creativity is now being seen as a capacity common to all – one that should be effectively developed by the school. Once considered a rare type of behavior limited to the arts, creativity is now viewed as penetrating, to some degree, almost all kinds of human activity. Even educators who are usually chary of accepting new responsibilities for an already overloaded curriculum are fascinated by the idea of teaching for the development of creativity.

Art education has long been concerned with the development of creativity. Unlocking the creative impulse has been a major function of the teacher of art. Although he may sometimes have confused mere impulsivity with serious creative art, his concern with creativity has been real and sincere. Viktor Lowenfeld (1939, 1957), Herbert Read (1945), and Henry Shaefer-Simmern (1948) are only a few of those who have contributed to both the theory and the practice of developing children's creativity in the arts. The recent flow of creativity research by psychologists is beginning to persuade those working in other academic fields that education for creativity is not solely the responsibility of those working in the arts. Thus, research based largely on scientific grounds is providing new and important directions in American education.

Approaches to the study of creativity

Guilford, whose work has been particularly influential, has postulated a set of factors and factorized tests that are theoretically relevant to understanding the structure of the human intellect (Guilford *et al.*, 1952). He sees creativity as a complex of unitary abilities that are displayed singly or in combination in the creative act. His factor-analysis methods have provided a major approach to the study of creativity, and his tests have been widely used by workers in this area.

A second approach, taken by Blatt and Stein (1957) and others, has been to study individuals known to have high creative ability (as evidenced through patents, discoveries, publications, inventions, and the like) in the hope of finding common personality traits.

A third approach has been the identification of process characteristics through examination of the completed product. This method, developed by Beittel and Burkhart (1963), has been especially valuable in the field of art education, where

the product's characteristics are indicative of the methods and modes of action employed by the artist. The constructs *spontaneous*, *divergent*, and *academic* have proved useful for analyzing the artistic process, and significant personality correlates have been found for individuals displaying these process-strategies.

The research reported here presents a fourth approach to the study of creativity. It represents an effort to formulate and test a typology of creative behavior in the visual arts.

Types of creativity in the visual arts

The treatment of *types* of creativity as distinct from that of creativity in general may have advantages. First, kinds of behavior that are now excluded from the conception of creativity in general may be brought into a wider view of creativity. Second, if art works are analyzed with an eye to the different sorts of "creativeness" that they exhibit, it may be possible to arrive at defensible views about the creative competencies of different individuals and, with this knowledge, encourage these competencies more efficiently.

The conception of types of creativity is based upon the various qualities and characteristics that have historically been considered creative in the visual arts. Analyses of children's art works, as well as those of adults, show that their qualities can be classified into a system of types. Some artists make their creative contribution through the treatment of form; others through their selection of subject matter; some in the novel treatment of the conventional; others in the creation of the utterly new. Some children develop unique ways of combining media; others formulate new methods of expression; still others are able to bring aesthetic order to conventional visual elements. Creativity in art does not seem to be a simple unitary trait. Like art itself, creativity has many faces.

The purpose of the present study was to see whether the types of creativity found in the art products of sixth-grade pupils could be systematically identified and, if so, to determine the relationships existing among these types.[1]

Four types of creativity and two loci constitute the typology. The types are (1) *Boundary Pushing*, (2) *Inventing*, (3) *Boundary Breaking*, and (4) *Aesthetic Organizing*. They are described *in general* in the four sections that follow. The loci are (1) content and (2) form. Content is defined as an attempt at representation, and is evidenced by the presence of conventional signs. Form is defined as the presence of formal qualities. Thus, every visual art product contains formal qualities but may or may not contain conventional signs.

Boundary Pushing

In every culture, objects are embedded within various mental fields. These fields are bounded in such a way as to enable members of the culture to place an object in some meaningful context, usually that in which the object is normally found. These fields also act as a sort of psychic economy, a slicing up of the world so that objects within it can be meaningfully and efficiently classified. In addition, they provide the culture with a common set of object-field expectations that act to discourage bizarre actions by individuals within that culture. The fields specify and encourage acceptable, stereotyped, and restricted behavior on the part of individuals who act within the limits of the fields. Some individuals, however, are able to extend these limits. The process of extending or redefining the limits of common objects is called *Boundary Pushing*.

In the area of technology, *Boundary Pushing* was demonstrated by the individual who first thought of installing electric shaver outlets in automobiles, thus extending the usual limits of both the automobile and the shaver. It was also demonstrated by the person who first thought of using rubber for the blades of electric fans and by the individual who first used nylon for the wheels of roller skates. In the classroom, *Boundary Pushing* is displayed by the child who uses numerals to create designs or pictures or who uses an inked eraser as a rubber stamp. *Boundary Pushing* is displayed in the recognition that plywood can be molded into a chair, that a cellophane strip can be used to open a package of cigarettes, and that a key can open a can of coffee. Thus, *Boundary Pushing* is the ability to attain the possible by extending the given.

Inventing

Inventing is the process of employing the known to create an essentially new object or class of objects. The inventor does not merely extend the usual limits of the conventional; he creates a new object by restructuring the known. Edison, to use a classic case, exemplifies the inventor, for his activities were directed not merely toward the novel implementation of known materials or objects but rather toward their combination and reconstruction. His contributions differ markedly from those produced by *Boundary Pushing*. The terminus of *Inventing* is the creation of a new product that may itself be creatively employed, thus being the subject of *Boundary Pushing*. Gutenberg, Bell, and Marconi are only a few of those who have displayed inventive behavior; and our recognition of their contributions, combined with our general reluctance to call them scientists, is indicative of the distinction we make at the common-sense level regarding the ways in which creativity is displayed.

Boundary Breaking

Boundary Breaking is defined as the rejection or reversal of accepted assumptions, thus making the "given" problematic. This type of behavior is probably characterized by the highest level of cognition. In *Boundary Breaking*, the individual sees gaps and limitations in current theories and proceeds to develop new premises, which contain their own limits. Copernicus, for example, displayed *Boundary Breaking* in his conceptual (if not theological) rejection of the theory that the earth was the center of the universe. His hypothesis that the earth moves around the sun (and not vice versa) led him to develop a theory that, as far as we know, is valid for the astronomical system. His rejection of the knowledge of the period – theories and beliefs that were limiting – allowed him to contribute significantly to man's understanding of the universe. In the present era, Einstein's notion of simultaneity allowed him to develop new concepts useful for understanding nature through his theory of relativity. His questioning of currently accepted beliefs regarding relationships in time and space led him to propose a theory from which certain natural phenomena can be more accurately predicted.

Another example of *Boundary Breaking* is found in the work of Binet. "Binet's approach was the direct opposite of that of his predecessors. Instead of trying to find a single index of intelligence, he went to the other extreme and deliberately searched for a multiplicity of indexes" (Stephens, 1951, p. 181). By making the "given" problematic and by reversing the approach taken by others, Binet set the pattern for over fifty years of intelligence testing.

Two kinds of behavior characteristically displayed by *Boundary Breakers* – insight and imagination – may function in the following ways. Insight may help the *Boundary Breaker* grasp relationships among seemingly discrete events. It may also enable him to recognize incongruities or gaps in accepted explanations or descriptions. As he recognizes these gaps, his imagination may come into play and enable him to generate images or ideas (or both) useful for closing the gaps. Through the production of these images and ideas, he is able to reorganize or even reject the accepted in order to formulate a more comprehensive view of the relationships among the elements that gave impetus to the initial insight. Insight into gaps in contemporary theory or actions and visions of the possible are probably insufficient to satisfy the *Boundary Breaker*; he must be able to establish an order and structure between the gaps he has "seen" and the ideas he has generated.

Aesthetic Organizing

Aesthetic Organizing is characterized by the presence in objects of a high degree of coherence and harmony. The individual who displays this type of creativity confers order and unity upon matters; his overriding concern is in the aesthetic organization of qualitative components. Decisions about the placement of objects are made through what may be called a qualitative creativity.

Individuals who are able to organize components aesthetically probably obtain a great deal of pleasure from so doing. This inclination toward aesthetic order also seems to be displayed in the way in which forms are *perceived*. Barron (1958) has reported that both creative artists and creative scientists show more preference for designs that are highly complex, asymmetrical, and seemingly disorganized than do less creative individuals. In this sense, the *Aesthetic Organizer* may be an aesthetic see-er as well; that is, he may obtain his aesthetic pleasures by seeing through disorder to identify orderly elements. Some artists and writers report that they are controlled by these urges and drives and admit to following their lead consciously, rather than having and adhering to carefully preconceived plans of execution.

It should be noted that a major difference exists between *Aesthetic Organizing* and the other three types of creativity. In *Boundary Breaking, Inventing,* and *Boundary Pushing*, novelty is a defining characteristic. Either a new use for an object or a new object itself is created. In *Aesthetic Organizing*, this is not necessarily the case; neither a new use nor a new object may have been created. The object upon which creativity was exercised, however, displays a high degree of coherence. Its parts hang together harmoniously. For most artists the aesthetic organization of form is a prime concern, but in children (and they are the subjects of the present study) high aesthetic organizing ability is relatively rare. The preadolescent who is able to organize form to a high degree of coherence and harmony is often said to be gifted; in this study this particular kind of giftedness is considered one type of creativity.

Subjects and instruments

Once the classes constituting the typology were formulated, the problem shifted to the empirical question: could this typology be used to identify types of creative characteristics displayed in children's art products?

In order to answer this question, specific criteria were deduced from each general description of a type. These criteria stated the characteristics that would be present in an art product if the subject had displayed a particular type of creativity. For example, a subject who engaged in *Aesthetic Organizing* would produce a work with satisfying formal qualities. Its parts would hang together and it would be unified, balanced

between figure and ground would be achieved. A subject who engaged in *Boundary Pushing* would produce a work in which either form or content was used in a novel way; his treatment of these aspects of the art product would be original.

Eighty-five sixth-grade pupils – 46 boys and 39 girls – in a mid-western private school were the subjects. Their IQs ranged from 93 to 180, with a median of 128. Where IQ measures other than the Stanford-Binet had been used, scores were converted to Stanford-Binet equivalents.

The subjects were asked to produce two kinds of art works. One was a piece of sculpture made from one-quarter pound of oil-base clay, a handful of colored toothpicks, and a paper plate to be used as a base. To insure privacy, each S worked in an enclosed booth. The instructions were as follows:

> In the booth before you, you will find a paper plate, some colored toothpicks, and some oil-base clay. You may build anything you wish out of the clay and toothpicks. The paper plate is to be used as a base so that whatever you make can be moved easily. You will have 45 minutes to complete your work. You may begin.

The second product consisted of a set of nine drawings made in an $8''$-by-$11\frac{1}{2}''$ booklet. On each page, the Ss found an abstract line, which was to be used as the starting point or stimulus for their drawing. Each page had a border line $1\frac{1}{2}''$ from the edge. The Ss had two minutes to work on each page and were given a signal by the test administrator when the two minutes had elapsed. The instructions were as follows:

> On each page of this booklet you will find some simple lines. You are to use your pencil to change each of the lines in any way you wish. You will have two minutes to work on each page so you will have to work rapidly. Wait for the signal before you begin. Once you complete one page, don't turn to the next page until you are told to do so. You may begin.

Procedure and treatment of data

Three judges were selected to identify the various types of creativity that each art product might display. Each one had had over five years of art-teaching experience with children as well as considerable experience as a practicing visual artist. The judges met daily for two weeks to discuss the criteria and to practice using them in judging the creative characteristics of works similar to those produced in the study. At the end of this time, the judges believed that they adequately understood the criteria and their application and proceeded to the actual evaluation.

The art products of the Ss were arranged in two large rooms. The judges, using a nine-point scale, independently evaluated each product for each type of creativity – one type at a time. As soon as a judge completed one evaluation, he handed in his score sheet and received one for another type; he then selected a different point in the display to begin his next evaluation. This procedure, the purpose of which was to reduce halo effect, was used throughout the judging.

To determine interjudge agreement, the data were treated as follows:

1 For each evaluation[2] the 85 raw scores assigned by each judge were transformed into normalized standard scores. The 14 normalized standard scores from each judge's evaluations were summed for each subject. This procedure yielded three over-all creativity scores for each subject. These three sets of 85

summed scores (one set for each judge) were intercorrelated to determine how well the judges agreed in over-all assessment of creativity.

2 An analogous procedure was followed for *each medium* separately, thus providing individual measures of how well the judges agreed in evaluating structures and how well they agreed in evaluating drawings.

3 The raw scores assigned to the products by each judge in each type and locus of creativity were intercorrelated.

Obtaining measures on these three bases – ranging from over-all assessment of creativity to successively more specific assessments – made it possible to locate the points at which interjudge agreement diminished.

On the first basis, over-all assessment of creativity, interjudge agreement was rather high; the coefficients were 0.82, 0.78, and 0.72. When the two media were taken separately, the amount of interjudge agreement dropped slightly; the coefficients for structures were 0.74, 0.65, and 0.61; for drawings, 0.80, 0.79, and 0.71. Finally, when *each type and locus in each medium* was taken individually, the coefficients ranged from 0.90 to 0.10, with a median of 0.59. These data are shown in Table 1.1.

Once it was decided that the interjudge agreement was high enough to warrant using the data, it became feasible to investigate the relationships existing among the types and between each type and other variables. The following questions guided the investigation:

1 What relationships exist among the scores in the various types of creativity within and between media?

2 When the boys and the girls are grouped separately, are the relationships among the types different in the two groups?

Table 1.1 Interjudge correlations computed from raw scores

Type and locus of creativity	Judges		
	A vs. B (N = 85)	A vs. C (N = 85)	B vs. C (N = 85)
Boundary Pushing – content, structures	0.80[a]	0.70	0.90
Boundary Breaking – form, structures	0.88	0.72	0.75
Boundary Pushing – form, drawings	0.74	0.58	0.68
Aesthetic Organizing – form, drawings	0.55	0.60	0.76
Inventing – content, drawings	0.52	0.73	0.60
Aesthetic Organizing – form, structures	0.58	0.56	0.68
Inventing – form, structures	0.52	0.62	0.61
Inventing – form, drawings	0.55	0.56	0.65
Boundary Pushing – form, structures	0.53	0.53	0.63
Inventing – content, structures	0.51	0.47	0.54
Boundary Pushing – content, drawings	0.39	0.60	0.49
Boundary Breaking – form, drawings	0.33	0.38	0.68
Boundary Breaking – content, drawings	0.10	0.81	0.42
Boundary Breaking – content, structures	0.27	0.27	0.76
Median	0.53	0.59	0.66

Note
a The smallest product-moment correlation coefficient based upon 85 cases that is significantly different from zero at the 0.01 level is 0.25 (one-tailed test).

3 When the subjects above the median in intelligence and those below the median are grouped separately, are the relationships among the types different in the two groups?

4 What are the correlations between the scores in each of the types and the Stanford-Binet IQs?

As mentioned earlier – to make the ratings by the three judges comparable, each set of 85 raw scores was transformed into a set of normalized standard scores. The three corresponding standard scores (one from each judge) of each subject were summed; this provided a *single* score on each type (and locus) of creativity in each medium for each child. The intercorrelations of these summed scores and their correlations with Binet IQs are presented in Table 1.2.

The first conclusion to be drawn from the data in Table 1.2 is that the relationship between creative performance in one medium and creative performance in the other was low. The median coefficient among the 49 *r*'s between media was 0.11. This finding is consonant with the situation among professional artists. Aside from a few outstanding exceptions, such as Degas, Michelangelo, Picasso, and Moore, most artists display high-level creativity in one or, at best, two media. When they do function creatively in more than one medium, it is most often in media of the same kind – collage and drawing or sculpture and has relief. The apparent specificity of creative behavior in the visual arts is probably a function of the status of certain skills that are necessary in working in two rather than in three dimensions (or vice versa) or in working in color rather than in black and white (or vice versa). The type of demands a particular medium makes upon an individual probably affects the extent to which he can employ those cognitive abilities that exemplify or make possible creative thinking. A person unable to perceive depth might be able to function in a highly creative way in the production of mosaics but surely would be severely handicapped in the production of sculpture. Since the Ss in the present study had had about the same amount of experience in the two media they used, the character of these media and the different kinds of abilities that they elicit may account for the low correlations between them.

Although the relationships indicated by these correlations tend to be slight, seven significant relationships did emerge. Six of these seven occur between types having the same locus. For example, *Boundary Pushing* in content in structures is significantly correlated with *Boundary Pushing* in content in drawings, also *Inventing* in content in structures with *Boundary Pushing* in content in drawings, etc. These relationships may be due to the mental set that each S brought to his work. Those Ss who obtained high creativity scores in the locus of *form* may have sought the stimulation of emerging formal qualities rather than the successful imposition of a preconceived idea or symbol upon the medium. Instead of attempting to master the medium, they may have preferred to treat it as a partner, taking their cues from the unexpected forms that flowed from their actions.

The second conclusion from the correlation table is that the relationships among types of creativity in drawing were higher than those in structures. The fact, that the scores in drawing were based on *nine* work samples whereas there was only one structure, may partially account for this difference.

The third conclusion is that scores on *Boundary Breaking* in form and content for structures were more highly correlated than were the other types of creativity in form and content. In addition, scores on this type of creativity were least highly correlated with scores in the other types.

The fourth finding from the table isolates a particular type of creative behavior: *Boundary Breaking*, in both form and content, emerged as the most independent

Table 1.2 Correlations among types and loci of creativity and between types and IQ (N = 85)

Type and locus of creativity	Form, structures				Content, structures			Form, drawings				Content, drawings		
	BP	I	BB	AO	BP	I	BB	BP	I	BB	AO	BP	I	BB
IQ	-0.02	0.05	-0.04	-0.01	0.21	0.18	-0.09	0.05	0.16	0.03	0.07	0.15	0.01	-0.15
Form, structures BP		0.40	-0.05	0.76	0.33	0.32	-0.03	0.25	0.19	0.17	0.25	0.13	0.27	0.20
I			-0.30	0.39	0.02	0.20	-0.38	0.13	0.09	0.04	0.05	0.13	0.09	0.04
BB				0.08	-0.00	-0.05	0.64	0.11	0.16	0.01	0.18	-0.04	-0.04	0.05
AO					0.34	0.29	0.10	0.27	0.14	-0.03	0.25	0.07	0.17	0.04
Content, structures BP						0.83	0.22	0.09	0.06	0.11	0.18	0.28	0.18	-0.05
I							0.05	0.06	0.07	0.11	0.16	0.29	0.21	-0.06
BB								-0.04	-0.03	-0.02	0.11	-0.01	-0.09	-0.06
Form, drawings BP									0.77	0.26	0.73	0.52	0.45	0.39
I										0.39	0.76	0.60	0.52	0.45
BB											0.26	0.33	0.39	0.50
AO												0.56	0.55	0.35
Content, drawings BP													0.75	0.36
I														0.57

Notes
BP = *Boundary Pushing*; I = *Inventing*; BB = *Boundary Breaking*; AO = *Aesthetic Organizing*.

of the four types. This may be explained by the nature of *Boundary Breaking*; to engage in this type of creativity, an individual must reject or reverse (or both) the premises upon which the problem rests. Persons able to escape the limits of deeply embedded cultural expectations are rare, and since *Boundary Breaking* is the most dramatic kind of successful escape from such expectations, its rarity (and, therefore, its relatively infrequent occurrence with other types of creativity) is not surprising.

One child who engaged in *Boundary Breaking* in structures used the paper plate, which was intended only as a base, as an integral part of his structure and, in addition, combined torn pieces of cardboard as a functional element. Another child used the colored toothpicks not as a structural element in the clay but as a burden carried by the clay donkey that he built. In drawings, one child carefully punched holes in the several pages so that his drawings had a relief quality. These subjects rejected or reversed the premises on which the problem was built in order to develop novel solutions.

To find out whether different relationships existed among the types of creativity for each sex, the intercorrelations were computed separately for boys and for girls. In 19 of the 91 pairs of coefficients, significance was attained by only one of the coefficients in the pair. However, no pattern could be discerned in these 19 pairs.

The intercorrelations were also computed separately for those Ss above the median IQ and for those below it. All of the 19 significant relationships, found were in the matrix based on the scores of Ss in the high-IQ group. In other words, consistency in level of creative performance across media occurred more frequently among high-IQ than among low-IQ subjects.

As has been found in other studies, the relationships between creativity scores and the kind of cognition assessed by Stanford-Binet IQs were small. In no case did a significant relationship appear between the scores on any type of creativity and IQ.

Summary

Creativity was differentiated according to type and according to the locus (i.e. form or content) at which it was displayed within an art product. The typology was then used to evaluate two art products made by each of 85 sixth-grade pupils. One product was a nine-page booklet of drawings, and the other was a three-dimensional structure of clay and toothpicks. Each product was rated independently by three artistically experienced judges, using a nine-point scale. The degree of interjudge agreement was sufficiently high to warrant investigating the relationships among the ratings.

The relationships between creative performance in one medium and creative performance in the other were low, the median coefficient being 0.11. However, when significant (0.25 or higher) coefficients between two types did occur, they were between types having the same locus. That is, creativity in form in one medium was most likely to be related to creativity in form in the other medium; creativity in content in one medium was most likely to be related to creativity in content in the other medium.

One type of creativity, *Boundary Breaking*, occurred much less frequently than the other types. Whereas *Boundary Pushing*, *Inventing*, and *Aesthetic Organizing* were displayed in some degree by almost all subjects, *Boundary Breaking* was not. The difficulty in achieving this type of creative behavior may account for its rarity.

When correlations were computed for the boys and the girls separately, no differences in the pattern of relationships among the types of creativity were

found. However, when the sample was divided in half at the median IQ, those subjects in the upper half were more consistent in their creative performance across media than those in the lower half. No significant relationships emerged between IQ and any of the types of creativity.

Notes

1   The study also investigated the relationship between each type of creativity and psychological health. These findings are reported elsewhere.
2   The types and loci on which the 14 evaluations were based are listed in Table 1.1. For obvious reasons, only the locus *form* was used in conjunction with *Aesthetic Organizing*.

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CHAPTER 2

EDUCATIONAL OBJECTIVES
Help or hindrance?

If one were to rank the various beliefs or assumptions in the field of curriculum that are thought most secure, the belief in the need for clarity and specificity in stating educational objectives would surely rank among the highest. Educational objectives, it is argued, need to be clearly specified for at least three reasons: first, because they provide the goals toward which the curriculum is aimed; second, because once clearly stated they facilitate the selection and organization of content; third, because when specified in both behavioral and content terms they make it possible to evaluate the outcomes of the curriculum.

It is difficult to argue with a rational approach to curriculum development – who would choose irrationality? And, if one is to build curriculum in a rational way, the clarity of premise, end or starting point, would appear paramount. But I want to argue in this paper that educational objectives clearly and specifically stated can hamper as well as help the ends of instruction and that an unexamined belief in curriculum as in other domains of human activity can easily become dogma which in fact may hinder the very functions the concept was originally designed to serve.[1]

When and where did beliefs concerning the importance of educational objectives in curriculum development emerge? Who has formulated and argued their importance? What effect has this belief had upon curriculum construction? If we examine the past briefly for data necessary for answering these questions, it appears that the belief in the usefulness of clear and specific educational objectives emerged around the turn of the century with the birth of the scientific movement in education.

Before this movement gained strength, faculty psychologists viewed the brain as consisting of a variety of intellectual faculties. These faculties, they held, could be strengthened if exercised in appropriate ways with particular subject matters. Once strengthened, the faculties could be used in any area of human activity to which they were applicable. Thus, if the important faculties could be identified and if methods of strengthening them developed, the school could concentrate on this task and expect general intellectual excellence as a result.

This general theoretical view of mind had been accepted for several decades by the time Thorndike, Judd, and later Watson began, through their work, to chip away the foundations upon which it rested. Thorndike's work especially demonstrated the specificity of transfer. He argued theoretically that transfer of learning occurred if and only if elements in one situation were identical with elements in the other. His empirical work supported his theoretical views, and the enormous