What Are the Implications for Lesson Design Using Dewey's Mode of Inquiry Discovery and Sousa's Brain Based Research

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What are the implications for lesson design using Dewey's mode of inquiry discovery and Sousa's brain based research?

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A journey that began thirty-one years ago is now concluded. There were many bumps in the road, but diligence and hard work are second only to the support that was given me to ensure my success.

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DEDICATION

To my wife, Alice who has been a constant source of support and encouragement; and to
my four sons, Jim, Chris, Mike, and Matt, who have enriched my life and helped me see
education through the eyes of children as nothing else could.
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Chapter I

Introduction

Statement of the Problem

...there is an intimate and necessary relation between the processes of actual experience and education. (Dewey, 1938, p. 20)

In his slim volume, Experience and Education, John Dewey explored the value of experiential learning - a departure from the typical educational institution of his day. The traditionalists determined that the student's mind was a muscle that needed to be developed. For example, William T. Harris (a leader in the kindergarten movement in the 1890s, and member of the Committee of Fifteen) "strongly favored the textbook recitation method of teaching elementary school science over the laboratory method" (Tanner & Tanner, 1980, p. 244).

Dewey, a contemporary of Harris, formed a different view that curriculum should develop intelligent activity. As he later explained, the process of curriculum selection should involve "selection of means-analysis - out of the variety of conditions that are present, and their arrangement - synthesis - to reach an intended aim or purpose" (Dewey, 1938, p. 84).

For decades, the tension continued around how to teach. Around the 1930s, the "perennialists" led by Robert M. Hutchins, at the University of Chicago, thought that Great Books should be used as a mental discipline. On the other hand, Dewey's progressive "problem-focused" studies were in direct opposition to the perennialists' point of view. The progressive education movement was under constant attack because it differed so much in its method of curriculum delivery.
In the 1990s, an explosion of research on the brain has now determined how the brain learns. In spite of varying opinions on how curricula should be taught, the findings of current brain research support Dewey's long held theories. And, because brain research now enables educators to design lessons for optimal learning based on how the brain learns, we will also see that Dewey's mode of inquiry discovery is as valid today as it was a century ago. This mode for optimal learning will be measured against the latest brain-based learning as developed by David Sousa. The value of Dewey's decades old insights into education as now validated by the results of brain research will provide insights for educators in lesson design.

Need for the study

How to organize a student's day as well as a student's lesson to foster optimal learning and long-term retention are issues with which educators often grapple. Those who are in charge of the organization of curriculum and scheduling of courses are typically faced with options and choices. The options of Dewey's mode of inquiry discovery uses social problem solving in an interdisciplinary framework. Dewey hoped "to discover in administration, selection of subject matter, methods of learning, teaching, and discipline, how a school could become a cooperative community while developing in individuals their own capacities and satisfying their own needs" (Mayhew & Edwards, 1936, p. xv). Subject matter would be a resource for the school to use for the problem solving activities of the students and "the key emphasis would be given to 'curriculum synthesis'" (Tanner & Tanner, 1980, p. 285). Dewey's ideas would be tried with great success in the Gary School in Michigan, the Elementary School at the University of Missouri, in Fairhope, Alabama through Marietta Johnson, and Flexner's "Modern
School" (Coffin, 1936; Horn & McBrown, 1926; Johnson, 1926; Mossman, 1937; McCall & Loftus, 1937; Pratt, 1926; Reynolds & Harsh, 1935). Noteworthy was the success of the Lincoln School of Teachers College (developed as a result of Flexner's book A Modern School), where "attention was to be directed particularly to the problem of curriculum synthesis within and between the major fields of knowledge" (Tanner & Tanner, 1980, p. 313).

Those who subscribe to Dewey's mode of inquiry discovery would use block scheduling (eighty minute periods) to accommodate subjects that would be taught in an interdisciplinary approach. Today, the Deweyan concept is amplified in Turning Points 2000 that encourages "place-based" curriculum that connects the student to the community so that "students can strengthen their connections to the community" and "be viewed by others as making essential contributions to their community" (Jackson & Davis, 2000, p. 37). The vehicle for achieving this concept is an integrated approach to curriculum. According to Turning Points 2000, there is a recommendation for "broad-based generic concepts, generalizations, and questions that go across disciplines" (Jackson & Davis, 2000, p. 133).

On the other end of the continuum facing educators is the knowledge-production mode of inquiry discovery that was a product of societal influences. A conference was convened at Woods Hole, Massachusetts following the launch of Sputnik I which influenced curriculum development. The curricula manifesto was the report of the committee, outlined by Bruner entitled "The Process of Education." The pervading theme that emerged was the specialization of knowledge.
Educators who believe in this specialization subscribe to a departmentalized arrangement of curriculum. Curriculum specialists teach the subject, and the selection of content is to "the structure of the discipline" as a guiding force in planning a lesson. According to Schwab (1962), "we cannot afford to be uninterested in the structures of the discipline" (p. 197). Phenix (1962) supported Schwab's philosophy that "only knowledge contained in the discipline is appropriate to the curriculum (pp. 57-58). In lieu of block scheduling and a thematic approach, the school day would be departmentalized and subject matter specialists would teach classes.

The tension has become heightened between how to organize curriculum—Dewey's mode of inquiry discovery using social problem solving versus Bruner's knowledge production mode of inquiry discovery based upon the structure of the discipline (Bruner, 1960).

Another problem is instruction delivery. What instructional model will staff use in presenting their lessons? Administrators will want to know how effective the lessons are to ensure quality education.

Without any hard data, it has been assumed that students who receive high test scores are learning. Now, with the use of technology, we can determine actually how children learn to ensure that everyone can be successful. Enter the "Decade of the Brain."

In July, 1989, following a congressional resolution, President Bush officially proclaimed the 1990s the "Decade of the Brain" (Bush, Presidential Proclamation 6158, Library of Congress, 1990). That proclamation was the genesis for exploration on how the brain functions. The findings that came out of that decade of research were
extraordinary, and the results hold great implications for education. In spite of the excitement, Wolfe and Brandt (1998) state "researchers especially caution educators to resist the temptation to adopt policies on the basis of a single study to use neuroscience as a promotional tool for a pet program" (p. 8). On the other hand, according to David Sousa, (1998) "The revolution in brain research provides teachers with new information and insights that can increase their chances of success with more students" (p. 25). Sousa developed a model of lesson components that incorporated the validated research for lesson design that had been done by Madeline Hunter. Out of the many researchers active in the 1990s, Sousa was able to construct a framework for designing any lesson based on his brain research findings.

If we look at the rich data provided by schools that used Dewey's mode of inquiry discovery we see an articulation of concepts of subject matter integration. Finally, can it be established that Dewey's philosophy is substantiated by brain research findings? This research will attempt to provide an answer to that question.

The educational quandary is to find ways to infuse meaning into what educators teach. Otherwise, "punctuating sentences, measuring angles, solving equations, or analyzing social systems are activities that students' brains often find meaningless or difficult to understand" (Westwater & Wolfe, 2000, p. 49).

According to Wolfe, "The brain research should not be an add-on program for schools, but rather add to our knowledge base helping us better understand how the brain learns - or doesn't learn - and why" (p. 64). There is a need "to assist teachers in carefully studying new research and innovation to determine whether they validate their practice, require them to rethink their practice, or both" (Wolfe & Brandt, 1998, p. 64). How the
new research underscores Dewey's inquiry discovery mode for lesson design needs to be addressed.

Finally, Bruee (1998) claims that "during the past year, a flood of articles in popular and professional publications have discussed the implications of brain science for education and child development" (p. 14). However, it is important that those administrators who consider Dewey's philosophies in developing curriculum and use lessons as substantiated by the brain research will have the benefit of this research. As more and more districts move towards an interdisciplinary approach to education they are embracing Deweyan concepts.

It is also interesting to note that in 1960, Goddard stressed the idea of not following fads. As a writer of the report from the Project on Instruction (National Education Associations study to upgrade the quality of America's education and to give direction) Goddard drew two conclusions: one, form without structure is hollow; and two, "all educational scaffolding is nothing more than a man made temporary means by which men achieve whatever appears to them to be important" (Goddard, Van Stvephusius, & Klein, 1960, p. 54).

The educational ideas of John Dewey can now be examined through the findings of extensive brain research to illuminate for educators a successful model for lesson design. Otherwise, despite all the good intentions and thought-provoking pronouncements, "educators produce school products that fall far short of their best dream" (Goddard, et.al., 1966, p. 69).
Methodology

What questions do we need to ask in this study that will be helpful to educators?

1. What are the basic philosophical principles and/or assumptions underlying Dewey's mode of inquiry discovery as it relates to curriculum design?

2. What are the basic philosophical principles and/or assumptions underlying Sousa's brain-based research findings as they relate to curriculum design?

3. In analyzing components of Dewey's inquiry discovery mode and Sousa's brain-based research findings, what similarities and relationships exist?

4. In designing lessons, what concepts from Sousa's brain research are needed for long-term retention, incorporating Dewey's theories?

5. Using Sousa's model for lesson design, do the findings of brain research support Dewey's inquiry discovery mode for lesson design as a way to promote long-term learning?

Limitations

This study is limited to the propositions of John Dewey as they relate to subject matter and/or their integration into a practical setting. Selected references of Dewey's work in the Laboratory School in Chicago will be used: My Pedagogic Creed (1897), School and Society (1899), and The Child and the Curriculum (1902). Dewey also stated his philosophy of education in Democracy and Education (1916). Other works by Dewey that are important to the research include Experience and Education (1938), How We Think (1933), Schools of Tomorrow (1915), The Educational Situation (reprinted
1969), and *Education Today* (1940). These texts exemplify Dewey's theories and/or their application in the classroom.

According to Tanner and Tanner (1980), "Dewey's definition of thinking was the scientific method applied to all human problems, ranging from the simple problems of daily living to complex social problems and abstract intellectual problems" (Tanner & Tanner, 1980, p. 303).

The curricula of the Lincoln School, "regarded as one of the best and most influential progressive experimental schools" (Tanner & Tanner, 1980, p. 309) will be one of several schools examined as an example of Dewey's mode of inquiry discovery.

The research conducted by David Sousa (2000, 2001) on how the brain learns will be used as a lens through which to examine Dewey's mode of inquiry discovery. The design concepts used to determine the validity of Dewey's philosophy would be restricted to the clinical supervision model developed by Madeline Hunter (1982) since they have been substantiated by research.

**Significance of the study**

According to Wolfe and Brandt (1998), participants in workshens wonder if educators have "eliminated very effective practices in favor of the newer innovations on the block," and asks, "Is it possible that the effective teaching strategies of 20 years ago are still relevant today and that we can look to current and neuroscience research to help us understand why they are?" (p. 61).

Sousa echoed the same concerns of Wolfe and Brandt (1998) when he claimed that "teachers enter classrooms every day trying to teach the students of the 1990s with a pedagogical knowledge base that hasn't changed since the 1960s" (Sousa, 1998, p. 22).
Sousa goes on to say, "Some discoveries bear directly on the teaching and learning process, yet it remains the responsibilities of educational leaders to determine their usefulness" (p. 25). We need look no further than John Dewey and his mode of inquiry discovery to "devise strategies and techniques that translate the research into effective classroom practice" (Sousa, 1998, p. 25).

The significance of this study can be found in applying the findings of brain-based research to Dewey's inquiry discovery mode of curriculum investigation for the purpose of identifying meaningful and applicable strategies in lesson design. Also of significance would be the relationship of educational supervision of the application of lesson design. The first step is to study the correlation between Dewey and brain research. The next step is to organize Dewey's theories into a lesson design model developed from the findings of lesson design and brain research. The final step is to show how supervisors can apply this model to their supervisory style. This will enable supervisors and teachers to have a common language, which can be used during reflective conferencing.

Recognizing that the role of supervision is to promote the improvement of instruction, in Chapter V the research from this study will offer practical suggestions for supervisors. Having the information on lesson design will be useful for students of teacher pedagogy. In addition, students of educational leadership and management are directed by New Jersey State law (N. J. State Professional Teaching Standard Board, 2002) to improve instruction and provide suggestions to teachers. New Jersey Administrative Code, Title 6 states that each teaching staff member shall have an individual professional improvement plan. The improvement plan is a written statement
of actions developed by the supervisor and the teaching staff member to correct deficiencies or to continue professional growth. The Supreme Court in the Koch case also reaffirmed the role of a supervisor in providing direction, which stated, "the purpose of evaluation procedure is not just to fire bad teachers but also help teachers become better." (Supreme Court Case No. 1403, 1996) The Supreme Court Justices further stated, "The purpose of evaluation is well served when criticisms are made without recommendations as to remedies or avenues of help." Much may be discovered in the following chapters relative to recommendations and remedies.
CHAPTER II
Review of the Literature

In 1916, John Dewey slim text, *Democracy and Education*, provided educators with a link between practicing democratic principles and educational practice. He saw “democracy as a social process for achieving man’s highest goals and education as the democratic way of preparing people to make intelligent decisions about social change” (Tanner & Tanner, 1980, p. 266). This book, “more than any other, established Dewey as an authority in many departments and colleges of education, sometimes as an infallible authority” (Lilge, 1960, p. 352). During the 1920s and 1930s his influence on educational thought and practice in this country became greatest when his concepts were transcribed into programs and loosely labeled as progressive education.

Dewey’s theories within the progressive education movement had its roots as early as 1870 with the Quincy movement. By 1895 the stage was set. Parker and the Herbartian Movement developed educational plans based upon unity of knowledge and active participation. Dewey’s writing had been stressing learning and doing. The pinnacle of his educational popularity would occur as a result of his writings in *Schools of Tomorrow* which was published in 1915. That text did much to secure him as the “acknowledged spokesman of the progressive education movement” (Cremin, 1959, p. 161). Within ten years Dewey’s book would go through fourteen printings, which was unusual for any book and unheard of for a book about education (Cremin, 1959, p. 161). The book discussed various programs that schools implemented which dealt with the children’s’ freedom in the classroom, individual growth and personal social growth, articulation of the school and the community, attention to citizenship, vocation and social
awareness. *Democracy and Education* (1916) and *Schools of Tomorrow* (1915) were the "classics of the early progressive education movement" (Cremin, 1959, p. 163). Dewey's educational philosophies which were articulated in *Democracy and Education* provided a theoretical educational framework for administrators and teachers to understand the relationship. His text, *Schools of Tomorrow* provided examples of the actual application of this link for educators to use in the schoolhouse. The educator who wanted to know how to construct a school using Dewey's philosophies using the natural development of the child could refer to the Elementary School of the University of Missouri for guidance. How to divide the day into periods would be provided in his *School of Tomorrow*. Or, how to deviate from the norm with respect to curriculum construction, would cause the reader to refer to the Mrs. Johnson's school in Fairhope, Alabama. The "how to" manual for educator had just arrived!

Dewey made his "greatest contribution to the development of the curriculum of American schools" (Caswell, 1949, p. 145) by developing democratic ideals and the nature of subject matter. Dewey was better able to articulate the new educational concepts that had been begun by Parker in numerous texts (1884, 1885, 1889), writings and speeches in which his philosophy of the aims of education and his concept of the nature of subject matter would eventually influence the activities of curriculum workers, educational reformers and education practices.

Dewey's work at the University of Chicago was focused on social awareness and articulation of the individual with his environment. This work was continued at Columbia where Dewey "stood out as the leading spokesman for a new version of the old
Dewey (1957) felt that:

"The supreme test of all political institutions and industrial arrangements shall be the contribution they make to all-around growth of every member of society" (p. 186).

Dewey's writing contributed to the growth of each individual. In a dinner given in honor of Dewey's ninetieth birthday, Joy Morgan (1949) from the National Education Association said:

We live in a period during which the names of statesmen and warriors are much in the headlines, but I suspect that when the history of this epoch is written, a century from now, the greatest names will not be those now most in the headlines, but rather the names of such men as Tolstoy and Gandhi and John Dewey who have done so much to give men faith in themselves and to guide the thinking of the world toward a better way of life. (p. 647)

Other honors included life membership in the National Education Association, election for life to the position of honorary president of the National Education Association, and a member of the Committee on Social-Economic Goals.

In reviewing the works of Dewey, his contribution of uniting the individual with society, critical thinking and scientific inquiry and belief in democratic principles are subjugated to his greatest contribution: "Confidence in willed intelligent action as man's great resource in the solution of his problems" (Crary, 1949, p. 134).
This chapter will also review the brain research done by many leading researchers, especially David Sousa. Sousa's research on how the brain learns has earned him a reputation as a leader in this field.

Sousa (2000, 2001) has served as an international consultant, conducting workshops on brain research in hundreds of districts. His background also includes editing science books and publishing articles in leading journals on staff development, science education and brain research. Sousa is listed in Who's Who in the East and Who's Who in American Education. He has been interviewed on the NBC Today show and National Public Radio. Sousa's development of lesson design, which incorporates the research of Hunter's clinical supervision of lesson design with his brain research, allows teachers and administrators to use a model for instruction for the teacher, and a vehicle to evaluate instruction for administrators. The model provides the teacher and the administrator a common language for dialogue and reflective conferencing.

A society transmits its culture through education. Primitive society was able to pass knowledge and educational functions from one generation to the next by sharing their experiences. In many cases, this was done through oral history. As knowledge became more complex and societies became more technically, socially, and economically advanced, it became the school's function to educate rising generations so that they could develop insight and strength for creating a better society.

In a school environment, "curriculum" has become the vehicle for transmitting knowledge. With the changing nature of knowledge, new conceptions of the learner, and demands of social life, the concept of curriculum has changed in every decade. Furthermore, without a philosophy to guide and influence educational objective and
curriculum development, schools become vulnerable to pressures, whims, and new programs. John Dewey's approach offered a systematic path to inquiry discovery and the organization of knowledge. Inquiry discovery was a natural and spontaneous expression of the child interacting with his or her environment. Intelligent activity was distinguished from aimless activity as purported by Rousseau in that it involved "selection of means - analysis - out of the variety of conditions that are present" (Dewey, 1938, p. 84). His arrangement was to reach an intended aim. The more innovative the learner, "the simpler must be the ends held in view and the more rudimentary the means employed" (Dewey, 1938, p. 84).

Dewey was a twentieth-century philosopher who wrote about inquiry discovery as a method. He addressed the question of experience and child-centered activities that Rousseau developed. He wrote in *Experience and Education* (1938) that not all experiences are genuinely or equally educative. Care must be taken to ensure that the experience is a worthwhile one. Dewey (1902) added that nothing could be developed from nothing and to throw the child back upon himself will develop nothing but the crude. The child and the curriculum are just two points which define a process, like two points that define a straight line, wrote Dewey in *The Child and The Curriculum* (1902).

Dewey stressed unity in curriculum construction and not fragmentation of subject disciplines. "Knowledge," according to Dewey, was "an outcome of inquiry and a resource in further inquiry" (Dewey, 1916, p.220).

Dewey had the opportunity to practice his theories in a laboratory school. During the years of 1895 to 1904, the University of Chicago experimented with a school system from kindergarten to the university level. It was often called the Laboratory School; a
name suggested by Ella Fagg Young, a professor of education in Dewey's Department of Philosophy, Psychology and Education at the University of Chicago. Under the management and supervision of the University's Department of Philosophy, Psychology and Education, a school system was developed to exhibit, test, verify, and criticize theoretical statements and principles and to add to existing facts and principles. In short, it was the practical application of theoretical concepts.

In 1894, John Dewey was named head of the Philosophy, Psychology and Education Department. It was part of his philosophical and psychological theory that "ideas, even as ideas, are incomplete and tentative until they are employed in application to objects in action and are thus developed, corrected, and tested" (Mayhew & Edwards, 1936, p. 3). He therefore had the opportunity to test his theoretical ideas in a laboratory school. The philosophical and psychological conceptions that Dewey entertained "had more to do, for better or worse, with the founding of the school than educational experience or precedent" (Woody, 1934, p. 35).

According to Meriam (1959) in *John Dewey: Master Educator*, a keynote throughout Dewey's many writings may be expressed in his own words:

"Learning? Certainly, but living primarily, and learning through and in relation to this living" (Dewey, 1899 p.53).

How could this learning and testing of ideas take place? Colleagues, interested friends and groups felt that the idea of a school would test in practice the newly stated principles. There was also a desire, according to Mayhew and Edwards (1936, p. 5) that "their own children should experience this kind of schooling." According to Dewey in *The School and Society*, "What the best and wisest parent wants for his own child, that
must be the community want for all its children. Any other ideal for our schools is narrow and unlovely: acted upon, it destroys our democracy" (Dewey, 1897, p. 7).

The ideas of Dewey’s colleagues at the University of Chicago (which included Angell working in functional psychology, Mead working in psychology, and Tufts writing for parents) were formulated in a privately printed brochure, “A Plan of Organization of The University Primary School.”

The school was to be an experimental school, and according to Dewey, “not a practice school, nor (in its) purpose what is now called a progressive school.” (Mayhew & Edwards, 1936, p. 464) The object of studies was to arouse the student’s spirit of curiosity and investigation and awaken him to a consciousness of the world in which he lives, to help him become more observant and to “instill a sense of methods of inquiry” (Mayhew & Edwards, 1936, p. 31).

With the use of the experimental approach in education to test in practice the value of theory, the school opened in January 1896, in a private dwelling with sixteen pupils and two people in charge. The first six months of this school was a “trial-and-error” period. During this period the personnel could test, evaluate, or modify its ideas to develop an effective program. This was one stage in the school career—the developmental stage. The second stage was a two-year period of growing experiences.

After the six-month period, the school was opened in October 1896, at 5718 Kimball Avenue, Chicago, with thirty-two children ranging from six to eleven years, and a staff of three regular teachers; one in charge of science and the domestic arts, one of literature and history, and one of manual training. A part-time instructor in music was also on staff, and three graduate students volunteered part of their time. It is interesting
to note that the teachers represented educational thoughts similar to Dewey, specifically, the Hobertians, Child Study Groups, and Manual Training Movement.

The school differed from its predecessors and contemporaries in its view of education as a social process. The school, according to Woody (1934), was to be a "socially participating group" whose activities were to progress from social needs and develop ways to understand and satisfy them. (p. 35).

There was a constant need for Dewey to participate in public meetings and join with educators in campaigns to obtain support. The first edition of *The School and Society* (1899) was a collection of Dewey's money-raising speeches.

By December 1897, the staff of teachers had grown to 16, the children numbered 60, and the school again needed larger quarters. In October 1898, the school opened in an old residence at 542 Ellis Avenue, Chicago. At this residence, the school took its departmental form. The science department had two laboratories; one for combined physics and chemistry, and one for biology. The history department shared three special rooms with the English department. Domestic science now had a kitchen large enough for two groups to work and two dining rooms.

Dewey's school differed from the traditional self-contained grade room in that pupils were in contact with several teachers each day. Pupils worked in a social studies room half the day, went to an assembly room for music, cooperated in the kitchen and lunchroom, and participated in physical education and outdoor sports. The school operated through a longer school day with fewer vacations and no long one during the summer.
The concept of the school was to be a "single concrete whole," according to Woody (1934), with the dualism between ideas and acts broken down, and education of complete activity involving purpose, comparisons, reflection and development of new ideas (p. 35).

Consequently, the school's physical structure was changing as assembly rooms, libraries, shops, and rooms for drawing and painting were considered in the design of the school. "By 1906, a movable desk was on the market. It was not long until great public high schools and elementary schools were being equipped throughout with movable furniture that makes for easy movement and breaks down formality" (Newton, 1929, p. 231).

The pupils were not placed in grades contingent on age or passing of a previous grade. Grouping was based on interest and abilities that corresponded roughly to chronological age. Therefore, ten groups developed ranging from four year old kindergarten children to 14 and 15 year olds in the tenth group.

In his school, Dewey stressed the inter-relationships of the school and society and not their isolation from each other. In The School and Society (combined edition, 1956), Dewey stated that the great waste in school comes from the isolation of the school from its environment. He wrote that the child is unable to "utilize the experiences he gets outside the school in any complete and free way within the school itself" (Dewey, 1956, p. 75).

Tanner and Tannier (1975) enhanced this idea when he said that life situations are not isolated and segmented; life problems require cross-disciplinary and inter-disciplinary approaches for their solution. (p. 400). Education, therefore, becomes a process of living,
as Dewey stated in *My Pedagogic Creed* (1897), and not a preparation for future living. In his *Creed*, Dewey claimed that it is impossible to prepare definitely and predict what civilization will be like twenty years from now due, in part, to industrialization. To prepare the child for the future meant to "give him command of himself so that he has full and ready use of all his capacities" (Dewey, 1915 p. 5).

The Laboratory School dealt with the process of living by offering cooking, sewing, carpentry, and weaving as well as studies of occupations outside the home - farming, mining, lumbering. The chief object of the school was to secure a community life by emphasizing various forms of practical and constructive activity. Intellectual development did not separate knowledge from its application. Shipka (1970) stated that Dewey's method was founded in a unique concept of experience. "Here experience is practical and not speculative; it involves doing and undergoing the consequence of doing." (p. 1179) Belth (1953) wrote that the school is an institution for the development of intelligence, not in "absorption of factual material" but "in terms of the development of instruments for the recognition and resolution of problems, not only in school, but in societal life as a whole" (p. 126).

As Bode described in *Progressive Education at the Crossroad*, (1971) "learning is a process by which experiences are changed so as to become more serviceable for future guidance" (Bode, 1971, p. 41).

In the first stage of Dewey's school, from ages four to eight or eight and one-half, there was the connection and inter-relationship of the school, the home and the neighborhood. The second stage emphasis, for nine year olds, was put on "sewing, ability to read, write, handle numbers, not in themselves, but as necessary helps, and
adjuncts in relation to the more direct modes of experience" (Mayhew & Edwards, 1936, p. 51). The third stage was the acquisition of skills for application in problem solving. Scientific method and scientific investigation were used in the classroom to test out experiences and to clarify values.

Prior to Dewey, as well as concurrent with him, was the work of Colonel F. W. Parker, an educational philosopher who, at one point, considered Dewey the "real philosopher of the new education" (Rugg, 1926, p. 86). Parker had requisitioned twenty copies of Dewey's The School and Society for use at Chicago Institute, a school under his charge in 1900. Concurrent with Dewey was the work of two schools associated with Teacher College: The Horace Mann School from 1887 and Sperry School from 1899 (Rugg, 1926, p. 86). These three influences helped to break the practice of "lock step" in the elementary grades, whereby children advance consecutively through the grades one year at a time.

Colonel Parker was influenced by Rousseau's romantic nature as well as by Comenius, Pestalozzi, and Goebel, but criticized "Rousseau's advocacy of wild growth" (Campbell, 1976, p. 134). Parker's philosophy of educational reform attacked the traditional curriculum and felt that development of this curriculum would lead to "knowledge for knowledge's sake, bigotry, pedantry and ultimate authoritarianism" (Campbell, 1976, p. 129).

The philosophy of educational reform that Parker felt would unify democratic ends with democratic means was his theory of concentration. This theory was centered on the unification of purpose, method and subject matter with emphasis on the child and
not the subject matter. The concept of democracy was dynamic such that it required action.

Parker's educational theory criticized the ornamental and useless curriculum of the traditional school. It attacked isolated subject fields and suggested that traditional education was unnatural in that it did not allow the child to think, question or reason. His theory also scorned traditional curriculum for preventing freedom and growth by memorizing isolated and abstract subject matter.

Parker's educational theory unified content into central subjects to help children see relationships and to see beyond set limitations. The disunity of subject matter, according to Parker, was the "method of aristocracies to keep people from thinking" (Campbell, 1976, p. 133). Examples of disunity were reading for its own sake and arithmetic without application.

The methods of learning that arose from Parker's educational theory were unique. The senses were used to acquire knowledge. Learning was divided into modes of attention and modes of expression. Reading, hearing, observation and language were examples of attention modes. These modes were mental. The modes of expression, by contrast, were physical. They were voice, speaking, gesturing, modeling, drawing, writing, painting and music making. These were vehicles that the child would be thinking and feeling - his thoughts and emotions.

The mode of attention and the mode of expression were a twin process that worked in conjunction with the central subjects. Parker's theory of concentration unified the process and method to economize time as well as to make the educational experience meaningful. His theory provided an organizational pattern for the curriculum, and
attempted to seek "the 'structure' inherent in the various disciplines of knowledge" (Parker, 1889, p. 133). He felt that if students learned "the structure or design of knowledge, facts would fit together naturally and not fall into a series of meaningless things to memorize" (Parker, 1889, p. 133).

Parker's theory of curriculum construction or synthesis was linked to Herbertian principles, specifically, the Herbert principles of correlation and concentration. The concept of constantly moving ahead and that nothing is finally worked out, that every course of study has to be revised and improved was a part of Herbert philosophy that Parker liked. It is not surprising that "Parker actually gave credit for the theory of concentration to Herbert" (MacDonald, 1965, p. 134).

According to Tanner and Tanner (1975), Parker was more of a champion of children and exponent of child-centered methods than a curriculum theorist (p. 202). Parker, like Dewey, sought to unify the child and the curriculum.

Parker's "practical school" was a place to prepare teachers, prove the concepts of the "new education" and a laboratory for perfecting life, society, and the state. The Parker School accepted as its principal aim the "training of character through vital social experience and for useful community life" (Cooke, 1926, p. 305).

This notion of cooperation and development of character was a philosophy opposed to authoritarianism. It supported observation, forming judgments, critically thinking and forming decisions within the existing social phenomena. According to the principal of the Parker School, the curriculum for all the grades would be the "social group project" (Cooke, 1926, p. 306).

The Parker School philosophy was pragmatic in that it sought as its educational
purpose the preparation for democracy and self-growth. The psychology of this philosophy of education was derived from the "associationists who professed the mental faculty theory." The idea of the association of thoughts in building memory could even have inspired Parker's association of subject matter in the central subjects" (Cooke, 1926, p.306). Parker's unification of the curriculum was noted in Spencer's ideas and the work of Charles Darwin. According to Cooke (1926), Parker tended "more and more to concern himself with the world of nature and with the theory of Darwin" (p. 146). The theory of Darwin was, therefore, the "single most powerful influence on Parker's theory of concentration" (Tanner & Tanner, 1975, p. 204).

Parker's philosophy was consistent with Dewey's philosophy with respect to the child and the curriculum, and by the end of the nineteenth century, Parker's philosophy of the new education was turned over to Dewey who Parker said "put the ideas into terse and pregnant words" (Cooke, 1926, p. 146).

Parker's philosophy was also consistent with personal social growth in that the teachers were responsible for ensuring a scope and sequence that unified the curriculum. The selection process would be dictated by what each pupil needs for personal development to ensure that he can serve the school and the world. The needs of the school and the needs of the world are the needs of the individual (Cooke, 1926, p. 308). The needs and interests of the student were paramount in the development of the elementary school curriculum according to the building principal, Raymond Osborne (Osborne, 1935, p. 280).

Two other schools that practiced Dewey's concepts, The Horace Mann School and Speyer School of Teachers College, did not clearly differ in their "scientific and
experimental work from that of the Quincy Schools," (Rugg, 1928, p. 95), as their purpose was to recon struct the curriculum based on personal/social growth.

The Horace Mann School's philosophy stated that education was the training of the child for life and it sought to develop the complete child via hands-on activities and integration of theoretical concepts with physical activities and massed training. Samuel T. Dutton (1904), Superintendent of the Horace Mann Schools, listed the following motives and principles underlying the work of the Horace Mann elementary School:

- The pupils of the school usually come from excellent homes... The most important factor in their development has been the social life of the home...
- The comparatively independent position that the school enjoys permits a freedom of action that differentiates it from many large schools.
- From the earliest days of the founding of the school, the development of the child through self-activity has been a cardinal aim.
- ...things are placed before words...the schoolroom becomes a laboratory in which there is more or less apparatus to be handled and used, and in which the creative element is constantly present.
- ...There is an increasing broadening and enriching of constructive work as the child progresses through the grades.
- Appreciation and enjoyment of the best literature is one of the leading aims of the school.
- ...more emphasis is placed upon the forming of good habits than upon formal instruction in ethical ideas. (pp. 1-7)

The school's function was the promotion of a social life. The principles and
motives used to reach that goal was to integrate the studies to ensure correlation and unity as opposed to fragmentation. The disciplines were not viewed as separate and discrete, but integrated. The child, the curriculum and the environment were all involved in this personal social development. The school was "interpreting to the child his environment and aiding him in adjusting himself to that environment." (Dutton, 1904, pp. 1-7)

Children who attended Horace Mann were "private"; they paid tuition for their schooling. In order to help other children, the school remained open after 3:30 to make it available for public school children and all children in and around the neighborhood. Over 2,400 children applied in the first year of operation for the after-school program. From the 2,400 pupils that applied, 116 were enrolled in sewing, cocking had 167 pupils, drawing and clay modeling had 142 pupils, and 83 pupils were in the woodworking session (Woodhull, 1904, p. 28).

The Horace Mann School sought from the beginning to improve education and experimented with the curriculum. By providing activity and pupil freedom, the school struck a middle ground, between disorder and chaos, and inflexibility and rigidity.

The Horace Mann School, however, could not handle all of the demands of students seeking practice, knowledge and skill in teaching. Another school, which could also be flexible and devoted to experimentation, was established in 1899 through the gift of Mr. and Mrs. James Speyer.

The Speyer School sought to complement the work of the Horace Mann School by allowing teachers and/or students practice-teaching opportunities and also to promote research with respect to public education. The Speyer School was different, however, from other experimental schools that had been established in two respects.
First, unlike the laboratory schools before it that charged a tuition; i.e., Parker School, Horace Mann, Chicago Schools, it did not charge for tuition. By not charging for tuition, it almost guaranteed that the pupils who were enrolled were samples of the community. Therefore, methods and procedures would be more reflective of public schools and not private schools. According to Rugg (1926), the average I.Q. of the pupil body in the University of Chicago Laboratory Schools, Horace Mann School and Lincoln School was 116 points, plus or minus two or three points (p.104). With an average I.Q. in this range, it certainly represents an above average economical and social population.

The second aspect of the Speyer School that helped to distinguish it was its combination of the experimental school concept with a social concept. The social concept was full use of the school for the community. The current public schools were operating five days a week, six hours a day for approximately forty weeks a year.

Realizing that there were approximately one hundred and eighty days in the school year, the school would be operating about one-half of the time. It was the philosophy of the Speyer School that schools were built by the public for the purpose of educating the community's youngsters, as well as the community. The public should use public buildings; therefore, school buildings should be used by all of the community as much as possible. Whatever could help the people of the community with respect to education and the attainment of higher ideals could overall benefit the parents as well as the children. To satisfy that need, the Speyer School opened up its doors. The community made the school available for use after school hours in the afternoon and evening. It was allowed to remain open all day Saturday, holidays, and regular vacations. Lectures, social meetings and entertainment could be accommodated in the kindergarten room or
the gymnasium.

Classes in cooking, sewing, music, drawing, woodworking, and industrial arts were offered in the afternoon and evening. Mothers' groups were organized; adult education activities were proposed; girls' social groups developed and instruction in the library was provided. The library was opened and was offered as a free library for the residents of the community. This factor was significant in that there were no other public libraries in that part of the city.

From 1910 to 1913, Dr. Bonser and the staff of the Speyer School worked on the school curriculum. Their work was published as The Speyer School Curriculum. In the construction of the curriculum, two unique characteristics are obvious. First, in lieu of clearly defined narrow subjects, a broader approach is used like industrial and fine arts, history, civics and social life, social and industrial life, geography and nature study. Second, industrial and fine arts were given for two hundred minutes in all grade levels for a total of 1600 minutes per week. The allotment of 1600 minutes for industrial and fine arts constituted 15.2% of the total time. This allotment was second only to English that was approximately 350 minutes per week for a total of 26.2%.

Since the organizational principle of the curriculum was to "represent the needs and interests of present day life in our own immediate environment and the world at large, the social factor," (Bonser, 1926, p. 1) one can see the significance of history, civic and social combined with industrial and fine arts. The combined percentage of history, civic and social life (13.2%) and industrial and fine arts (15.2%) constituted the largest percentage of time per week. The fundamental aim of the school, the social factor, was united with the psychological factor of work and projects which allowed children to
become active and concrete as well as abstract thinkers since theory would be applied in
a practical manner. The social studies involved the industrial, commercial, economic,
cultural and social aspects of the studies. An example was in fifth grade history that
involved exploration, colonization in America - the Dutch in New York, the English at
Plymouth Colony and in Virginia, Spanish and French colonies, and Colonial History to
1776.

Industrial arts projects involved the making of objects representative of colonial
life and reproducing processes common in colonial life - such as bleaching, dyeing, soap
and candle making, making of cider, vinegar and yeast, and patching and darning.

To further integrate the school subjects, English would involve reading Stories of
American Life and Adventure, Home Life in Colonial Days, Child Life in Colonial Days,
Pratts' Colonial Children, Boys of '76, Old Times In The Colonies, and Knickerbocker's
History of New York (Bomer, 1926, p.3)

Nature study involved the study of corn, tobacco, coffee, and tea. The pupils also
studied weeds and common flowers as well as cotton and sugar cane.

The integration of the curriculum was accomplished both horizontally and
vertically. For example, when the students studied history in fifth grade, they would talk
about and study Colonial America; make tools and do activities that colonists did in
Colonial America as part of their industrial arts program; read about Colonial America in
English; and study products, i.e., coffee, tobacco, of the Colonists. The emphasis was on
developing an awareness of the subject by interpreting it in humanistic terms and in terms
of the value it held for human well-being. This helped the pupils to foster a greater social
responsibility as well as developing greater personal-social growth.
The school sought to develop the social factor as well as how to apply facts. It sought to develop socially, responsible pupils who were capable of critically thinking and acting. "Any system of education that plans solely or mainly for acquisition of knowledge and for mental discipline omits, therefore, half of what is necessary for a good education." (McMurry, Garnsworth, & Wood, 1902, p. 296). The Speyer School followed the work of other experimentalists, particularly the "influence of Dr. Dewey," (McMurry et. al, 1902, p. 308) and tried to reconstruct education by activity, social growth and child growth.

The Speyer School, therefore, had a lot in common with the F. W. Parker School, the University of Chicago Laboratory School, and the Horace Mann School of Teachers College, since they all organized their curriculum on "subject" basis. Organizing work or problems around a central theme developed unity in the school curriculum. Occupations and other phases of social life were used as a correlating theme both horizontally and vertically.

The influence of Dewey, the work of Colonel F. W. Parker, and the work of Teachers College with its Horace Mann School and Speyer School gave impetus to the leadership for "protest, progressive, laboratory, free schools" in many locations after 1910 (Rugg, 1926, p. 109). Examples include Beaver Country Day School, Brookline, Massachusetts; School of Organic Education, Fairhope, Alabama; University of Missouri Elementary School, Missouri; University of Iowa Elementary School, Iowa; University of Chicago Laboratory School, Chicago; and the City and Country School, New York City.

The Beaver Country Day School developed its curriculum to blend the interests of the children and to help each child develop skills and methods of obtaining information.
The curriculum was constructed by combing as many subjects as possible into a large single subject. The curriculum was developed to "approach the blending of all interests that are so common in real life, instead of being artificially cut up into blocks designated as subjects" (Smith, 1926, p. 321).

By combining the subjects as much as possible, integrating and interrelating the subjects, the teacher was able to use the class time for pupil interests and needs. In practice, the social science central subject included history, geography, civics, and current events.

When studying this subject, the initial thrust would be the pupil, the community and its surroundings. From this immediate and microcosmic study, a large study would develop which would be broader and include the United States, North America, and the world. The subject matter, therefore, was geared to the interests of the children, integrated, not fragmented.

Contrast this to the School of Organic Education, Fairhope, Alabama. They believed that the needs of the child should dictate the educational program. The curriculum was constructed on the nature and needs of the child with the thought that "childhood is for itself and not a preparation for adult life" (Johnson, 1926 p. 749).

Children would engage in projects using clay, sand and blocks. Eventually they would use tools and work on art and craft projects. The children were encouraged to succeed while the feeling prevailed that no child should fail.

Although this laboratory school was geared to the child, it threw too much back to the child and was too romantic in its approach.
Horace Mann School sought to be progressive and somewhere between the School of Organic Education and Beaver Day Country School. It sought to demonstrate good methods and evaluate existing methods. If the existing methods were more effective they would be incorporated. The University of Iowa Elementary School was also a demonstration school that had its curriculum organized by subject matter, adaptation of the curriculum to the needs of children, and flexibility for the teachers to make changes in the curriculum.

In the University of Iowa School, which started in 1915, the curriculum was organized based upon subjects. The teachers who sought to integrate the curriculum with universal values in life developed the course of study. How each subject related to functions outside the school and how children acted and behaved outside the school was important. Practical problems that had meaning and significance were developed like building furniture and birdhouses. "The children were encouraged to work freely but "with a strong sense of responsibility for getting something done" (Horn & McBrown, 1926, p. 295).

The school sought to develop the children by offering a curriculum that was based on their needs as well as situations that should help them outside of school. Some subjects, however, were maintained intact and remained that way until experimentation changed them.

Another laboratory school in which teachers selected the content of the subjects was the City and Country School. The program that was developed was divided into four headings: Practical Activities, Special Training, Organization of Information, and Play Activities.
Children worked on projects and the attempt was for each child "to have integrating experiences in school so that he may tend to become an integrated individual" (Pratt, 1926, p. 332). The "projects" were not activities done for the sake of a specific discipline. "We do not have history, geography, nor yet shop projects" (Pratt, 1926, p. 332). These places, these rooms - shop, laboratory, and library - are places to go to work on "something which applies to the general program of the particular group or possibly to something which is going on outside of school" (Pratt, 1926, p. 332).

All of these schools agreed in their purpose:

♦ To provide for the interests and needs of individual children.
♦ To utilize the play, dramatic, constructive, and exploratory impulses of children, thus encouraging creative expression.
♦ To develop methods of cooperative activity in school classes and groups.
♦ To utilize the conditions and activities of the environment and the experiences of pupils as points of departure and means for further educative experiences.
♦ To permit much freedom to the teacher in selecting and adjusting work to the conditions and needs of pupils.
♦ To break down the barriers of subjects which interfere with true learning through correlating or integrating their elements in life-like experiences.

(Bonser, 1926, pp. 353-354)

Generally, the schools used creative hands-on activities with a practical application of theoretical concepts; they encouraged democratic principles of cooperative, free and individual growth, integrated the environment into the learning process, and
fostered creative projects in addressing issues. According to Bonser (1926), all the laboratory schools were "striving to develop the traits of behavior which constitute efficient individual and social life" (p. 354).

While the laboratory schools had the pupils engage in projects, William Heard Kilpatrick, who came on the scene in 1918, formalized a theory incorporating the psychology of Thorndike and the current educational philosophy that was Dewey's. Kilpatrick (1925), Professor of Education, Teachers College, Columbia University published Foundations of Methods in 1925 that discussed his concept of the project method. Dewey's complete act of thought, which applied the scientific method to solving problems, listed five phases or indispensable traits. In How We Think (1910), Dewey's indispensable traits were: (1) Define the problem, (2) Note conditions surrounding the problem (collect data), (3) Formulate a hypothesis, (4) Elaborate (reason), and (5) Test the hypotheses (Dewey, 1933, p. 116). Kilpatrick's method of dealing with any given project included: purposing, planning, executing, and judging.

Kilpatrick's (1918) project method was conceived using whole-hearted purposeful activity operating in a social environment. The term "project method" itself was not new as Kilpatrick stated that he "did not invent the term," nor did he "start it on its educational career" (p. 320). The terminology was not of extreme importance to him, and he wrote that project was to be thought of a pro-ject, "something projected" (Kilpatrick, 1918 p. 321).

The project method was predicated on the idea that students would engage in purposeful activities for a worthy life. Kilpatrick felt that education was to be considered as life itself and not the preparation for later life. When he compared his educational
philosophy to existing practices, he stated existing practices were preparation for adult life while his philosophy was "wholesome social life." The "new" theory of curriculum treated subject matter as intrinsic. The essential element of the theory was the educative experience, its need, and its relation to the environment. Having a need for the subject matter based upon the individual's frame of reference and environment makes the material more rewarding, immediate and useful.

Kilpatrick further listed evils of extrinsic subject matter. He cautioned that this approach used assignments, testing, information and knowledge as vehicles to assess the subject matter. Testing in the cognitive domain allowed for acquiring knowledge using lower cognitive skills and omitted the affective domain - habits, attitudes, appreciation and ideals. Kilpatrick felt that "deferred values" (things learned in the present) be used for the future "was a sign of failure in the teaching" (Kilpatrick, 1923, Part III, p. 368). He noted that the "old" curriculum stressed teaching using deferred values, while his point of view used "intrinsic subject matter" incorporating the child's present experiences under tactful leadership. This continually guided enrichment of present life promised the "most for future continual enriching" (Kilpatrick, 1923, Part III, p. 368).

Another fault of the extrinsic subject matter approach lay in the fact that traditional teaching involved its effect on the teacher. Using extrinsic methods, the teacher ceased to make curriculum decisions. What had to be learned, how it should be taught, the prescribed stages of a course of study, all affected the teacher's decision-making process. Using tests and examination and comparing teacher with teacher, school with school, and system with system, according to Kilpatrick, solidified this process. Education, he explained, was a vital process whereby the pupil would live and grow. The
pupil and the teacher must decide what to do and what activity to pursue. "Real curriculum must be made on the spot and as it is used," according to Kilpatrick (1923, Part III, p. 372) in defense for his intrinsic subject matter theory.

The extrinsic subject matter theory also had a negative effect on what was learned. Kilpatrick felt. Pupils would learn how to beat the teacher game and learn how to respond to teacher questions and how to get away with as little as possible with respect to studying. In short, pupils would be learning only to pass a test. The Intrinsic subject matter theory would use the experience of the child and enrich it. The child would attack the present situation. For example, in civics the child would study relationships of child to child in his own environment as a starting point.

Finally, the extrinsic subject matter of the traditional approach did not fully develop good social relationships. By memorizing facts, cramming for tests, testing of assignments, Kilpatrick felt that it developed a relationship that was adverse for the teacher and the child. Intrinsic subject matter made the teacher an ally with the pupil because subject matter and pupil experience were integrated.

In an address made before the Department of Superintendents in Chicago, February 28, 1924 Kilpatrick asked if his scheme could work, and if it could be done. His reply to his own question was that "it will work" (Kilpatrick, 1924, p. 9). To substantiate his comment, he cited preschool family education and "all good kindergartens." He further noted that extracurricular and moral education subscribed to this theory.

He further stated in his address that this theory can and does work in ordinary schools. He used his project method in a country school where it achieved better results
from a standardized test than other schools and national norms.

As administrators, Kilpatrick encouraged the superintendents to study all the facts, base the curriculum on activities 'as fast as is practicable,' (Kilpatrick, 1924, p. 10) and guide the development of democratic principles. In short, develop skills that would and could be used for later life.

Kilpatrick stressed that the curriculum would be built on life experience in an integrated approach. Learning for later life was pre-adjustment with skill and fact segregated. His theory was based upon the learning process, curriculum, and subject matter of the "whole child growing in wholesome social relationships" (Kilpatrick, 1931, p. 557).

The project method assumed to develop skills in the child that would be used for later life; it assumed that the child and teacher would work harmoniously in developing skills for knowledge; it assumed that there would be a greater transfer of knowledge because the child had a concept and did not deal in abstraction but in a practical manner.

There was a primary difficulty to learning with intent to remember for later life. Bagley (1921) considered it as "coming close to learning for its own sake" (Bagley, 1921, p. 290). In Democracy and Education (1916), Dewey found fault with learning one set of circumstances when he stated the example of the burnt child. If a parent arranged conditions so that a child would burn himself every time he touched a toy, then the child would soon learn to avoid the toy. This was "dealing with what may be called training in distinction from educative teaching" (Dewey, 1916, p. 13).

It may also be called training when teachers show pupils a set way to solve problems working only in the classroom. Without application of the activities in a
broader, social, ecological setting, pupils were learning a mechanical process that would use lower cognitive skills of recall. It was a fallacy to assume that "higher cognitive processes were learned automatically from practical activities," stated Tanner (Tanner & Tanner, 1971, p. 8). Another fallacy was that "verbal abstractions through prefabricated didactic instruction will shape behavior in the absence of practical activity" (Tanner, 1971, p. 8). The application of theoretical concepts into practical activities requires appropriate curriculum material as well as teacher knowledge and ability.

Although Kilpatrick had a wide following, there were educators who suggested dangers and difficulties. Bagley (1921) wrote of three dangers:

"...to teach subject matter exclusively in the context of immediate purposes may tend to reduce the revival values and transfer value of what is learned, almost exclusive emphasis upon the instrumental values of knowledge which this method encourages tends to blind one to other values that are equally significant and, perhaps, in the general education of the elementary and secondary school, much more important...an over-emphasis of purpose may blind us to the fact that nature has provided, and apparently quite wisely, for learning of a non-purposive sort; and that such over-emphasis may also lead to the assumption that the imposition of adult purposes is always an evil when, as a matter of fact, its very possibility has been one of the most important factors in human evolution, (p. 29)

The project method, according to Frederick G. Bonser (1926), Professor of Education, Teachers College, suffered from misinterpretation and neglect. By omitting important intellectual, appreciative or skill or habit forming activities and limiting activities to constructive projects alone was "narrow, inadequate, and inconsistent"
(p. 298). In developing constructive projects and activities, work may start with the project or task at hand and end with the project. In the progression which starts with the development of an idea, leads to a project, and concludes with a completed task, there may not be questions of a higher cognitive nature, nor would there be an articulation of the other disciplines; i.e., social studies, math, reading, reference skills, history, civics, or geography. The pupils may only pursue the task at hand.

Other dangers listed by Bonser (1926) were:

♦ …assuming that all expressed interests of children are of equal value.
♦ By so interpreting the project method as to ignore the profoundly significant values of race inheritance.
♦ The danger of exploiting the mere name, project method, without catching its spirit or meaning lies in a practice, not uncommon, of calling topics projects.
♦ …selecting projects too often which are individualistic rather than those requiring class cooperation. (pp. 298-300)

The project method dangers of relying on expressed children's interest may have resulted in over indulgence in selfish activities and the development of poor or even bad habits and attitudes. Dewey (1902) wrote in The Child and The Curriculum that "nothing but the crude will be developed out of the crude" and "nothing will develop from nothing" when we turn the child back upon himself (p. 18).

The dangers of developing projects which were topical or individualistic resulted in moving too rapidly to new activities without summarizing, emphasizing and resolving content and "leaving subject matter in isolated fragments rather than as parts of a
gradually expanding organization of thought" (Dewey, 1902, p. 301). To resolve the
difficulties and dangers, the teacher needed to develop a clear understanding of the
pupils' project, so that proper activities could proceed. The project and/or activities
should not have been developed in isolation. Using the project method by the factors of
socialization set forth by Dewey, namely "common drives, the spirit of cooperation, and
division of labor," according to Hosic (1921, p. 306), would have been the application of
the principles of democracy via the project method.

Hatch discussed student response to the project method in his history class at the
Horace Mann School and listed the following bad features:

♦ ... unnecessary discussion.
♦ too much talk about the method.
♦ indefinite homework assignments.
♦ too much time devoted to a particular project.
♦ a few pupils do the work.
♦ tendency for pupils to do minimal work; i.e., outside reading.
♦ wandering off the topic to other topics or activities. (p. 308)

Unfortunately, some did not welcome the project method. Methods such as
cooperative activity, working in groups, allowing movement in class, and the role of the
teacher, were foreign to educators. The previous model of students sitting in the
classroom listening to the teacher lecture required a quiet class and one-way interaction-
from the teacher to the student.

The project method, which promoted cooperation and teamwork for problem
solving, eventually found its way into building supersonic aircraft, and developing
nuclear weapons via the Manhattan Project. In the 1950s and 1960s, the project method was used to develop new curricula as scientists worked together in groups such as the Physical Science Study Committees, the School Mathematics Study Group, Unified Sciences and Math for Elementary Schools, and Biological Sciences Curriculum Study.

During the period that the project method was being utilized, the Laboratory School continued to develop. The new education or progressive education as it would be called, started to develop from the laboratory schools, as well as "expensive private schools, or the public schools of swank suburbs" (Prakken, 1938, p. 1).

Everywhere, the new education was taking hold. At the forefront of the movement, one philosopher was gaining recognition. The progressive education movement regarded the philosopher, John Dewey as its father. Perhaps this was because his theories were central to the movement; i.e., the treating of children as individuals, development of curriculum based on their needs (School and Society (1899), Child and The Curriculum, (1902), active involvement in the learning process ("learning by doing"), practicing democratic principles in the classroom, articulation of the whole with regard to the school and society, and personal/social problem solving. Dewey's book, School and Society, published in 1899, linked the social process of democracy with education. Education was sought to develop democratic principles by developing personal/social growth and helping pupils become responsible citizens who were able to make intelligent decisions. Parker had stated Dewey's view of democracy and education earlier in 1894. Parker lay the foundation for the progressive view that the "democratic principles of mutual responsibility - the idea that each member of society contribute to the good of all - must be translated into educational goals that reflect the enormous responsibility of
citizenship" (Tanner & Tanner, 1975, p. 218). Tanner and Tanner state that Dewey, like Parker, "viewed the school as a democracy in microcosm and, like Parker, Dewey viewed education as a social process and a social function" (Tanner & Tanner, 1975, p. 219).

Dewey continued espousing Parker’s theories and was better able to articulate the new philosophy. The movement now had a leader and texts to use (Child and Curriculum, School and Society) as guidelines. Progressive education continued to grow, partly because many people "jumped on the bandwagon" as well as the fact that there was a lack of agreement as to just exactly what progressive education was (Prakken, 1938, p. 1). There were many texts available but equally as many educators applying the theory as they interpreted it.

Perhaps the top ranking progressive school in America was The Lincoln School in Manhattan (Prakken, 1938, p. 1). The Lincoln School was a cooperative venture of the General Education Board, and Teachers College, which merged from Abraham Flexner’s (1923) essay, entitled "The Modern School." An objective of "The Modern School" was personal/social problem solving. In his pamphlet "A Modern School," Flexner wrote that the object in view "would be to give children the knowledge they need, and to develop in them the power to handle themselves in our own world" (Flexner, 1923, p. 98). Material would be presented to children in ways that promoted "their proper development and growth—individually and socially" (Flexner, 1923, p. 119). Intellectual power, therefore, was the objective to be developed through a realistic education. The curriculum would be realistic by containing those subjects that would serve a purpose. The burden of proof would be on the subject. Therefore, tradition as a justification for including a subject in the curriculum was not a valid criterion. Flexner felt that the experimental school would
develop and test curriculum principles and materials; otherwise it would not be different from the traditional model. The notion of discipline for discipline's sake was to be replaced by attention to "genuine need, interest, or capacity," (Flexner, 1923 p. 98) with additional attention directed to curriculum synthesis. No longer would subject-matter discipline dictate the teaching process. Instead, the process would use the various disciplines for problem solution.

In the materialistic and scientific world, Flexner (1923) felt that abstract thinking, the process of intellectual power, had "perhaps never before played so important a part in life" (p. 101) What to do, how to do it, and how knowledge can be applied to solve problems became Flexner's thrust as he wanted his students to be able to apply what they were learning.

As a teacher in his own school in Louisville, he stressed excellence with his pupils as he prepared them for college. The average age of entrance was nineteen and his pupils were entering at sixteen and graduating at nineteen. President Eliot of Harvard who took notice of Flexner's results discussed what he was doing. Years later, President Eliot's interest and confidence in Flexner would have significant results.

In a meeting with John D. Rockefeller, Jr. and President Eliot, Flexner discussed his theories about a model school. President Eliot was aware that Mr. Flexner's school in Louisville was a successful experiment, but saw the need to test for educational theories and record their progress because without assessment records one could not state how successful the school actually was. Mr. Rockefeller was curious about Flexner's medical school in Louisville and the fact that it was no longer in operation, as well as Flexner's hope for a new school to test his educational theories. The meeting lasted for several
hours, and President Eliot of Harvard remarked:

I have long wanted some such experiment; now I should regard it as a calamity if we, having in our service the one man best fitted to organize such a school, should fail to give him and the country the chance.

(Flexner, 1960, p. 159)

Eliot wrote a paper, "Changes Needed in American Secondary Education," that was incorporated in Flexner's "Modern School" pamphlet. The General Education Board provided Teachers College of Columbia University with the funds to establish the Lincoln School that would serve as a model for the Modern School.

The Modern School sought to have education train pupils to know, care about and understand the world they lived in - both the physical and social world. It would be a model for development of personal/social growth. The comprehension of current industry, science and politics as it related to genuine interest, need or capacity as opposed to "training of the mind" was the thrust of the school. "Training the mind," Flexner wrote in Modern School, "in the sense in which the claim is thus made for algebra or ancient languages is an unproved assumption" (Flexner, 1960, p. 97).

According to Dewey (1916), having a child touch a toy and get burned will result in the child not playing with the toy. To arrange these conditions was what he called, "training" and non-educative teaching. An educative experience happened when genuine experience and instruction was conveyed and ability measured (Dewey, 1916, p. 77).

Flexner felt that the Modern School must amplify and enrich the child's experience so as not to be restricted to secondhand impressions. The child's interest and skills must be cultivated and interpreted. Eventually, the school fell victim to its lack of assessment and
documentation. As stated by Bonzer (1929):

In too many progressive schools there has been no record made of what was done, no attempt to evaluate results or establish alleged achievements of growth to analyze purposes and methods in terms of basic principles... No error could be more unfortunate or more costly to progressive education than that of assuming that it is in opposition to the use of the scientific method or to the findings of valid scientific investigation. (p.15)

By 1947, the Teachers College had its decision to close Lincoln School upheld by the New York Supreme Court. The decision to close Lincoln School was based on the college's conviction that the school "had not functioned to the fullest extent of its potentialities for experimentation" (Scholasticus, 1940 p. 208). The experimentation of the progressive educators was quickly becoming extinguished.

By the 1950s, reconstruction was in order. The "war babies" would now be attending school, and this would contribute to a 33% increase in students. There would also be a need to recruit, train, and employ 50% more teachers. This was echoed in a report submitted to President Eisenhower in 1953 that not only stressed the need for teachers, but specifically for mathematics and science teachers. The report, according to Kreighbaum and Dawson (1969), stated that the short supply of science and mathematics teachers that were currently being trained would not "... even provide for normal replacements at the present level, let alone take care of foreseeable growth" (p. 164).

The terror of the times was now leaning towards technology and national defense. As a result of the war, America emerged as a technologically oriented society. It would be in direct competition with Russia for a race of supremacy. The last frontier, space,
was being challenged. To meet the challenge, academic professors in the universities were being sought. Quite naturally, schools, schooling and education began to get scrutinized. Morality was examined, anti-communism was beginning, McCarthyism influenced and crept into all segments of society, television was becoming popular, jobs and the nature of jobs were examined, and a reaction to the progressive and life-adjustment movement in education began to spread.

When examining the schools, dissatisfaction was expressed with the high school graduates who seemed to be ill prepared. The material used in the classroom was criticized as being out of date, inconsistent with the knowledge explosion. Teachers, teaching methodology, teaching strategies and the education of teachers were also criticized. Bester, McMurry, and Kaier's book, Educational Wastelands, published in 1933, helped to put the nail in the progressive education coffin. He charged that "the post-Dewey progressives and life adjustment advocates had gotten the school so involved in vocational activities and child-centered learning that the intellectual development of pupils had been lost" (Bester et al., 1933, p. 120). The pursuit of excellence was beginning. According to Tanner and Tanner (1975):

The pressures of the Cold War and space race produced an initial reaction that called for the pursuit of academic excellence in our schools, coupled with efforts to give priority in the curriculum to science, mathematics and modern foreign language. But the most significant influence on curriculum development in our elementary and secondary schools came as a result of the formulation of a rationale that has been termed the structure of a discipline principle. (p. 404)
For those who doubted the need for a pursuit of excellence, the flight of Sputnik I in October 1957, seemed to shock them to their senses. Was it not proof that America was falling behind the Soviets in educational and technical manpower? Congress had denied previous support for education via federal money. By 1958, the correlation between the nation’s future and educational improvement was tied. President Eisenhower urged Congress to expend money by way of special federal assistance to education. National concern for education was now taking hold. Eisenhower called for a five-fold expansion in the National Science Foundation (NSF) science education activities. A new act entitled The National Defense Education Act was promoted to provide programs in areas related to science and technology. The curriculum reform movement was starting its march with funding vehicles like the National Defense Education Act, the National Science Foundation and grants from private foundations. Eisenhower, in an address to Congress on January 27, 1958, requested categorical assistance for specific programs. He stated the "education best fulfills its high purpose when responsibility for education is kept close to the people it serves - when it is rooted in the home, nurtured in the community, and sustained by a rich variety of public, private and industrial resources." To sweeten the proposal, he explained that it would "not be considered a permanent federal responsibility" but temporary. Obviously, he was persuasive since less than one year after Sputnik had been launched, the National Defense Education Act moved through Congress with relative ease and became law" (Witt, 1962, p. 63).

In retrospect, the National Science Foundation, since 1956, supported over forty national curriculum projects which included University of Illinois Committee on School
Mathematics, Physical Science Study Committee, Biological Sciences, Curriculum Study (BSCS), Unified Science and Math for the Elementary school (USME3), and Harvard Physics Project, to name a few. The National Science Foundation peaked in the mid-1960s at $10 million for curriculum projects and overall, it invested approximately one $100 million during an 18 year period, according to a US House of Representatives report entitled, "The National Science Foundation and Pre-College Science Education: 1958-1975," submitted to the second session of the 94th Congress.

According to a National Science Foundation report, the NSF spent $640 million since 1953 for teacher institutes and activities related to teacher training. Of the total figure, the NSF spent $532 million (83%) for teacher training via institutes offering training, instruction and services to teachers to help them develop a broader scope of knowledge of the science disciplines, not necessarily geared to a specific curriculum project. The NSF earmarked the remaining $110 million of the $640 million to teacher institutes for specific curriculum projects supported. This money was used for teaching methodology, dissemination of teaching techniques related to the new curricula, and procedures for implementing the programs in the classroom. Interesting to note is that almost five times as much money was spent for teacher training and teacher awareness for no specific curriculum project. The reasoning for not directing all of the teacher training funds to specific programs or projects, according to Bowen Dees, a former NSF Assistant Director for Education, were two-fold:

First, NSF staff believed that teachers' lack of subject matter competence was a bigger problem in improving science education than poor teaching methods or difficulties in using new material.
Second, NSF staff judged that Congress or others might interpret directing training funds to the implementation of the new material as a mover by the Federal Government to take over science education in the schools, which might lead to disabling controversies. A policy was established that the new materials developed by the curriculum projects would have "to make their way on their own merits." (Wirt & Quick, 1976)

Since the development of new curricula was a risky economical adventure, it was easy to see why the commercial developers did not want to produce them and opted instead to let the government to do it. Also, the federal government had supported leaders and innovators in the field for curriculum projects since it became a research function of the government. This added credence to the notion of federally supported programs. Finally, having federally supported programs, the process started from the top (university scholars) and filtered down to the local levels (teachers) which was something that added more credibility to the programs and which could be done more easily at a federal level as opposed to a local commercial level.

The National Science Foundation's approach for implementation, according to Wirt and Quick (1976), was a set of working assumptions. They included the following:

First, the general goal of the program was to improve the quality of science education (and to achieve a more uniform, distribution of quality among schools) as opposed to directly increasing the quantity of scientific and technical manpower...

Second, funds were not directed to the final target of students in classrooms but to intermediate points of entry in the education system, because of
the budget limitations and staff convictions that in the long run this would be a more effective use of federal funds...

Third, the means that NSF chose in interviewing were typically integrative rather than programmatic, in the sense that funds were directed to activities for bringing personnel who would ordinarily not be mutually involved in educational improvement activities into association rather than to build with governmentally administered programs (pp. 11-12)

Thus, the National Science Foundation projects involved teachers, scientists, discipline curriculum experts, university professors and educators. The Foundation’s method of influencing the school curriculum, i.e., money provided for conferences, projects and teacher training institutes was to gather experts to develop curriculum.

The 1990s saw a very different focus emerge. The new direction was brain research. With the advent of technology, researchers were able to better understand how the human brain collects, processes, and interprets information. Little would educators realize that President George H. Bush’s declaration that the 1990s was the “Decade of the Brain” would lead to an explosion of information on how the brain works.

According to Bush’s Presidential Proclamation 6158, a new era of discovery was dawning in brain research. “Powerful microscopes, major studies in genetics research and advances in brain imaging devices are giving physicians and scientists even greater insight into the brain” (Bush, Presidential Proclamation 6158, Library of Congress, 1990). There were literally ‘thousands of research projects, books, magazine cover stories, and television specials regaling us with new facts and figures, colorful PET scans, and at times, suspiciously simple ways to improve our memories, prevent Alzheimer’s,
and make our babies geniuses" (Wolfe, P. & Brandt, R., 1998, p. 8).

The information released has been revolutionary. Previously, educators could not say with certainty what was working. With the intervention of all the new technology, the efforts of the scientists and neuroscientists rendered guesswork unnecessary. The task for educators, therefore, is to learn to separate brain fact from brain fiction. Neuroscience research's purpose was "to learn how the brain functions" as "brain research does not - and may never - tell us specifically what we should do in a classroom" (Wolfe, P. & Brandt, R. 1998, pp. 8-10).

The brain research bandwagon is easy to jump on. Educators need to determine first how the brain learns, then incorporate that information into a lesson design that will maximize learning. Functional Magnetic Resonance Imaging (MRI) and Position Emission Tomography (PET) scans have been able to produce new three-dimensional maps of the human brain. Having this capability, what are the implications for brain research? This new technology has allowed researchers to plot what areas of the brain are stimulated when learning takes place.

David Sousa is an international education consultant with a Bachelor's degree in chemistry, a Master's Degree in Teaching from Harvard, and doctorate from Rutgers University. Sousa has used the above new technology aids to identify for educators what needs to take place in a lesson to ensure that students' brains are fully engaged. According to Sousa (1998), research tells us there are "windows of opportunity" for learning, a need to understand "emotions in learning," and a need to make "connections to past experiences," employ "sensory engagements during learning," and design "shorter lessons" (pp. 23-25).
Keeping those considerations in mind, educators would have a different perspective for lesson design. For example, with respect to Sousa's (1998) concept of windows of opportunity, the implication is that there would be educational significance if educators provide certain impact or conditions. He cites two implications for "windows of opportunities" - "early childhood education" and "second-language instruction in 4th grade" (p. 23).

The need for early childhood education (ages 2-4) is important because children are born with an estimated 12 to 15 billion nerve cells (called neurons). Each neuron interacts with others by extending branches (called dendrites). What brain researchers have found is that the number of synapses per unit volume of tissue (called synaptic density) will change over a person's life span (Goldman-Rakic, Bourgeois, & Rakic, 1997; Hettenlocher & Dabholkar, 1997; Rakic, Bourgeois, & Goldman-Rakic, 1994, in Bruer, 1998, p. 15). Basically, an infant is born with more brain cells than they will need and by age 4, the synaptic densities will be 50% more than that of an adult level. By the age of puberty, "a pruning process begins to eliminate synapses, reducing synaptic densities to adult, mature levels" (Bruer, 1998, p. 15).

If children are born with more (50% more by age 4) synapses than we necessary, then what happens to the extra ones? Also, do the extra synaptic densities mean that the person will be more intelligent? Is there a direct relationship between synaptic densities and intelligence? Yes and no. It depends whose research one reads. Bruer states "neuroscience suggests that there is no simple, direct relationship between synaptic densities and intelligence (Bruer, 1998, p. 15). He argues that the increases in density are not the result of learning experiences. He reasoned that more learning experiences will
result in more synapses and less pruning of the ones not used. He does, however, admit that the changes in the synaptic densities resemble an inverted U pattern with the representation being high at birth and childhood, and lower in adulthood.

There are other researchers who tend to disagree with Bruer. Ronald Kotulak, (1996) Pulitzer Prize winning author and scientist, wrote Inside the Brain and described the relationship between genes and the environment using a metaphor of a banquet:

The brain gobbles up the external environment through its sensory system and then reassembles the digested world in form of trillions of connections which are constantly growing or dying, becoming stronger or weaker depending on the richness of the banquet. (p.4)

Ronald Kotulak (1996) presented a paper on "Learning How To Use The Brain." He disputed the old theory that the brain is "hard-wired" and that children's intelligence is fixed at birth. He dispelled that notion as a myth (he felt it is in the same category as the unbreakable four minute mile) because of the "plasticity factor" (Kotulak, 1996, p.1).

The plasticity factor, according to Kotulak, is the brain's ability to "constantly change its structure and function in response to experience coming in from the outside" (p. 2).

Basically, the researchers (Peter Huttenlocker at the University of Chicago and Ron Kotulak) discovered that the synapses (the telephone lines that are used for brain cells to communicate with each other) reach a total of about 1,000 trillion connections in the whole brain, and gradually decrease to about 500 trillion" (Kotulak, 1996, p. 3).

According to Kotulak (1996), we can allow a newborn to "receive input from any environment it is born into, whether it's Chicago or Calcutta, and to adapt to the food, language, and culture," (p. 4) since the individual is born with an abundance of brain
The concept of having more brain cells than are necessary will mean that a certain "pruning" takes effect so that some brain cells survive and some perish. The brain cells that are stimulated will not perish. Therefore, information children receive through their senses (vision, hearing, smell, touch, and taste) need to be used in conjunction with the learning.

In order to ensure that information is processed in the brain, the synapses must be stimulated so the connections become part of the structure that is retained. Kotulak (1996) presented startling data to substantiate his theory by citing the research he discovered while developing this theory. He stated that in the 1970s, Torsten Wiesel and David Hubel sewed shut one eye of a newborn kitten for a period of a few weeks. To their surprise, when the closed eye was opened, the kitten could not see. Kotulak further stated that as a result of this discovery the manner in which doctors decide what to do with children born with cataracts has also changed. In the past, doctors would not operate on children who had cataracts until the children were older. To their shock and dismay, the children whose eyes were surgically corrected still could not see. Apparently, what happened in the experiment with Weisel and Hubel's cats also occurred in children.

To further make his claim for a stimulating environment for children, Kotulak (1996) cited the work of Bill Greenough, Director of the William T. Greenough Laboratory, University of Illinois in which he conducted an experiment where by rats were placed in a stimulating environment. The rats were allowed to play with toys, exercise devices, challenging mazes, playmates, etc. To further enhance the visual arena,
color was used. His findings concluded that the "animals living in the stimulating environment had 25% more connections between their brain cells than the control rats, and the experimental group was a lot smarter" (The connection to humans shown by this research is brainpower - possibly a boost in IQ of 20 points or more.) (Kotnik, 1996, p. 5).

Marion Diamond (1998), who has studied the anatomy and physiology of the brain for more than 40 years, further supports the rich "banquet" of knowledge. She conducted research on how the brain changes physically to various responses to the environment. Recognizing that a quarter inch thick blanket of cells called the cerebral cortex covers the brain, Diamond investigated the changes in the nerve cell structure in the cortex. In one experiment, she was investigating the changes in the cerebral cortex when rats were exposed to two different environments. One environment was an "enriched environment" with toys, objects, etc. for exploration. The experimental group had toys to climb on while the control group was "impoverished." In the results of the study, Diamond reported, "the rats living in the enriched environment had developed a thicker cortex than those living in the impoverished environment" (p. 21). The significance of the growth of the cortex was in newer cell growth that resulted as the nerve cells got stimulated. New dendrites were formed. The dendrite is the receptive surface of the cell. Cells get stimulated and grow more dendrites, which increase the reception and number of connections among the cells. The change that occurs when new growth occurs in response to the environment is called plasticity. But, does that change in connection have anything to do with intelligence?

The question of nerve cell connections and intelligence was answered by
Diamond (1998) as he concluded that "intelligence depends on the connections among the nerve cells" (p. 21). She concluded that an enriched environment resulted with changed structures in nerve cells and more dendrites' growth that allowed for more connections. Furthermore, rats "that live in the enriched environment can run different kinds of mazes with greater ease than rats that live in the impoverished environment," and rats that did not participate (the rats who decided to sit and watch and not engage in any of the activities) had fewer changes in nerve cell growth (Diamond, 1998, p. 21).

Another question arises from this research relative to learning environments. Can an enriched environment for one student, or a group of students, lead to meaning? Sousa (1998) wonders if there will be a greater impact on whether information and skills will be learned and stored (p. 24). The reverse of Sousa's assumption would be that if students do not find "meaning" when the lesson is concluded, there is a strong possibility the lesson will not be learned. They probably will retain the information until they walk out the classroom door! What, therefore, should be done?

Teachers, according to the research conducted by Sousa, and noted in his texts of *How the Brain Learns* and *The Special Needs and the Brain* - should "work harder at helping students establish meaning" (Sousa, 1998, p. 24). Lessons developed by teachers must make sense to the student but the need, according to Sousa, is for "meaning."

"Helping students to make connections between subject areas by integrating the curriculum, increases meaning and retention, especially when students see a future use for the new learning" (Sousa, 1998, p. 24).

Dr. Pat Wolfe (1999), independent educational consultant who has studied brain research over the past decade, explained the connection between sense and meaning as
the challenge for educators. Specifically, educators are challenged to construct and establish an enriched environment that helps the student see the integration between what is taught and what they know. "So, students can sprout new dendrites, which form new connections and become strong through review" (Wolfe, 1992, p. 22). The second time the neurons fire together they become more efficient and the interaction fires more easily.

The search for meaning was also amplified in the brain research of educators Geoffrey Caine, Professor Emeritus of Education at California State University and Renata Caine. The Caines are authors of several textbooks and are both consultants for Caine Learning. They were succinct in their assessment of the concept of "meaning." When asked about the importance of meaning, they replied, "every human being is driven to search for meaning" (Caine & Caine in D'Arcangelo, 1998 p. 23). They felt that environment was important and the way to encourage "meaning" would be to solicit from the learners the purpose of the new lesson and how it connects to previous learning.

Although no two people are alike and may respond differently to "enriched environments," Diamond (1998) considered that concern in her research. She suggests that children should be taught to "think for themselves." The way to encourage that process is to have them grouped and exposed to a cooperative experience. The method is to group children, so they are talking to one another, asking questions of each other, and learning to be teachers because "you have to understand something to teach it" (Diamond, 1998, p. 21).

The initial premise was that the brain cells one had at birth were the brain cells one dies with - the cells (neurites) do not regenerate. In light of the recent research on how children learn and on brain research, Wolfe and Barami (1998) concluded "the brain
changes physiologically as a result of experience. The environment in which the brain operates determines to a large degree the functioning ability of that brain" (p. 10). The process is cyclical, as the environment will affect the nerve cells. When the nerve cells interpret the environment and respond, the response is with dendrite connection growth. The implication is that the "plasticity" that Diamand (1998) wrote about means the connections between brain cells can grow due to an enriched environment.

Wolfe and Brandt (1998), Editor Emeritus of Educational Leadership substantiate what Sousa claims is necessary for long term retention - the concept of sense and meaning. Sousa claims this as a critical component for the learning experience as well as student interest. With respect to student interest, it presumes that the teachers would know their class well enough to know each student's interest.

As educators, we can design lessons that will incorporate experiences in an enriched environment to help the brain make connections by growing more dendrites, or we can allow the connections to wither and die from lack of appropriate stimulation. To help educators make the "grow more dendrites" choice, Wolfe and Brandt (1998) offer four points:

1. The brain has not evolved to its present condition by taking in meaningless data; an enriched environment gives students the opportunity to make sense out of what they are learning, what some call the opportunity to "make meaning."

2. The brain develops in an integrated fashion over time. Babies don't talk one week, tie their shoes the next, and then work on their emotional development simultaneously.
3. The brain is essentially curious and it must be to survive. It constantly seeks connections between the new and the known. Learning is a process of active construction by the learner, and an enriched environment gives students the opportunity to relate what they are learning to what they already know. As noted educator Phil Schlechty says, "Students must do the work of learning."

4. The brain is innately social and collaborative. Although the processing takes place in our students' individual brains, their learning is enhanced when the environment provides them with the opportunity to discuss their thinking out loud, to bounce their ideas off their peers, and to produce collaborative work.

Certainly Dewey has written enough about the importance of environment relative to the construction of curriculum. "It is not enough to insist upon the necessity of experience, nor even of activity in experience. Everything depends upon the quality of the experience which is had" (Dewey, 1938, p. 27). Experience for the sake of experience does not mean that a child is learning because he or she is experiencing. Quite the contrary, the quality of the experience, as noted by Dewey in *Experience and Education* is important. Learning, therefore, is more than providing experience and expecting knowledge. Intelligent activity is purposeful and directed as opposed to inferential and aimless. According to Dewey, "Intelligent activity is distinguished from aimless activity by the fact that it involves selection of means - analysis - out of the variety of conditions that are present, and their arrangement - synthesis - to reach an intended aim of purpose" (Dewey, 1938, p. 84).

Keeping Dewey's writings in mind, we see how his concepts are applicable with
today's brain research. Brain research is consistent with Dewey's insistence for a directed, controlled environment for providing experiences to children that will be beneficial. "Whether we permit chance environments to do the work, or whether we design environments for the purpose makes a great difference" (Dewey, 1916, p. 19).

One could read Dewey's Experience and Education (1938) and Democracy and Education (1916) and see his concepts in the brain research of Sousa, Wolfe, Brandt, and Kotulak.

Brain research has also proposed that IQ is not fixed at birth. (Wolfe & Brandt, 1998, p. 11) Building on Diamond's (1998) brain research, Craig Ramey (1996), University of Alabama Psychologist, decided to test if Diamond's experimentation with rats relative to an enriching environment had positive impact on brain cell growth in children. Ramey directed various studies that included thousands of children, and sought to determine if an infant's scores on intelligence tests could, indeed, be raised by manipulating the environment (as Diamond had done in her studies with rats). Ramey concluded that scores on intelligence tests could be raised by "15 to 30 percent." The results of his study were taken from a sample of children whose ages ranged from six weeks to four months. The results were titled, "At risk does not mean doomed" (Ramey & Ramey in Wolfe & Brandt, 1998, p. 12).

John T. Bruer (1998), President of James S. McDonnell Foundation, warns educators that when it comes to brain research relative to young children, educators must critically evaluate all the research that is available, especially the research on early brain development as research shows neural connections form rapidly early in life. Critical periods occur in a person's development, and enriched environments have a pronounced

The first piece of research that Bruer (1998) attacks is the relationship between synaptic densities and intelligence. His contention is that the research that had been done was based on animal research. Then it was extrapolated to findings for human infants. He does not argue that synaptic densities rapidly increase in infants. He feels that synaptic densities decrease at adult levels. Greenough challenged Bruer's opinion by claiming that people can acquire skills at any age, can benefit from instruction at any age and intelligence, and given the right opportunities their knowledge base will increase. Greenough's point is that although synaptic densities decrease, use will stimulate new brain cell growth (p. 17).

Bruer (1998) continues his attack on the critical periods of development theory. Bruer contested the experiment of visual deprivation whereby one eye was closed in kitten for a period of time, resulting in permanent visual loss when re-opened. He cited a study done by Hubel, Wiesel, and LeVay in 1977 in which the closing of one eyelid in the early months of life for cats or monkeys did result in loss of functional use of the eye when it was reopened. "However, the same or longer periods of complete visual deprivation in adult cats had no effect on either the animals' ability to use the eye when it was reopened or on its brain structure" (Bruer, 1998, p. 16). The impact was significant for only the young animals, during a critical period in their developmental growth. Bruer further made his case by claiming, "reverse closure," i.e., opening the closed eye and closing the open eye "allowed a young deprived animal to recover the use of the originally deprived eye" (Bruer, 1998, p. 16). The author warned that the reverse suturing had to be done early enough in the critical period. It seems that the reverse had
to be done early enough in order for detrimental effects not to occur! Why would educators take a risk of hoping to reverse a trend when, in order to prevent the harmful effects, they know what needs to be done - in this case, an enriched environment?

Brer (1998) also had expressed concerns regarding the enriched environment and critical periods of development. He stated that critical periods say little about formal education and "we have no reason to think that there are critical periods" since "formal schooling instructs children about social and cultural particulars, not about evolution-based, species wide skills and behaviors" (p. 17).

If Greenough showed that there are windows of opportunities for learning critical skills and an enriched environment is helpful in synaptic development, then why wouldn't Greenough's theories be applied?

Brer (1998) disputes Greenough's research. He felt that Greenough's environment was not "enriched" but complex. Brer wrote that there were two contrasting environments in the study: One, the typical laboratory environment of being alone in a small cage with food and water available, and two, several rats in a large cage with "novel objects" and obstacles. The "complex environment," according to Brer was "not special, accelerated rodent learning environments. One should not think of them as high-quality infant care or Head Start for rats. One should think of them more as attempts to create New York City subway tunnel conditions in the laboratory" (Brer, 1998, p. 17). Despite his criticism of the laboratory conditions, Brer does acknowledge the effect of "complex" (his word) or "enriched" (Greenough's choice of word) environment as an impact. The final criticism of Greenough by Brer was that Greenough and his colleagues established "the brains of adult rats also form new
synapses in response to complex environments." His contention is that the brain's ability to reorganize itself was established in adulthood.

When Marion Diamond (1998) (researcher who studied anatomy and physiology of the brain for more than 40 years) was interviewed, the interviewer stated "mech of your research focuses on how the brain changes physically in response to the environment. You work with animals because of the similar structure and behavior of nerve cells across species. What have you found that applies to humans?" (D'Arcangelo, 1998, p. 21). Diamond (1998) replies that "we work with rats because I have yet to find a human being who's willing to give me a piece of cerebral cortex to study. ... We found that the rats living in the enriched environment had developed a thicker cortex than those rats living in the impoverished environment" (D'Arcangelo, 1998, p. 21).

Obviously, the results of the research conducted by Diamond (1998) in her studies of more than 40 years and the results of Greenough's studies, were similar: Enriched environments do enhance brain cell growth.

However, let's assume that Bruer's claim that the work done by Greenough and Diamond deals with rats and is not applicable. The Carnegie Corporation of New York in its report "Starting Points" answered that question. It was reported, "The first three years of a child's life are vitally important to brain development. Unfortunately, for a growing number of children, the period from birth to age three has become a mental wasteland. "Society," said the Carnegie report "needs to invest adequate resources in helping these children at this critical period in their lives" (Kosalak, 1996, p. 5).

Kotulak (1996) goes on to report that the culprit "may well be brain cells that do not learn what they are supposed to because they have been deprived of normal
simulation on the one hand and overexposure to violence and stressful events on the other" (p. 6).

Does that mean that the process is irreversible? The theory had to be tested and Craig Ramey, working at the University of Alabama, attempted to prove that Greenough's work with animals could indeed be applied to humans. For his control group he used children who were as young as six weeks of age. He provided a nurturing and mentally stimulating experience for the control group. The results were that "after three years children in the intervention group had IQs in the normal range, around 100, whereas children living in similar poor neighborhood, but who were not in the intervention program, averaged IQs that were twenty points lower" (Kotulak, 1996, p. 6).

The results were also not limited to impoverished children but to other groups. To test the work of Ramey (and Greenough), Jeanne Brooks-Gunn of Columbia University's Teachers College studied premature infants (approximately 1,000 infants) at various centers. The 10 centers that were used reported, "those in the intervention group had modest, but significantly higher IQs than infants in the control group after three years (Kotulak, 1995, p. 6). What was interesting to note about her study was the wide range of students in the sample who had diverse backgrounds, (some were middle class and some were lower) and a diverse ethnic background.

The question becomes - did the intellectual benefits last? The concern may be that interventions were applied, but were short term, or were a "flash in the pan." As reported by Kotulak, the gains were sustained, as "the gains remained solid, after five years and appear to be holding now, some eight years later."

Knowing that intellectual benefit can be achieved with early intervention, it
becomes more important that educators apply that knowledge into early (pre-school) programs. Wolfe and Brandt report in their studies that "an estimated 12% of infants born in this country suffer significant reduction of their cognitive ability as a result of preterm birth, maternal smoking, alcohol use, drug use in pregnancy, maternal and infant malnutrition, and post-birth lead poisoning or child abuse" (Wolfe & Brandt, 1998, p. 13).

Evidently, the benefits of early intervention are not going to be overlooked, as with the new federal legislation of No Child Left Behind (2000), more and more research is required to receive federal funding for programs. There is also an emphasis to start early intervention programs. Furthermore, "learning is strongly influenced by emotion" (Wolfe & Brandt, 1998, p. 13).

In addition to Wolfe and Brandt (1998), two other researchers who addressed emotions are Daniel Goleman, who wrote Emotional Intelligence (1995) and Joseph LeDoux, author of The Emotional Brain (1996). The claims by Wolfe and Brandt (1998) about emotions are two-fold.

First, it plays a positive role in that the stronger the emotion connected with an experience, the stronger the memory of that experience. Chemicals in the brain send a message to the rest of the brain: "This information is important. Remember it."

In contrast, LeDoux has pointed out that if the emotion is too strong (for example, the situation is perceived by the learner to be threatening), then learning is decreased." (p. 13)

Whether one calls the activity "downshifting," "cooling down," or "inefficiency,"
it is clear that emotions have a significant part in the educational process.

In a conversation with Robert Sylvester, author of numerous articles and books about the brain and learning, Ron Brandt asked the relationship between thinking and emotion, to which Sylvester replied:

... Thinking programs encourage a greater use of reflective thinking. The reflexive system is triggered by a strong emotional impulse..." (Brandt, 2000, p. 77)

The interviewer went on to ask Sylvester about Greenspan's research on emotions - specifically, "Greenspan contends that good thinking depends not just on pure rationality but also on emotional overtones."

Sylvester's reply underscored the value of emotion by stating, "Emotions drive everything." Furthermore, "we attempt to solve only problems that are emotionally important to us. Emotion is an unconscious arousal system that informs our body and brain that something important has occurred or will occur" (Brandt, 2000, p. 74).

What becomes critical then is for the teacher to understand how significant emotions are in the educational process. Another consideration is ensuring that students are also in touch with their emotions since emotions are an unconscious arousal system. Having a safe and orderly school environment as well as students cognizant of stress reduction, conflict management, and biofeedback help to ensure emotional security.

"Folks with no conscious understanding of their emotional state often do foolish things, so it's important to help children understand how emotions and feelings affect behavior," according to Sylvester (Brandt, 2000, p. 74).

The idea of emotional intelligence took hold when Daniel Goleman (1995), a
science writer for the New York Times, wrote a book that would spearhead the cause. His book was entitled *Emotional Intelligence: Why It Can Matter More Than IQ*. He followed his initial text with another book about emotional intelligence called *Working With Emotional Intelligence*. However, because he was able to write about his theory, it didn't mean that it was research-based. It wasn't until technology was able to catch up with the theory that Goleman, with the help of Joseph LeDoux (1990), a neuroscientist at the Center for Neural Science at New York University, that his theory could be proven. Neural pathways were pinpointed, and LeDoux discovered that information entering through the senses of vision and hearing initially went to the thalamus. If the information was emotional, then the thalamus sent out responses to two parts of the brain. "What this means is that the emotional brain has the information first, and in the event of a crisis can react before the thinking brain has even received the information and had a chance to weigh the options" (Gabriel, 2000, p. 3). This is the "fight or flight" concept.

What was interesting was an excerpt in Goleman's book *Emotional Intelligence* (1995) in which he cited a study done at AT&T Bell Labs where 10 to 15 engineers were identified as leaders. He attributed this leadership to the fact that they were "less likely to become dominated by emotional impulses" (Gabriel, 2000, p. 4). They were able to control their emotions.

To help children understand the emotional aspect of learning is important for the student. Understanding that there are growth cycles for the brain is important for the teacher. Initially, the concept of growth was the notion of development as sequential stages (like the rungs of a ladder). However, "current work replaces that overly simple notion with the rich biological concept of a recurring growth cycle: Both behavior and the
brain change in repeating patterns that seem to involve common growth cycles" (Fisher & Rose 1998, p. 56). In essence, the old notion of conceptual thinking in a progression is replaced with a "dynamic skills framework" which is flexible. A useful metaphor for the dynamic properties as seen by Fisher and Rose is a "developmental web, with thinking and learning changing in parallel along multiple strands or domains, as reflected in such concepts as Gardner's (1993) multiple intelligences" (Fisher & Rose 1998, p. 56).

The developmental process starts with constructing levels or skills that stem from a single unit. The next step is to expand the single units by "mapping" which involves joining the single units into multiple units. The multiple units are jointed into systems; after a system is developed, the next level begins. According to Fisher and Rose (1998), the four stages of action and thought are identified as "reflexes," "actions," "representations," and "abstractions" with skill levels for each tier are: reflexes - 3-4 weeks to 10-11 weeks old; action - 3-4 months to 10-11 weeks old; action - 3-4 months to 11-13 months; representations - 2 years to 6-7 years old, and abstractions - from 10-12 years old to 18-20 years old (p. 58). Assuming the researchers are correct in their assumptions, the implications for educators are:

- The cyclical nature of cortical growth and optimal cognitive development seems to foster characteristics of resilience and plasticity.
- Brain development involves a recurring growth cycle of neural networks and learning.
- Children (and adults) function at multiple levels of skill and understanding.
- An individual level of skill and understanding depends pervasively on contextual support for high-level functioning.
Educators need to focus on teaching children at lower, as well as at optimal levels because independent learning and thinking usually occur at lower levels, with optimal functioning limited to supportive situations. (Fisher & Rose 1998, p. 60).

Knowing that cognitive growth and brain growth are resilient, providing a rich and rewarding learning environment and not imposing the knowledge, methods and content inconsistent with the appropriate age level for comprehension. "Intelligent activity is distinguished from aimless activity by the fact that it involves selection of means - analysis - out of the variety of conditions that are present, and their arrangement - synthesis - to reach an intended aim of purpose" (Dewey, 1938, p. 84).

How then has the research been applied to the classroom? The new view of learning draws upon various research done in cognitive neuroscience, cognitive psychology, brain research, and artificial intelligence. According to Lowery (1998), the new view of education is expressed simply in terms of:

- Learners construct understanding for themselves.
- To understand is to know relationships
- Knowing relationships depends on having prior knowledge. (p. 26)

Learning is more than teachers lecturing and students sitting at their desks taking notes. The process is such that learners are involved in the activity and interacting with their environment. This interaction is important as learners store components of the images they are learning and in various places. Items that are similar are stored together. There is storage space for shapes, color, movement, sequence, and textures, for example. The brain makes interwoven connections and stores items in clusters. The critical factor
is the quality of the connection and how well the brain organizes and stores the relationships between and among the events' various aspects. Prior knowledge is used to interpret new material and "wherever bits of information are isolated from these systems, they are forgotten and they become inaccessible to memory" (Cowley & Underwood, 1998 in Lowery, 1998, p. 27).

"Constructions in a student's brain depend on the interest and prior knowledge of the student and on the richness of the environment" (Lowery, 1998, p. 27). Having students explore, touch, manipulate, test theories, all help to reconstruct the students' learning and bring meaning to the learning. Written text are symbols with no reality in the brain's mind's-eye, while symbols that have been connected to experience have meaning. A quick test of that concept would be the advertising that is done to help people associate symbols with reality. When someone asks, "Did you BK today?" thoughts of going to a Burger King and eating a charbroiled hamburger flash in your mind (assuming you have experience there). If a student is shown a big yellow M, they would relate it to "McDonalds." So our new knowledge is learned by rearranging prior knowledge with new connections.

To further enhance conceptual growth, the National Science Foundation has been funding programs that are multisensory, laboratory-oriented, with the knowledge that these projects promote inquiry and activate many areas of the brain. Samples of the programs are: Full Option Science System (FOSS), Science and Technology for Children (STC), Math in Context, and Science Education for Public Understanding Program (SEPUP) (Lowery, 1998, p. 27). The concept behind these programs is constructivist, such that the learners link new knowledge with knowledge already constructed.
The new curriculum approach of linking the old with the new includes concepts like "rehearsal teaching." The concept involves reinforcing what has been learned. The rehearsal provides knowledge construction and reinforcement thereby making the concept permanent. The next step is to add something new to the equation so the brain can use the prior knowledge to assimilate the new knowledge, thereby making a connection of the old with the new. An example of this is an activity taken from Full Option Science System (FOSS) Balance and Motion module for grades one and two. The first step is for students to balance a cardboard cutout figure on its edge at the tip of the student's finger. The next challenge is to find other ways to balance the cardboard figure, including in-between locations. The balancing and rebalancing of the figure reinforces the students' prior knowledge of what they learned with a new challenge that is slightly different. An additional challenge is added to find other relations that can develop. Next, mass is added to the cardboard cutout to see how the balance point changes. The rehearsal is students doing "something again in a similar but not identical way to reinforce what they have learned while adding something new" (Lowery, 1998, p. 28).

This notion of rehearsal is different from practice. Practice is repetition of a task to improve the performance of the task. When playing an instrument, the musician will practice scales to improve his/her performance. The practice will involve slowing and correctly playing the scale. The concept for developing speed and proficiency for scales is to "practice slow to get fast." In essence, slow and methodical practice will reinforce proper position and develop muscle memory. Eventually, the practice speed will be increased to the desired level.

Rehearsal, on the other hand, endeavors to promote learning by allowing the brain
to recognize that the task that is being learned is not task-specific, but transferable and can be used in a variety of ways, other than only in one particular way. The rehearsals will strengthen the connections among and between the various storage areas. "If connections are not strengthened, they will disengage and fade away. Thus the adage, "Use it or lose it" (Diamond & Hopson, 1998, in Lowery, 1998, p. 29). To continue with our balancing example, the next logical step is to change the shapes of the figures being used.

Absent the articulation of the child's experiences or the connections of the subject matter, "the curriculum is a pseudo-curriculum, an eclectic collection of activities with weak, if any, linkages and no long-range goals or purpose" (Lowery, 1998, p. 29). This lack of integration is what Dewey refers to as the problem of securing "the unity of the whole" as stated in School and Society (1899).

Brain research conducted by Sousa focused on long-term retention and how children learn. Dewey expressed his views of tying in the school and society and the child and the curriculum. He also stressed the practicality and applicability of learning so that the students will see the relatedness of what they are learning and how it can be applied. "If the environment is not designed, then the learning will occur by chance," according to Dewey. "And, any environment is a chance environment so far as its educative influence is concerned unless it has been deliberately regulated with reference to its educative effect (Dewey, 1916, p. 19). Lowery (1998) reports that the new curriculum supported by the National Science Foundation is not intended to "speed up" the student's development or "move down" advanced concepts. Rather, the intent is to make what the student is capable of learning more useful, effective, relevant, and
interesting and to enable the student to progressively build, from grade level to grade level, an understanding of the grand ideas of a subject by relating subsequent knowledge to prior knowledge" (Lowery, 1998, p. 29). Why change has not occurred relative to the knowledge about how the brain works and how students construct knowledge is baffling.

In a paper presented at the annual meeting of the American Educational Research Association in San Francisco, California, April 18-22 1995 by Deoares Liston, the author postulated that

"all thinking is abstract, that educators should build upon the incessant natural desire for knowledge, that students be allowed to recognize patterns for themselves, instructors should contextualize information so as to provide multiple perspectives, and instructors should employ challenging but not overwhelming instructional and evaluation methods..." (1995, p. 13)

Research by DeBacker and Nelson (2000) showed that the "degree to which students and their teachers collaborate on the development of learning and performance goals is directly related to the characteristics of a learning environment" (Holloway, 2000, p. 85). If teachers emphasize learning strategies and student effort, the expectation is that the students would do well.

How can science teachers use brain-based techniques? According to Anderson and Stewart (1997), the techniques include:

- Encourage student autonomy, interaction, and leadership
- Allow student thinking to drive and alter lesson plans.
- Ask students to elaborate on their responses.
- Allow wait time when asking questions.
Encourage students to interact with one another and with their teachers.

Ask thoughtful, open-ended questions.

Encourage students to reflect on experiences and predict future outcomes.

Ask students to articulate their theories about concepts before the teacher presents his or her understanding of the concepts.

Look for students' alternative conceptions and design lessons to address any misconceptions. (Anderson & Stewart, 1997, in Holloway, 2000, p. 85-86)

The concept of teaching becomes more than the old stand-and-deliver model. The teachers will have to construct activities and experiences in an interactive environment. According to Caine, "the teacher has to learn how to elicit and then to facilitate learning based on student interest" (Caine in D'Arcangelo, 1998, p. 24).

The University of California medical school using PET scans to examine brain regions when people speak had done research regarding rote memorization. They concluded that "rote memorized verbal tasks require little thought or sophisticated cortical activity (e.g.: Do you want fries with that?)" (Bookheimer, et. al. 2000, in Nunley, & Van Tassell, 2002, p. 2). Therefore, lesson design and delivery is more than just lecture followed by students reciting what they heard. There needs to be engagement on the students' part and the activity should use a variety of senses.

A study out of Germany revealed that patients who had brain damage on their right hemisphere had difficulty finding the center of a horizontal line but no difficulty in finding the center of a square. To try to determine how this could occur, an MRI was used. The MRI determined that the right cortex was used to determine the center of a line while both hemispheres of the brain were used to find the center of a square. They
realized that the more "object-like gestalt," the greater the brain regions needed for interpretation. The moral of the study: Use manipulative and diagrams whenever possible for simple abstract concepts and to involve more of the brain" (Fink, 2000, in Nunley & Van Tassell, G. 2002, p. 10).

In short, prior learning, environment, peers, life experiences are influenced in how we learn. Eric Jensen, staff developer and author of numerous books, followed a student for a day in school from the perspective of her brain ("How Julie's Brain Learns") and concluded that three things were necessary for student success: One, provide an outlet for emotional expression; two, reconnect learners with one another; and three, help learners reconnect with the content (Jensen, 1998, p. 42).

This study will use the research by Dewey on inquiry discovery as held up against new research on how the brain learns to determine how to design effective lessons.
CHAPTER III

Methodology

This study is based on a theory that lesson design that incorporates Dewey’s mode of inquiry discovery and Sousa’s research findings on how the brain learns has implications for retention and long-term learning. The methodology will start with a listing of the essential elements of lesson design. The lesson design model to be used is Sousa’s model that he has taken as part from Madeline Hunter's clinical supervision model - Instructional Theory Into Practice.

Hunter’s model, also known as A Clinical Theory of Instruction, ITIP, Mastery Teaching, PET, Clinical Teaching, Target Teaching, or the UCLA Model, “identifies the decisions all teachers must make regardless of content, age or ethnicity of the learner, style of teacher or mode of teaching (direct, indirect, discovery, lecture, cooperative learning)” (Hunter, 1979, p. 3).

Educators at all levels can confidently use Hunter’s lesson design model based on strong supportive research as to its effectiveness. Hunter’s model was validated in Project Linkage, used in Los Angeles inner-city schools. The California State Department of Education, and Effective Schools Research also validated the model (Lezotte, 1990). The significance of Hunter’s model is that it does not apply to one way of teaching. The model is appropriate for all teachers and under a variety of circumstances. The applicability of the model is not only for elementary education but “equally effective in secondary and university teaching” (Hunter, 1979, p. 4). Hence, Sousa stated that the “model of lesson components that evolve from Madeline Hunter’s (1982) work at UCLA since 1970s continues to serve that purpose” (Sousa, 2001, p.276).
Lessons designed using Sousa's model include essential elements. They begin with an objective, use an anticipatory set to motivate the class, follow with instruction, active participation, and closure.

Because the concept of lesson design can be applied to any philosophy or educational theory, a quick review of Dewey's educational philosophy and Sousa's brain research findings reveals that each has a controlling aim, a curriculum design and/or lesson design to be used to accomplish the aim (or objective), a methodology to employ, and the perceived role of the learner. For example, Dewey's experimentalist philosophy had as its controlling aim, according to Tanner and Tanner (1980), "reflective thinking for social problems; democratic citizenship, and growth" (p. 104). In order to meet those aims, the curriculum must be integrated such that problem-focused studies using collaborative activities would be required. Regardless of the activities that are planned, the lesson design could incorporate components of Sousa's model. Having a lesson developed within the Sousa framework does not, of itself, ensure that students will retain what is taught. It will only ensure that the lesson is based on brain research. The model also helps the educator design lessons that ensure long-term retention. The goal of the lesson is for long-term retention so the material is learned and can be applied in a larger macrocosmic setting.

Data Sources

The selection of data sources illustrating John Dewey’s philosophy and/or assumptions underlying his mode of inquiry-discovery includes works of Dr. Dewey. The selected references will include The Child and the Curriculum and The School and Society (1902), Democracy and Education (1916), Education Today (1940), Experience
and Education (1938), How We Think (1933), My Pedagogic Creed (1897), Schools of Tomorrow (1912), and The Educational Situation (1969). Additionally, other educators have included in their works the reflective thinking process of Dewey’s inquiry discovery, such as Colonel Francis Parker (1894), William Kilpatrick (1928), and Abraham Flexner (1923). Furthermore, curriculum used in their schools or in other schools, such as the Horace Mann School, Speyer School, Lincoln School, and various laboratory schools, will be used as data sources for program assessment.

Dr. Sousa’s brain-based research provides a framework for investigation relative to brain research in the classroom. He has conducted hundreds of workshops on brain research, made presentations at national conventions, and served as a consultant in science and staff development to the New Jersey Department of Education, regional and local school districts across the country and Canada. He was president of the National Staff Development Council in 1992 and manuscript reviewer for the Journal of Staff Development. His textbook, How the Brain Learns: A Classroom Teacher's Guide (2001), and other sources, including information from workshop presentations or videotapes, will be referenced.

Madeline Hunter’s lesson design that Sousa used in his model will include her text, Mastering, Coaching and Supervision, a text that is part of the Principles of Learning Series, as well as other publications, i.e. Mastery Teaching, Retention Theory for Teachers, Improving Instruction, Enhancing Reflective Teaching Through "Walk Through" Observations and Collaborative Conferencing. Additionally, various articles from workshops and conferences will be consulted.
Content Analysis

The focus of the methodology will be content analysis. Rigorous data collection will be used so that a triangulation of data can be employed. Textbooks written by the key theorists (Dewey, Sousa, Hunter) will be reviewed. Programs that applied the authors' theories will be examined. Schools where the Deweyan concepts were applied will be referenced in the analysis. Workshop material from Sousa and Hunter will be used for resources.

The framework for the study is outlined in Chapter 1. The methodology will be illustrated via grids that will be used as an overlay in interpreting and analyzing the data. The procedure for conducting the content analysis will be:

1. Selection of a qualitative research question that begins with "what" or "how." The question will include a description of what to expect.
2. The study will explore theories of Dewey and Sousa. Their writings and quantitative data will be used.
3. A detailed approach of the various theorists will be involved in the analysis.
4. The study considered the natural setting (the classroom) and the writings of various authors.
5. Any qualitative data available will also be used in the analysis.

The starting point is Dewey's theories and Sousa's application of brain research into lesson design. Each model will be assessed to see how there can be a convergence of each into lesson design. The design incorporated identifying data that clarified each point
of view. In the analytical focus, a matrix will be used to assess congruence and divergence. From the analysis, conclusions will be drawn.

Analytical Focus

Chapter IV will use a table to analyze Dewey and Sousa for question one and two. Question three will list similarities. Question four will look at Sousa's research for long term retention which involves the use of sense and meaning which includes anticipatory set, learning objective, and purpose. Question five will analyze the charts to determine what components of brain research are supported by Dewey.

The following cross-break charts (Table 1 and Table 2) will illustrate the educators, data sources, and analytical focus. A chart will be completed for Dewey and Sousa.

Table 1

Researcher: John Dewey

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| Aiken, Wilford, M., *Adventure In American Education, Volume I, The Story of the Eight Year Study* (1942) | This book offers analysis of the components of Dewey's inquiry discovery that were incorporated into a design study involving 30 schools over a period of eight years. "The study assessed curriculum employed in selected schools that were willing to experiment in a progressive...
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<td>\textit{direction} (Tanner &amp; Tanner, 1980, p. 365).</td>
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<td></td>
<td>Ralph Taylor was in charge of the educational evaluation of the project. The methods employed were tests, questionnaires, interviews for the purpose of assessing and appraising the performance of the students (Those students who were using &quot;experimental&quot; Deweyan concepts in their schools). There were 1,475 matched pairs used to assess the control and experimental groups.</td>
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Baker, Melvin C. \textit{Foundation of John Dewey's Dewey's Educational Theory} (1955) | \textit{Foundation of John Dewey's Educational Theory} will be helpful because lesson construction will be analyzed that incorporated Dewey's educational theories as opposed to the traditional models that were employed, i.e. daily programs, how and what lesson should include, subject matter, guided |
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<tr>
<td>Dewey, <em>Child and Curriculum</em> (1902)</td>
<td>This text analyzes Dewey's notion of how to construct subject matter that is fluid, embryonic, vital, and has sense and meaning for the child. This text will be used to determine if Dewey's mode of inquiry discovery is compatible with components of effective lesson design. The child and the curriculum are critical factors in lesson design. How, and what aspects of child development are to be integrated into the curriculum? How will the lesson make sense to the child? How will the curriculum be developed with respect to learning objectives, purpose, input, guided practice, and independent practice? How will activities be incorporated to meet the objective and</td>
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<td>Dewey, <em>School and Society</em> (1899)</td>
<td>other critical elements of lesson design: emotion (feeling tone), meaning, practice, and vividness. All of the previous principles of learning are used in the instructional model design for Hunter. Are there counterparts in Dewey?</td>
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How will the experiences the child has outside the school's classroom be incorporated into lesson design? The answer will be extracted from this text. The essence of Dewey's work is to draw the experiences from the student's frame of reference to make sense of what the child is learning. Also, examination will be made as to how Dewey gives "meaning" to the lesson's objective. An evaluation will be made of how lessons are designed to ensure that the activities are congruent with the objective. Exploration will be made as to how to use
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<td>Dewey, <em>Experience and Education</em> (1938)</td>
<td>Are all experiences that the child has genuinely and/or equally educative? Can some of the student's experiences be mis-educative? Dewey's text will answer these questions so that, when developing lessons, a framework can be considered for what experiences are educative. Dewey's text will address the notion of distinguishing intelligent activity from aimless activity, as well as the concept of &quot;freedom of intelligence.&quot; The selection of means - analysis - out of the various opportunities and conditions that are present plus their arrangement - synthesis - for a desired</td>
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<td>Dewey, <em>Democracy and Education</em> (1916)</td>
<td>Whether we permit chance environments to do the work, or whether we design environments for a purpose will make a &quot;great difference&quot; according to Dewey. How and why one merges the present with future learning is what Dewey addresses in this text. The essence of knowledge for educative reasons is to provide a balance between &quot;informal and formal,&quot; the &quot;incidental and intentional.&quot; Otherwise, Dewey warns that without this integration, knowledge may be passed directly from one to another by the false notion that &quot;all we have to do to convey an idea into the mind of another is to convey a sound in his ear&quot; (p. 4). Lesson design should therefore involve planning and selection of an objective at the correct level of difficulty for the student and presented in such a way that</td>
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<td>Rousseau, <em>Emile on Education</em> (1911) as found in Dewey, <em>Schools of Tomorrow</em> (1915)</td>
<td>Rousseau said as well as did many foolish things, but his insistence that education be based upon the native capabilities of those to be taught and upon the need of studying children in order to discover what these native powers are sounded the keynote of all modern efforts for education, according to Dewey. Translating that connection of the child’s interest into lesson design for meaning is critical. Relative to lesson design, this aspect is called “task analysis” whereby the objective is selected, clarified, and identified so that instructional activities can be designed to meet the objective. (Sousa: selection of objective and teaching to the objective – essential elements of instruction.) How does Dewey’s theory integrate with Sousa?</td>
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<td>Rugg, Harold. <em>Curriculum Making and the Scientific Study of Education Since 1910</em> (1926)</td>
<td>The curriculum of Dewey’s laboratory school, Horace Mann School, and the Speyer School, according to Rugg were consistent with Dewey’s philosophy. These curricula will be examined as representative of Dewey’s ideas along with the philosophy of Colonel Francis Parker.</td>
</tr>
<tr>
<td>Parker, Francis, <em>Talks on Pedagogics</em> (1894) and <em>How to Study Geography</em> (1889); Osborne, Raymond, <em>Francis W. Parker School</em> (1935)</td>
<td>Parker’s theories were harmonious with Dewey’s thinking, and the curriculum of the Parker School will be analyzed in determining lesson design. Parker’s school and Dewey’s Laboratory School merged under Dewey’s leadership in 1904.</td>
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<td>Cooke, Flora, <em>The Twenty-Sixth Yearbook of the National Society for the Study of Education</em> (1926)</td>
<td>The fundamental considerations underlying the curriculum of the Francis W. Parker School were written in <em>The Twenty-Sixth Yearbook of the National Society for the Study of Education</em> and</td>
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<tr>
<td>Pearson, Henry, <em>The Techniques of Curriculum Construction in the Horace Mann School Yearbook</em> of the National Society for the Study of Education, 29 (1926)</td>
<td>The curriculum of the Horace Mann School will be analyzed for its application to lesson design since that school practiced the Deweyan concepts.</td>
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<tr>
<td>Flexner, Abraham, <em>A Modern College and A Modern School</em> (1923)</td>
<td>Abraham Flexner's Modern School curriculum incorporated Dewey's ideas into its lesson design. Analysis will be made of the various curriculum activities and how they were developed into the overall curriculum. Sousa's model of lesson design will provide a framework for application of Dewey's ideas and a practical application of Dewey's theories.</td>
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<tr>
<td>Lincoln School Staff, <em>Curriculum Making in an Elementary School</em> (1927)</td>
<td>The curriculum design, activities, and programs of the Lincoln School, a school that incorporated Dewey's ideas, will be used for lesson design data analysis. Dewey's beliefs will give insight into what he saw as necessary for educational principles and practices.</td>
</tr>
<tr>
<td>Dewey, <em>Educational Situation</em> (1969)</td>
<td>Knowing the purpose for learning builds interest and establishes meaning. The value of &quot;what is contained in the textbook is brought home to the child&quot; (p. 33) by the teacher. How the teacher incorporates purpose will be analyzed from the data in this text.</td>
</tr>
<tr>
<td>Bonser, Frederick A., <em>Curriculum Making in Laboratory or Experimental Schools</em> (1925)</td>
<td>Frederick Bonser was principal of the Speyer School from 1910 to 1913 during which the school was identified as a school consistent with Dewey's beliefs. (Rugg, Twenty-Sixth NSSE Yearbook). The curriculum of the school was</td>
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<tr>
<td>Rugg, H. (Ed.) (1926) <em>The Twenty-Sixth Yearbook, NSSE Part I Curriculum</em></td>
<td>Flora J. Cooke, Principal, and Raymond W. Osborne, Assistant Principal of the Francis W. Parker School in Chicago wrote chapter XIX of this yearbook. They have implemented Parker's and Dewey's theories in their school. The curriculum will be analyzed relative to planning and design.</td>
</tr>
<tr>
<td><em>Making: Past and Present</em></td>
<td></td>
</tr>
<tr>
<td>McMurry, Charles, <em>The National Herbart Society Yearbooks, 1-5 1895-1899</em></td>
<td>The papers of the first yearbook of the Herbart Society for the Scientific Study of Teaching address the issue of &quot;What shall the public school teach?&quot; The other question posed was how should the subject matter be taught. The Herburts sought to answer the question of whether</td>
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<td>to use Parker's new theories of concentration (integration of subjects) or the traditional “mental discipline as the basis of selection.” Parker’s, and later, Dewey’s theory of integration were discussed in this yearbook.</td>
</tr>
</tbody>
</table>

Table 2.
Researcher: David Sousa

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Focus</th>
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</thead>
</table>
| Sousa, D., *How the Brain Learns: A Classroom Teacher's Guide* (2001) | Dr. Sousa has written many articles relative to brain research. His text is written for the classroom teacher to use. He provides teachers with a matrix composed of the components of a lesson. His lesson components are consistent with Hunter’s model for lesson design (*Instructional Skills: The Essential Elements of Instruction*) but expanded. Hunter has the principles of learning broken into four aspects – focus, rate and degree, transfer,
<table>
<thead>
<tr>
<th>Data Source</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sousa, <em>How the Special Needs Brain Learns</em> (2001)</td>
<td>A companion text to Sousa's Classroom Guide for Teachers is the text that deals with students who have special needs.</td>
</tr>
<tr>
<td>Brain research</td>
<td>The various articles written about brain research will be used to gather information relative to how brain research can be applied to the classroom. Extensive research has been conducted regarding the lesson design format that is known as the &quot;Hunter Model,&quot; Clinical Supervision model, ITIP (Instructional Theory Into Practice), the &quot;UCLA Model.&quot; The format developed by Hunter was used as a framework for Sousa's lesson design model since it is research based.</td>
</tr>
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</table>
CHAPTER IV

Analysis

Introduction

Does the new brain research provide teachers with data useful for lesson design that can be used to increase the success of students? The answer may be found in the research results that show how the brain learns. When an interviewer asked Geoffrey Caine, author of several books interpreting brain research and its influence on education reform if it is "not true that educators could profit personally and professionally by having a broader understanding of what makes us who we are and how we can interact more effectively with others," Caine responded, "absolutely… complex learning is enhanced by challenge and inhibited by threat" (D'Arcangelo, 1998, p.25).

In the article titled "What Do We Know from Brain Research," Wolfe and Brandt (1998) state that the classroom environment is an "enriched environment which gives students the opportunity to make sense out of what they are learning, what some might call the opportunity to 'make meaning' " (p.11). The authors claim that brain research validates what good educators have always done, and list four findings.

♦ The environment in which a brain operates determines to a large degree the functioning ability of that brain.

♦ IQ is not fixed at birth.

♦ Some abilities are acquired more easily during certain sensitive periods, or windows of opportunity.

♦ Learning is strongly influenced by emotion.
The researchers contend that the Decade of the Brain should lead to an enlightened Decade of Education. "Along with cognitive research and the knowledge base we already have, findings from neuroscience can provide us with important insights into how children learn" (Wolfe & Brandt, 1998, p.13).

Fogarty (1998) listed such educational visionaries as Dewey, Piaget, Vygotsky, Feurstein, Gardner, and Diamond who designed their theories "with the brain in mind" (p.78). Unfortunately, these educational visionaries don't have the technology that we have today that can illuminate the credibility of their theories.

According to Fogarty (1998), Dewey designed educational programs "that embedded learning in experience" (p. 76). He advocated field studies, life experiences, civic projects, and the stimulation of learning through experiences (p. 76). In Schools of Tomorrow (1915), Dewey advanced the probability that the greatest and most common mistake we make is to forget that learning is a necessary incident of dealing with real situations (p. 4). He, therefore, constructed the curriculum with student experience and active participation in mind. Education is more than making the subject matter isolated and fragmented.

According to Dewey, it is imperative that every energy should be bent to making the present experience as rich and significant as possible. Dewey (1958) stated that experience "lives in further experiences" which he called the "experimental continuum." Every attempt was made to discriminate between experiences that were "worthwhile educationally and those that are not" (Dewey, 1938, p. 33). Clearly, the focus of the teacher was to plan activities and lessons that provide a beneficial transfer to subsequent learning. Dewey's philosophy is consistent with Sousa's brain research finding which
claims that any person who has learned anything to the point where it becomes meaningful "always had some real world experience in which the skill or idea was embedded" (Sousa, 1998, p. 11). The term Sousa used was "orchestrated immersion" (p. 11) as it involves making authentic experiences for the students.

How does the brain research espoused by Sousa get applied to education? According to Astington (1998), "research shows that students who talk about how they and others think become better learners." In essence, "the new work in children's theory of mind shifts the focus into the ways children themselves think about thinking" (Astington, 1998, p. 46).

The new brain research is, therefore, concerned about new ways of thinking and how children make connections to learn. Education will involve teaching children to "assess their knowledge state" and "to find out things for themselves and how to evaluate conflicting sources of information" (Astington, 1998, p. 48).

Therefore, what aspects of Dewey's mode of inquiry discovery and Sousa's brain-based research can be used in curriculum design? This chapter will analyze the data presented in the review of the literature, using the questions posed in the methodology as a framework.

Research Questions

Question #1: What are the basic philosophical principles and/or assumptions underlying Dewey's mode of inquiry discovery as it relates to designing curriculum?
For Dewey, planning curriculum as it relates to lesson design, involved an organic connection between the child and the curriculum. In *The Child and the Curriculum* (1902), Dewey defined instruction as a process that involved, on one end of the continuum the child's experiences which he labeled as "fluent, embryonic, and vital," and the curriculum as something as "not fixed and ready made in itself," the two limits defined the single process (p. 11).

Keeping Dewey's continuum concept in mind, curriculum construction is an integrated process, and should not be developed to isolate the various disciplines. Even Jerome Bruner (1970), who proclaimed in *The Process of Education*, which emphasized a knowledge production model of inquiry discovery, had to revise his thinking about subject matter isolation. He changed to the Deweyan concept of integration when, 10 years after the publication of *The Process of Education* he said:

I believe I would be quite satisfied to declare, if not a moratorium, then something of a de-emphasis on the matters that have to do with the structure of history, the structure of physics, the nature of mathematical consistency, and deal with curriculum rather in the context of the problems that faces us. We might better concern ourselves with how those problems can be solved, not just by practical action, but by putting knowledge, wherever we find it and in whatever form we find it, to work in these massive tasks. We might put vocation and intention back into the process of education, much more formally than we had it there before (Bruner, 1971, p. 29).
The days of mastering facts or collecting data for the sake of retaining the information for a test (short-term memory) are long gone. The recognized expert who linked the democratic social process within an educational framework was Dewey. The text that forged the social process of democracy with the educational practice of democracy was *Democracy and Education* (1916). This book, "more than any other, established Dewey as an authority in many departments and colleges of education, sometimes as infallible authority" (Lilge, 1960, p. 352).

Dewey's admonition about presenting subject matter as a substitute for, or external to the child's life resulted in a lack of "organic connection" with the material as an entity that was purely symbolic. Instead, Dewey proposed that the primary responsibility of educators was knowing what is necessary when constructing student experiences. Educators should recognize what conditions "are conducive to having experiences that lead to growth." It is important for educators to "know how to utilize the surrounding," both the physical and the social, that exist so as to pull from those experiences what is valuable which will "contribute to building up experiences that are worthwhile" (Dewey, 1938, p. 40). Subject matter, therefore, is not as critical a factor as is the environmental conditions that allow for an interactive between the learner, his/her needs, desires, experiences, and purpose. If one assumes the opposite, then the subject matter guides the curriculum over the child's interest.

Certainly the results of the Eight Year Study conducted in the 1930s certified an interdisciplinary approach as students who participated in the study were able to do at least as well, and often better, on measures of school achievement when the curriculum was integrated (Aikin, 1942, p. 16). Dewey detractors had to rethink their stance
regarding curriculum integration after the Eight Year Study findings were released. In Dewey's mind, planning, developing, and designing curriculum was based on integration, not isolation of subject matter.

The significance in Dewey's philosophy is that there was insistence upon tying in new knowledge with past knowledge. Experience had an immediate aspect of "agreeableness" or "disagreeableness" and "its influence upon later experiences." "Agreeableness" or "disagreeableness" might also be categorized as "acceptance" or "rejection." If planning lessons and developing curriculum it to be useful, one would argue that the lessons should be retained or stored in long-term memory, and would be most useful if it had application (or influence upon later experiences), as Dewey (1938) wrote in *Experience and Education* (p. 27).

The notion that the subject matter per se is "educative" or "conducive to growth" is a fallacy, according to Dewey. He stated emphatically "there is no subject that is in and of itself or without regard to the state of growth attained by the learner, such that inherent educational value can be attributed to it" (Dewey, 1938, p. 44). Consequently, Dewey's planning was organic, connected, and integrated. Knowledge was seen as a tool that could be used and applied. Dewey (1902) wrote "the easy thing is to seize upon something in the developed consciousness of the adult, and insist that as the key, instead of seeing the whole of the connection." (p. 4). Using an either/or philosophy, educators would amend "what knowledge is of most worth," to "whose knowledge is of most worth - the math curriculum, the science curriculum, the English curriculum." Recognizing that a separate subject approach will set up an artificial paradigm that claims on's subject matter is of most worth. Integration, therefore, repositioned the separate disciplines into
themes, projects, and activities since everyday problems are usually complex and interrelated. In *Schools of Tomorrow* (1915), Dewey felt that the integration of subject matter with practical projects was "vital" and "the connection between the child and the environment as complete as possible" (1915, p. 231). Curriculum design and planning focused on the child and integration of the disciplines so as to have meaning for the child.

How were Dewey's assumptions applied in the classroom? In 1894, Dewey had the opportunity to apply his theories. The basic premise was to integrate learning in relation to its application to societal needs. His intention was to make the activities learned at school meaningful and applicable to real life situations. Dewey (1897) reasoned that it would be impossible to predict what the world would be like in 20 years (since the age of industrialization was beginning), but being able to prepare the child for the future meant developing the child's intellect and problem-solving ability through reflective thinking (p. 5).

As Dewey wrote to Maybew and Edwards (1936):

Because of the idea that human intelligence developed in connection with the needs and opportunities of action, the core of school activity was to be found in occupations rather than in what are conventionally termed studies. Study in the sense of inquiry and its outcome in gathering and retention of information was to be an outgrowth of the pursuit of certain continuing or consecutive occupational activities... Therefore, the first factor in bringing about the desired coordination of these occupations was the establishment of the school itself as a form of community life (p. 5).
According to Dewey, the school was "not a practice school, nor [in its] purpose what is now called a progressive school," but an experimental school (Mayhew & Edwards, 1936, p. 464). Dewey was quite clear in his assertion regarding the planning of the curriculum that the school was to be integrated with the larger community. In order to make sense of what they would be studying, and to have meaning for the pupils, there would be a connection of outside-world with school-world.

In Dewey's school, curriculum delivery differed from the traditional model. In a traditional school, self-contained classrooms were used so that pupils were in contact with basically one teacher each day who taught all the subjects. The pupils in Dewey's school worked in a social studies room half the day, went to an assembly room for music, prepared lunch in the kitchen, ate in the lunchroom, and participated in physical education and outdoor sports. The school operated with a longer school day, with fewer vacations.

The pupils were not placed in grades contingent upon age or passing of a previous grade. Grouping was based on interest and abilities that corresponded roughly to chronological age.

Time allotments were made carefully through experiments according to Baker (1955). The younger children attended school in the morning for approximately two and one-half to three hours. (This is basically the current time allotment of today's kindergarten.) The daily program consisted of classes from one-half hour to an hour and a half in duration. The time was determined by the activity, i.e., handwork or intellectual work, constructive work, or painting, sewing, etc. The traditional subjects were discontinued, and according to Meriam (1959), "living was the primary single objective"
with learning as a means to accomplish it. Meriam described other differences in Dewey's design as follows.

♦ Dewey's school encourages in each pupil his greatest achievement possible. Examinations are not formal tests. The pupil grows and passes from year to year, from grade to grade. But this rests upon the spirit of serious application.

♦ Discipline in Dewey's school is an exacting demand in that the system itself, not the office of a teacher, is in charge. Respectful attitude replaces disregard.

♦ Dewey's school provides wholesome play as an inherent portion of the program, not a recess for relaxation. Play for a young child is coordinated with work, one phase in natural development.

♦ In short, Dewey's school is one of wholesome living within the school regime in contrast to that of formal education of the traditional stamp. Dewey's school exemplifies his social philosophy: "Learning? Certainly, but living primarily" (Meriam, 1959, p. 30-31).

The Laboratory School was a place where freedom for investigation and the development of the child's life grew. It was "one which ministered constantly to the changing needs and interests of the growing child's experience" (Mayhew & Edwards, 1936, p. 20).

In Experience and Education (1938), Dewey stated how to design curriculum:

Finding the material for learning within experience is only the first step. The next step is the progressive development of what is already experienced into a fuller and richer and also more organized form (Dewey, 1938, p. 73).
According to Fox, for Dewey, "an independent realm of knowledge is inconceivable because there is no knowledge apart from the knowledge-getting process" (Fox, 1969, p. 69). Again, Dewey saw organized curriculum as an organic whole.

The significance of Dewey's theory is not that the definition of method be developed, nor for the extension of that method to the macrocosm outside the school, but according to Feinberg (1969), "the way he articulated his belief that the method would be used to enrich community and in his vision that it might very well be used otherwise" (p. 248). In short, the social and intellectual environment as well as the physical environment is furnished in the educational process of schooling the child.

The curriculum for the school has to answer the questions: What can be done; how can it be done; and how do we bridge the gap between the home and the neighborhood environment. Those questions needed to be answered in curriculum design. As Dewey states in School and Society (1899), the problem is to secure the unity of the whole and not to look at the school in isolation. From the child's standpoint, Dewey felt it was a waste for the school not to capitalize on the experience the child has and brings with him and not to be able to apply what he is learning in school to daily life.

As Dewey stated in Experience and Education (1938), not all experiences are equally educative, as "experience and education cannot be directly equated to each other" (p. 25). The intent of the school is to see how much can be given to the child regarding his environment and how first-hand experience can enable the child to grow and develop.

According to Dewey, the real course of study must come to the child from the teacher. In The Educational Situation (1969), Dewey writes:
What gets to the child is dependent upon what is in the mind and consciousness of the teachers, and upon the way it is in his mind. It is through the teacher that the value even of what is contained in the textbook is brought home to the child (p. 33).

Katz (1976) stated that the Deweyan model of thinking offers the "advantage of a concern for the practical implications of the problems it deals with and the results it achieves" (p. 164).

Dewey's assumption for curriculum planning focused on the child's interest and abilities as part of the process in lesson development. Children were encouraged to participate in the process by active involvement; and the curriculum activities and projects ceased to be external to the child - the school and society were linked.

Overall, schools that employed Dewey's concepts of integration of subject matter with experiences by using games, play, creative activities with the environment to stimulate cooperative action produced a more socially responsible citizen in a democratic society.

These concepts of integration were seen in such schools as the Horace Mann School (New York), the Beaver Country Day School (Massachusetts), City and Country School (New York), Frances Parker School (Chicago), Lincoln School (New York), University of Chicago Laboratory Schools, University of Iowa Elementary School, University of Missouri Elementary School, Walden School (New York), and the School of Organic Education (Atlanta) to name a few.

The significance of Dewey's mode of inquiry discovery was the fact that inquiry was guided and purposeful. Students who pursue inquiry discovery via projects lacking
in lesson design experience chaos. Unpurposeful activity or lack of guided practice
(stressed in Sousa's lesson design) leads to lack of skill development. In a visit to a
school that was not teacher directed, Samuel Tanenbaum (1939) noted that the projects
were "used by stupid teachers and supervisors, not as an outlet for the child's interest, but
as a mandatory task to show off and make the next-door teacher jealous." He went on to
say, "If medical practice applied current theory with the same stupidity and lack of
understanding, there would be a leap in the death rate" (p. 770).

To negate this view, Dewey's mode of inquiry discovery involved meaningful
experiences. At the Lincoln School (Columbia Teachers College) students sought to
study the transition of the early Industrial Revolution to the Power Age by looking at
basic American industries of coal and steel. The Alfred P. Sloan Foundation provided a
grant to the school for a visitation to the Consolidation Coal Company of Fairmont, West
Virginia. They followed that visit with a field trip to a mill at the Jones-Laughlin
Company in Aliquippa, Pennsylvania. The mines of Morgantown, West Virginia would
be part of their exploration, as well as discussion with officers of the United Mine
Workers. The concluding task was attendance at the National Bituminous Coal
Commission Conference and visitation to the United Mine Workers' headquarters.

Dewey's mode of inquiry discovery involved making sense of the concept of
studying the Industrial Revolution by actually visiting sites and talking to people. Parents
were pleased with the results as well as the maturity of their children when they got to see
the reality of what they were studying. They expressed "surprise and satisfaction" from
the field trips (p. 67).
The parents were correct in their assessment of pupil benefits. This was seen in the results of an “interpretation of data” test that was constructed using higher order thinking skills. The test consisted of graphs, tables, charts, diagrams, and so on, which required the students to analyze the data and draw conclusions. The group of students who had traveled was matched with a home group, and the results of the “interpretation of data” test revealed that:

The travel group exceeded by fifteen percent the general accuracy of the home group. … The travel group registered a gain in their ability to recognize the obviously true and false statements, while the home group slumped in this respect. … The travel group, after their return, tended less often to be “beyond the facts.” (Jones, 1940, p. 41)

Obviously, the travel group had a better understanding of the concepts when the inquiry discovery was tied to sense and meaning. More importantly, the travel group had a better understanding of the problem and social implications by first-hand experience. The travel group:

seemed more accurately to sense the relevance of the “evidence” to the conclusions; they were more able and more often to pick the critical assumptions upon which conclusions rested; and they demonstrated an increased ability to appraise the truth or falsity of the arguments. In addition to basing their influence more often on facts, the travel group likewise widened growth in the direction of being more able to detect critical assumptions upon which principles and generalizations rest, and to
sense the relationships between assumption and conclusion. (Jones, 1940, pp. 41-43)

Dewey's notion of designing the students' environment so it is "deliberately regulated with reference to its educative effect" is substantiated by the above reference (Dewey, 1916, p. 19).

In planning and developing lessons at the Laboratory School of Chicago, curriculum construction was carried out according to the following design:

1. The materials of the curriculum are selected according to definite objectives;
2. The materials are organized into pedagogical units according to psychological principles;
3. The curriculum is then tried under experimental conditions, i.e., the teaching and learning are observed, performance of pupils is measured, and the results are evaluated;
4. The materials are reorganized in the light of the classroom evidence and are submitted to experimental teaching and learning again;
5. The process of teaching, observing, testing and reorganizing is continued until satisfactory results are obtained. (Gillet & Reaves, 1926, p. 265)

Below, in Table 3 is a comparison of the basic philosophical principles and/or assumptions underlying Dewey's mode of inquiry & discovery as they relate to Sousa's view of curriculum design.
<table>
<thead>
<tr>
<th>Dewey</th>
<th>Sousa</th>
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<tbody>
<tr>
<td>1. Materials are selected according to</td>
<td>1. Selection of the objective at the correct</td>
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<tr>
<td>definite objectives. The organic</td>
<td>level of difficulty is the first step. The</td>
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<tr>
<td>connection of child and the curriculum</td>
<td>next step is teaching to the objective such</td>
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<tr>
<td>or themes based on projects,</td>
<td>that teacher actions lead the student</td>
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<tr>
<td>incorporating student experiences.</td>
<td>directly to the intended outcome.</td>
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<td>2. Materials are organized into</td>
<td>2. Sousa stresses teaching to the</td>
</tr>
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<td>pedagogical units according to</td>
<td>objective, requiring four teacher actions:</td>
</tr>
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<td>psychological principles.</td>
<td>- Provide information - organizing</td>
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<td>information and conducting explanations that are congruent with the</td>
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<td>selected learning.</td>
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<td>- Ask questions - plan and ask questions</td>
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<td>that will draw out information that will</td>
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<td>match the learning.</td>
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<td></td>
<td>- Respond to efforts of the learner - provide feedback to the student that</td>
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<td>indicates progress.</td>
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<td></td>
<td>- Design activities - plan activities to involve the student in the learning and</td>
</tr>
<tr>
<td>Dewey</td>
<td>Sousa</td>
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<tr>
<td>to provide an opportunity to practice the skill and process the information.</td>
<td>to provide an opportunity to practice the skill and process the information.</td>
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<tr>
<td>The teacher must design all four actions to be congruent with the selected objective.</td>
<td>The teacher must design all four actions to be congruent with the selected objective.</td>
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<tr>
<td>3. Monitor the learning and adjust the teaching are essential elements of instruction.</td>
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3. Curriculum is tried under experimental conditions, i.e., learning is observed, pupil performance is measured, results evaluated. Learning is observed. Performance is measured and the results are evaluated. The evaluation of the results is not an assessment test, as we know of it today, but through teacher observation, student performance is measured.

Sousa relies on Hunter's theory of checking for understanding. To practice without knowledge of results is a waste of time, according to Hunter. (Hunter, 1983, p. 68) Hunter suggests three different methods for checking for understanding - signaling, sampling, and choral responses.

Because there is a difference between knowing how something should be done and being able to do it, Hunter suggests guided practice through each phase of learning. As the student is guided through the practice, the student's learning is monitored and
Dewey

feedback given.

Again, Sousa looks to Hunter's model for direction. After the teacher checks for understanding, the teacher interprets behavior so as to proceed, practice, re-teach or quit. For assessment, ask "Is there constant monitoring of the degree of achievement of the objective so redundancy or acceleration can be built into the instructional process if either is indicated?" Hunter refers to the process of checking for understanding as "sticking," frequent checking to validate learning achievement before moving ahead as well as to avoid investing time on learning what has already been accomplished.

4. Materials are reorganized in the light of the classroom evidence and are submitted to experimental teaching and learning again.

Sousa answers that question by monitoring the learning (checking for understanding) and acting on the interpretation.

Sousa writes about positive transfer and uses Hunter's research. Hunter (1982)
Devey claims that “transfer” is one of the most powerful principles of learning (p. 107).
She defines it as the process of past learning influencing the acquisition of new learning.
To aid in the transfer, four factors in the learning situation are necessary: similarity, association (two events occurring together in time), degree of original learning (whatever is well learned will transfer into the future), and critical attributes (those attributes that differentiate one thing from another).

5. Satisfactory results are derived so students remember when five factors are incorporated into the teaching process. They are:
- **Meaning** - when material is meaningful, it not only is learned more rapidly but also is remembered longer.
- **Feeling tone** - One remembers those things with which pleasant and unpleasant feelings are associated.

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<th>Devey</th>
<th>Sousa</th>
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<td>claims that “transfer” is one of the most powerful principles of learning (p. 107). She defines it as the process of past learning influencing the acquisition of new learning. To aid in the transfer, four factors in the learning situation are necessary: similarity, association (two events occurring together in time), degree of original learning (whatever is well learned will transfer into the future), and critical attributes (those attributes that differentiate one thing from another). 5. Satisfactory results are derived so students remember when five factors are incorporated into the teaching process. They are:</td>
<td></td>
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<tr>
<td>5. The process of teaching, observing, testing, and reorganizing until satisfactory results are obtained.</td>
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Dewey

- Degree of original learning - use the principles of checking for understanding to ensure a firm foundation so learning is secure and not easily forgotten.

- Schedule of practice - two ways to promote practice - massed (many short, intense practice periods), and distributed - periodically reviewing material with longer and longer time intervals between reviews.

- Transfer - facilitate present learning for a springboard for future problem solving, decision-making, and creativity (Hunter, 1982, pp. 101-103).

Sousa

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Question #2: What are the basic philosophical principles and/or assumptions underlying Sousa's brain-based research as it relates to lesson design?

As of 2001, Dr. Sousa revised his text "How the Brain Learns." In the six years since his original text, technology has advanced to enable brain researchers to be more specific in how the brain learns.

Computerized tomography (CT, formerly called CAT) scanners enable researchers to map a cross section of the brain. By injecting radioactively tagged sugar,
The Positron-Emission Tomography (PET) can easily track the flow of blood into the brain. This is an indicator of brain activity. Pictures can then be produced for researchers to assess brain activity while the patient is engaged in a task. Blood flow can also be measured by functional Magnetic Resonance Imaging (fMRI). The fMRI machine is so advanced it can produce multiple images per second. The images generated from the fMRI can create a computer-generated movie enabling researchers to see what tasks trigger parts of the brain.

Another research tool is Magnetic Resonance Imaging (MRI) that sees radio waves to disrupt the atoms in the body's magnetic field, and then records the changes that occur. With the use of high technology, computers can record the signals and develop pictures.

The fMRI holds high promise for the researchers as it measures blood flow from outside the brain and does not require an injection of radioactive substances. All of these technologies have enabled researchers to be specific in "seeing" how the brain learns.

Knowing what part of the brain is activated when various tasks and functions are performed has allowed researchers the specificity for planning and developing lessons.

In planning the lesson, there are two questions that teachers should consider. One, how is the new learning to be presented and acquired, and two, how will the new information be retained? Learning, according to Sousa (2001), is "acquiring new knowledge and skills; memory is the process by which we retain the knowledge and skills for the future" (p. 78).
Sousa (2001) has developed an "information Processing Model" because "knowing how the human brain seems to process information and learn can help teachers plan lessons that students are more likely to understand and remember" (p. 38).

The critical factor for information to be stored for long-term retention is for the information to have sense and meaning.

According to Sousa (2001), within the concept of sense and meaning, of the two, "meaning" has greater importance for long-term retention. "Past experiences always influences new learning by acting as a filter by helping one attend to those bits of information that are relevant, hence have meaning, and discarding those that don't" (p. 49).

Planning and developing the lesson is critical. In Table 4, Sousa breaks down a lesson using Madeline Hunter's framework.

Table 4:

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipatory set</td>
<td>Use the anticipatory set to get the students' attention. Vary the approach that is used and, whenever possible, use humor.</td>
</tr>
<tr>
<td></td>
<td>• use positive transfer because it is necessary for acquisition of the new knowledge</td>
</tr>
<tr>
<td></td>
<td>• make use of prime-time 1 (the first 20 minutes of the lesson)</td>
</tr>
<tr>
<td></td>
<td>• ensure that the anticipatory set is tied to the learning objective</td>
</tr>
<tr>
<td>Element</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Learning objective</td>
<td>When planning a lesson, the objective is what will guide the teacher in designing activities to meet the specific objective. The learning objective will also provide a reminder to the teacher as to what the students are going to be expected to accomplish by the end of the period (or by the end of the unit). Sousa specifies two requirements for the learning objective:</td>
</tr>
<tr>
<td>Purpose</td>
<td>Oftentimes teachers, during the course of their instruction are confronted with the student who will ask:</td>
</tr>
</tbody>
</table>

- It should include a specific statement of the learning. (Sometimes teachers will abbreviate the objective by writing SWBAT for “students will be able to...” then define the behavior.)
- The overt behavior that demonstrates whether the learning has occurred and whether the appropriate level of complexity has been attained.
<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>&quot;Why do we have to learn this?&quot; In essence, the student is asking what is the purpose of the lesson. Purpose, according to Sousa, states why the student should accomplish the learning objective. In order to facilitate a positive transfer of knowledge, the student must see a connection with his/her prior learning so the link of the new learning with prior learning will lead to future transfer. Furthermore, once the link is made with prior knowledge, the student will understand the meaning of the new knowledge and connect it to long-term retention. This phase of the lesson planning and development involves determining what information and skills the students will need to acquire in order to address the learning objective and to accomplish it. Sousa (2001) suggests many different instructional deliveries for planning and developing this aspect of lesson design. A varied approach is the best vehicle as there will be a chance that all types of learning styles will be addressed so Sousa recommends audiovisual presentations, lecture, and cooperative learning groups. The audiovisual presentation will help the visual learners &quot;see&quot; what they will be learning. The lecture approach will meet the needs</td>
</tr>
<tr>
<td>Element</td>
<td>Description</td>
</tr>
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</tr>
</tbody>
</table>
| auditory learner. Sousa does, however, caution against devoting the entire period to lecture as only a small percentage of the lesson will be retained via lecture. Finally, cooperative activities will help students to share and provide for metacognition. Having students teach each other and immediately use what they are learning, according to Sousa, will have an average retention rate of 90% after 24 hours (p. 43)! On the other hand, he lists lecture as having a retention rate of 5% after 24 hours. To plan and teach a lesson in which only 5% will be retained after 24 hours is neither efficient nor effective. Sousa presents a learning pyramid in which he shows a percentage of the new learning that students will recall after 24 hours. At the top of the pyramid is the lecture method, a common technique. To double the retention rate to 10%, Sousa suggests reading. Audiovisual presentations will double the retention rate to 20%. Having a demonstration will increase retention rate to 30%. There is other brain research that deals with metacognition, or having students learn about learning by discussing the concepts, sharing their thoughts, and elaborating on responses (Halleway,
<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling</td>
<td>To ensure that three-quarters of the new material is retained, Sousa suggests practice by doing. Finally, at the base of the learning pyramid is teaching others/immediate use of learning which will yield a retention rate of 90% after 24 hours. Information that the brain determines is important is likely to be stored into long-term memory, and having students use new information and teach others, helps to establish meaning. Once meaning is established, importance follows. In order to plan and develop the lesson, the teacher needs to be mindful of how information will be preserved to the class. One way to present the data is to model. When a teacher models a lesson, it is important that the model provided to the class is very clear (and obviously, correct). In order to imprint the model for the student, Sousa has three requirements:  ♦ it must be accurate  ♦ unambiguous  ♦ non-controversial.</td>
</tr>
<tr>
<td>Check for understanding</td>
<td>How does the teacher know that what is being taught is being learned? Without assessing the students, there is no</td>
</tr>
<tr>
<td>Element</td>
<td>Description</td>
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</tr>
<tr>
<td></td>
<td>immediate way to determine if the students are meeting the lesson objective. What, therefore, is necessary is for the teacher to employ strategies throughout the lesson which will provide feedback to the teacher to verify if students are accomplishing the lesson objective.</td>
</tr>
</tbody>
</table>

This stage of the lesson plan should involve overt action so the teacher can make assessments relative to the data. The overt action can include oral discussion, think-pair-shares, choral responses, sampling, or signaling.

There are two phases to this aspect of the lesson that the teacher should acknowledge. The first phase is the actual checking for understanding. This phase provides information to the teacher that will be valuable. The next phase will be to act upon the information. What does the teacher do after information is received? There are four different approaches to take. If the students are meeting the objective, based on the feedback, the teacher can proceed. If the feedback shows that the students do not comprehend the material, reteaching may be in order. At this stage, the teacher can also provide practice activities for the students to help with reinforcement.
### Element Description

**Guided practice**

This aspect of the lesson has the teacher providing feedback (immediate in response, and specific in details) to the learner. As the learner applies the new learning, the teacher's role is important as practice doesn't make perfect but perfect practice makes perfect, according to Sousa.

**Closure**

This is the last opportunity the learner has to attach sense and meaning to the new learning. The learner is, therefore, asked to summarize what was learned. Closure can be overt or covert. The goal is for the student to do the speaking so the teacher can determine how the information was internalized.

Sousa distinguishes closure from review by explaining in the review process; the teacher does most of the work. Specifically, the teacher will restate key concepts that were explained throughout the lesson. The students will identify key learning points, or repeat aspects of the lesson they remember. Closure, on the other hand, refers to the students telling the teacher what they learned from the lesson. By the student mentally rehearsing and summarizing, the student attaches sense and meaning to the lesson. "Today, I learned X" is different from the teacher telling the student, "Today, you learned X."
<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Closure can occur during the lesson (Sousa calls this &quot;procedural closure&quot;), or at the end of the lesson (Sousa calls this &quot;terminal closure&quot; as it ties all the sub learning together). Practice of the new learning will help it become permanent. Students must try the new learning to help reinforce the concepts and the application, and use will make the new learning permanent. Practice over time will help increase retention. Sousa calls practice over time that is closely spaced as &quot;massed practice.&quot; His example is to rehearse a new telephone number by repeating it often. Over time, the number will fade from immediate memory to long-term memory as it is practiced and practiced. The practicing of the new telephone number over time will sustain meaning for the learner and then proceed to long-term learning.</td>
</tr>
</tbody>
</table>

Using the nine components listed above, Sousa then develops a lesson into a format that includes lesson component, purpose, and its relationship to research. The chart – Table 5 - below represents Sousa's concept of development of a lesson (Sousa, 2001, p. 279). He refers to Benjamin Bloom, Professor, University of Chicago, because of Bloom's expertise and work as published in *Taxonomy of Educational Objectives*.
(1956), publication used throughout the world to assist in the preparation of evaluation materials.

Table 5:

*Development of a lesson*

<table>
<thead>
<tr>
<th>LESSON COMPONENT</th>
<th>PURPOSE</th>
<th>RELATIONSHIP TO RESEARCH</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipatory Set</td>
<td>Focuses students on the learning objective</td>
<td>Establishes relevance and encourages positive transfer during first prime time.</td>
<td>Think of what we learned yesterday about prefixes and be prepared to discuss them.</td>
</tr>
<tr>
<td>Learning Objective</td>
<td>Identifies what learning outcomes are to be accomplished by end of lesson.</td>
<td>Students know what they should learn and how they will know they have learned it.</td>
<td>Today we will learn about suffixes.</td>
</tr>
<tr>
<td>Purpose</td>
<td>Explains why it is important to accomplish this objective.</td>
<td>Knowing the purpose for learning something builds interest and establishes meaning.</td>
<td>Learning about suffixes will help us understand more vocabulary and give us greater creativity in our writing.</td>
</tr>
<tr>
<td>LESSON COMPONENT</td>
<td>PURPOSE</td>
<td>RELATIONSHIP TO RESEARCH</td>
<td>EXAMPLE</td>
</tr>
<tr>
<td>------------------</td>
<td>---------</td>
<td>--------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Input</td>
<td>Gives students the information and skills they need to accomplish the objective.</td>
<td>Bloom's knowledge level. Helps identify critical attributes.</td>
<td>Suffixes are letters placed at the ends of words to change their meanings.</td>
</tr>
<tr>
<td>Modeling</td>
<td>Show the process or product of what students are learning.</td>
<td>Modeling enhances sense and meaning to help retention.</td>
<td>Examples are: -less, as in helpless; -able, as in drinkable; and -ful, as in doubtful.</td>
</tr>
<tr>
<td>Check for Understanding</td>
<td>Allows teacher to verify if students understand what they are learning.</td>
<td>Bloom's comprehension level.</td>
<td>John, tell me what you have learned so far about the meaning and use of suffixes.</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>Allows a student to try the new learning with teacher guidance.</td>
<td>Bloom's application level. Practice provides for fast learning.</td>
<td>Here is a list of 10 words. Add an appropriate suffix to each and explain their new meanings.</td>
</tr>
<tr>
<td>LESSON COMPONENT</td>
<td>PURPOSE</td>
<td>RELATIONSHIP TO RESEARCH</td>
<td>EXAMPLE</td>
</tr>
<tr>
<td>------------------</td>
<td>---------</td>
<td>--------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Closure</td>
<td>Allows students time to mentally summarize and internalize the new learning.</td>
<td>Last chance for attaching sense and meaning, thus improving retention.</td>
<td>I'll be quiet now while you think about the attributes and uses of suffixes.</td>
</tr>
<tr>
<td>Independent Practice</td>
<td>Students try new learning on their own to develop fluency.</td>
<td>This practice helps make the new learning permanent.</td>
<td>For homework add suffixes to the words on page 121 to change their meanings.</td>
</tr>
</tbody>
</table>

In developing a lesson, Sousa also has suggestions for educators. One suggestion is to develop "short" lessons. His premise of short lessons is based on the concept of the primary-recency effect in which Sousa claims "one tends to remember best that which comes first, and remember second best that which comes last. We tend to remember least that which comes just past the middle of the episode" (Sousa, 2000, p. 88). Although he notes this concept in his book *How the Brain Learns*, he attributes this concept to Ebbinghaus, who published studies relative to this effect as early as the 1880s!

In examining the research done by Ebbinghaus (1885), Sousa discovered that Ebbinghaus was the first to describe a shape of a learning curve relative to primary and recency (Ebbinghaus, 1885, pp. 5-15). "The fact that early and late items in a list are
more likely to be recalled than middle items" is an example of the primary-reency effect* (Sousa, 2001, p. 88). It was Ebbinghaus' work relative to the distribution of learning trial items over time and his research on primary/reency learning that led Sousa to conclude that the new information is stored in the working memory of the brain and stored there until rehearsed. Items in working memory (primary stage) are stored in working memory so as to allow for additional processing of the final item (recent) and need to be "rehearsed" (practiced) for long-term retention. The implication for learning is that new information should be taught first because it is most likely to be remembered. Practice or review should follow and "closures should take place during prime-time 2," usually the last ten minutes of a period, "since this is the second most powerful learning position and an important opportunity for the learner to determine sense and meaning" (Sousa, 2001, p. 89) Sousa even provides a chart for prime-time 1 (primary) and prime-time 2 (reency) for a twenty, forty, sixty, and eighty-minute lesson. The longer the lesson, the longer the down time between prime-time 1 and prime-time 2. Sousa translates the information by claiming that in a 20 minute lesson, down time is two minutes or 10% of the total time. For a forty-minute lesson, the down time is ten minutes or 25% of the total time. In an eighty-minute lesson, the down time is 30 minutes or 38% of the total time. The message - shorter is better!

Once the lesson is planned, designed and developed, how does that translate into Sousa's lesson design?

In designing lessons, one must start with selection of an objective. Once the objective is selected, there are four activities that are necessary and must be congruent
with the objective. They are: providing information, asking questions, designing activities, and responding to the efforts of the learner.

As the lesson is taught, the leaning is checked to determine if the students are retaining the information. This process is called checking for understanding. Based on the information that is received, the teacher will act upon the data.

Sousa incorporated the research done by Hunter (1982) that established the essential elements of instruction in a lesson model. There are four components of the principle:

- focus (anticipatory set, motivation, feeling tone, level of concern, interest, knowledge of results and success)
- rate and degree (active participation and closure)
- transfer (critical attributes, association, similarity, degree of original learning, and transfer)
- retention (vividness, practice, feeling tone, modeling, and meaning)

A comparison of Sousa's lesson design with Hunter's lesson design is depicted in the chart below, Table 6. This illustrates how Sousa incorporated Hunter's techniques, recognizing the validity of her research-based model.
<table>
<thead>
<tr>
<th>SOUSA'S LESSON COMPONENT</th>
<th>PURPOSE</th>
<th>HUNTER'S ESSENTIAL ELEMENTS</th>
<th>PURPOSE</th>
</tr>
</thead>
</table>
| Anticipatory Set         | Focuses students on the learning objective | Focus - Anticipatory Set | • Focus learners on the objective  
• Enhance meaning |
| Learning Objective       | Identifies learning outcomes to be accomplished by end of lesson. | Focus - Motivation | Maintain focus in order to satisfy a need |
| Purpose                  | Explains why it is important to accomplish this objective | Teach to the Objective | Teacher action leading student to intended objectives |
| Input                    | Gives students the information and skills they need to accomplish the objective. | Teach to the Objective | • Provide information  
• Ask questions  
• Respond to learner  
• Design activities |
<table>
<thead>
<tr>
<th>SOUSA'S LESSON COMPONENT</th>
<th>PURPOSE</th>
<th>HUNTER'S ESSENTIAL ELEMENTS</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling</td>
<td>Shows the process or product of what students are learning.</td>
<td>Retention Modeling</td>
<td>Showing/telling by demonstration, simulation</td>
</tr>
<tr>
<td>Check for Understanding</td>
<td>Allows a teacher to verify if students understand what they are learning.</td>
<td>Monitor the Learning</td>
<td>Elicit responses from learners; check for understanding.</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>Allows a student to try the new learning with teacher guidance.</td>
<td>Rate &amp; Degree; Active Participation</td>
<td>Help teacher to involve learner in congruent activities.</td>
</tr>
<tr>
<td>Closure</td>
<td>Allows students time to mentally summarize and internalize the new learning.</td>
<td>Rate/Degree; Closure</td>
<td>Learners process what they have learned.</td>
</tr>
<tr>
<td>Independent Practice</td>
<td>Students try new learning on their own to develop fluency.</td>
<td>Retention; Transfer</td>
<td>Past learning influences acquisition of new learning.</td>
</tr>
</tbody>
</table>
Question #3: In analyzing components of Dewey's inquiry discovery mode, and Sousa's brain-based research, what similarities and relationships exist?

Since Dewey's mode of inquiry discovery preceded the findings of brain researchers, what concepts and practices of Dewey are now validated by the research findings? Table 7 will illustrate a comparison.

Table 7:

<table>
<thead>
<tr>
<th>DEWEY</th>
<th>SOUSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Dewey Laboratory School curriculum design included a plan to develop a sequence of studies appropriate for several stages in the development of children. The first stage was from 4-8 1/2 years old which helped the child connect schoolwork with home and community. Stage II, ages 8-10, was viewed as the stage when more complex work increased. The third stage, 10-13, emphasized a shift to developing skills of investigation, reflection, and generalization. As the child progressed to the adult...</td>
<td>Windows of opportunity</td>
</tr>
</tbody>
</table>
Considerations: Dewey recognized that there were various stages for a child. He designed his laboratory school to accommodate the appropriate stages of development for children. Dewey proposed three stages in *How We Think* (1910). In the early childhood, the child has a curiosity that causes him or her to manipulate objects for the purpose of investigating them. The second stage involves social interaction and seeking more information. In the third stage, the learner seeks more remote relationships and, through reflective thinking, binds together observations and inquiries as a means to an end.

Dewey, like Piaget, believed that the educational implication was "not that the child's intellectual development will unfold of its own accord under any conditions but that appropriate environing conditions in the school and home must be provided in connection with each developmental stage" (Tanner & Tanner, 1980, p. 178). Dewey, therefore, acknowledged that there were stages of the child's development and opportunities for maximum educational development during these stages. A rich and rewarding environment would allow a student to make interconnections in the brain for learning to occur faster. He then asserts that the "windows" seem to be most pronounced between the ages of two and eleven.

Unlike Dewey who waited for the child to come to school in Stage I, Sousa implies that "we must recognize how important the early years (ages 2-4) are in helping children establish meaningful connections. The implication is for early childhood
Sousa felt that a foreign language instruction should begin in fourth grade. Schools that supported Dewey's ideas also had foreign language in elementary grades, but at a much later time - eighth grade.

Finally, Dewey was concerned with making the present experience as rich and significant as possible, then "as the present merges into the future, the future is taken care of" (Dewey, 1916, p. 56).

Table 8:

<table>
<thead>
<tr>
<th>DEWEY</th>
<th>SOUSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>In &quot;The Theory of Emotion&quot; in <em>Psychological Review</em> (1896), Dewey wrote &quot;emotion ... mode of behavior which is purposeful, or has an intellectual content, which also reflects itself into feelings or affects, as the subjective valuation of that which is objectively expressed in the idea or purpose&quot; (p. 15). He further claims that emotions are &quot;a mode of conduct, a way of behaving&quot; and &quot;always uppermost in consciousness&quot; (p. 17).</td>
<td>How a person feels about a learning situation determines the amount of attention devoted to it. (Sousa also cites Daniel Goleman's 1995 book, <em>Emotional Intelligence</em> as additional support for the influence of emotion.)</td>
</tr>
</tbody>
</table>
Considerations: Both Dewey and Sousa recognize the affect of emotions. Sousa’s perspectives on emotions focus on providing a physically safe and emotionally secure school and classroom. In reviewing the research of the Effective Schools, one of the seven correlates espoused by their findings is a "safe and orderly school environment" (Lezotte & Jacoby, 1990, p. 10).

In *A Guide to the School Improvement Process Based on Effective Schools Research*, Lezotte & Jacoby (1990) write, "In the effective school, there is an orderly, purposeful business-like atmosphere which is free from threat of physical harm. The school climate is not oppressive and is conducive to teaching and learning" (Lezotte & Jacoby, 1990, p. 147). The example that is given for this correlate is that if a school window is broken, the people responsible for an effective school will repair it quickly. A quick response sends a signal that the adults (administrators) care about the environment and want the students to know that they are maintaining a safe educational environment.

Sousa, however, in discussing emotions in the 21st century is talking about schools that deal with situations that involve students bringing guns to school and harming fellow students, as was the case with Columbine High School in Colorado. In Dewey’s time this was not an issue.

Dewey chose to describe the relationship between emotion and action in "The Reflex Arc Concept in Psychology" in 1896. In this article Dewey took exception to the common understanding that stimulus was separated from its response, and motor activity was something else again. Dewey contended that stimulus and response are connected as a circular act. He argued that viewing these different components as separate was a dualism that hampered effective education. "As a result, the reflex arc is not a
comprehensive, or organic unity, but a patchwork of disjointed parts" (Dewey, 1896, p. 358).

"The reflex arc theory, by neglecting, by abstracting from, this genesis and this function gives us one disjointed part of a process as if it were the whole" (Dewey, 1896, p. 370). Without the aid of modern technology, Dewey was able to conceptualize the connection between emotion and learning.

For Dewey, emotions were connected to attention and learning because he saw the process as a whole. Sousa stressed that schools needed to be safe and teachers need to be cognizant of the importance of emotional security. He contended that classroom climates are conducive to learning and encouraged teachers to reduce student fear or anxiety by:

- Supplying the question to which the wrong answer belongs, also called "redirecting": "You would be right if I had asked..."
- Giving the student a prompt that leads to the correct answer.
- Asking another student to help (Sousa, 2001, p. 61).

Sousa even suggests humor (not sarcasm) to enhance the classroom climate, as humor will get the students' attention, and increase retention. By enhancing positive feelings, the transfer of learning will be increased. Sousa contends that humor will reduce stress and consequently improve everyone's mental health.

Sousa specifically separates the emotional component of the educational process and causes its isolation to be examined and addressed. "More than ever, today's students are coming to school looking for emotional support" (Sousa, 2001, p. 65). He sees a
definite connection between emotions and learning, and isolates emotional behavior as an aspect of lesson design that must be addressed.

Table 9:

*The connection between new learning and past learning*

<table>
<thead>
<tr>
<th>DEWEY</th>
<th>SOUSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>The connection between new learning and past learning is so strong that three evils prevail when the subject matter is presented as a substitute for or an external annex to the child's life:</td>
<td>Making connections to past experiences. Past experiences will always influence new learning.</td>
</tr>
<tr>
<td>♦ The lack of any connection with what the child has seen makes the material formal and symbolic.</td>
<td></td>
</tr>
<tr>
<td>♦ Lack of motivation</td>
<td></td>
</tr>
<tr>
<td>♦ Inadequate development of the child's reasoning powers, specifically abstraction and generalization.</td>
<td></td>
</tr>
</tbody>
</table>

Dewey was emphatic that the subject matter should not be something fixed and outside the child's experience.

In the Elementary School of the University of Chicago, Dewey developed
his kindergarten in which the educative activities were "activities of children" and "not in the presentation and application of external material" (Dewey, 1915, p. 112).

<table>
<thead>
<tr>
<th>DEWEY</th>
<th>SOUSA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Considerations: Making connections to past experiences was a philosophical concept that Dewey and Sousa both agreed upon. The necessity to have the child tie in meaning by making the connection is what Dewey articulated. For him, the tying-in of past experiences involved a full integration of the child's experiences.

Dewey's Laboratory School (as well as the experimental work of the Quincy School under Parker's leadership, the Practice School in the Cook County Normal School, The Horace Mann Practice School, and the Speyer School) strove to illustrate the "reconstruction of education" (Rugg, 1926, p. 95). Dewey's laboratory school was oriented by children's "full spontaneous interests and intentions" and "school subjects, like reading, writing, and arithmetic should develop out of children's 'life' activities and methods of living and learning - not out of distinct studies" (Dewey, 1899, p. 11).

Dewey's beliefs resulted in essays (The School and Society, 1999, second edition of 1915 included The School and Social Progress, The School and Life of the Child, and Waste in Education, The Child and the Curriculum, 1902) that were read at meetings of the Parent-Teacher Association of the Laboratory School. The underlying theme, according to Dewey, was not "by trick of method" and "sugar coating," because "there is no such thing as sheer self-activity because all activity takes place in a medium, in a
situation, and with reference to conditions" (Dewey, 1902, p. 30). The child and the curriculum are united.

Table 10:

Sensory engagement in the lesson

<table>
<thead>
<tr>
<th>DEWEY</th>
<th>SOUSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Colonel Parker was wonderfully attracted to interest. He realized that a great step was being taken toward making the child a center instead of subordinating the child to subject matter. The fact that we are only starting even now on the idea of interest suggests how big the idea is and how difficult to practice. There was no problem in the curriculum to speak of until the doctrine of interest emphasized the need of selecting subject matter that would appeal to the child&quot; (Dewey, 1913 p. 7). &quot;It is, indeed a stupid error to suppose that arbitrary tasks must be imposed from without in order to furnish the factor of perplexity and difficulty that is the necessary cue to thought. Every vital</td>
<td>Sensory engagement during learning. The cognitive research reaffirms strongly that we learn best when we are actively involved in interesting and challenging situations and when we talk about the learning.</td>
</tr>
</tbody>
</table>
DEWEY
activity of any depth and range inevitably meets obstacles as the course of its efforts to realize itself - a fact that renders the search for artificial or external problems quite superfluous" (Dewey, 1939, p. 342).

Dewey stressed the value of active involvement of students, recognizing that the material presented must be interesting and challenging. He stated that "it calls attention, in the first place, to a fact which professional educators are always forgetting: what is learned in school is a relatively superficial part, and yet what is learned in school makes artificial distinctions in society and marks persons off from one another" (Dewey, 1915, p. 2).

| SOUSA |

Considerations: Dewey and Sousa both implied that student involvement was necessary for the learning process. Active involvement is more beneficial as opposed to passive. In
active involvement, students are engaged in the learning process. This process would not classify teacher lecture as "active" involvement.

Sousa developed a diagram that showed the average percentage of retention of material after 24 hours. Only 5 percent of information received by lecture was retained. Practice by doing and teaching others/immediate use of learning yielded 75 and 90 percent respectively in student retention.

When Dewey developed his laboratory school in Chicago, he ensured the organic connection between the child's world and the school world by including activities that were done at home into the school curriculum. The concept of education was to connect social interest and development with education. "What distinguishes the student's social labor in miniature from that of adult life is that it is carried on with no consideration of gain and therefore in full freedom of spirit," Dewey wrote in "Education from a Social Viewpoint." He wanted to separate "pure knowledge and pure activity so "the problem of professional education" becomes changed (Dewey, 1965, p. 82). Science, for example was not "the property of a few." What must occur is a radical "reconstruction of pedagogical principles" so "the dualism of earlier times" is no longer possible (Dewey, 1965, p. 92). Dewey reasoned that the integration of student interest in challenging activities would translate into the development of a social consciousness. "School knowledge would be seen to be significant in that it functioned in life" (Wirth, 1966, p. 94).

The desire to provide child interest, societal interest, and social education was simple, according to Dewey.
Formerly, in the area of professional education, it was thought that men should be brought up to become farmers, engineers, architects, carpenters, etc. Today the concept is quite different: Each one should dedicate himself to some work which, directly or indirectly, contributes to the enrichment of community interests, which broadens the life of the group (Dewey, 1965, p. 82).

The needs of the children were being addressed via the subject matter of the school that, in turn, benefited society. Dewey truly believed this notion as he noted it in his Pedagogic Creed that "school must represent life - life as real and vital to the child as that which he carries on in the home, in the neighborhood, or on the playground" (Dewey, 1897, p. 3).

Sousa suggests the use of technology and materials to make school engaging and interesting. He further stresses that teachers need to use a multisensory approach so that all the students will be engaged, with various learning styles being met. Sousa has one advantage over Dewey - the benefit of years of research in which various learning styles have been identified. In essence, educators have recognized that there are various styles and ways in which children learn.

Sousa (1998) not only ties in student learning styles, but also suggests that the classroom should be visually pleasing, allow for student movement, and discussion between students while they are learning (p. 25).

Through the findings of brain research, Sousa linked student interest as desirable for long-term memory.

The next area of implications of brain research findings looks at "shorter is better." Sousa reasoned that many students in today's world are used to "speed" - fast
computers, fast cars, fast action video games, and so on. As such, he thinks "because today's students are accustomed to quick change and novelty in their environment, many find it difficult to concentrate on the same topic for long periods of time" (Sousa, 1998, p. 25).

How long is "long enough?" What, if any, are the implications for lesson length. Sousa, in using the research of others has determined that "shorter is better." He based his finding on the research of Ebbinghaus who concluded "with a considerable number of repetitions, a suitable distribution of them over a space of time is decidedly more advantageous than the massing of them over a single time" (Ebbinghaus, 1885, p. 68).

To substantiate his claim for "shorter is better," Sousa claims that "timing is crucial" and recommends twenty-minute periods. The implication for this concept would be to have several shorter lessons in an eighty-minute block schedule.

Dewey didn't specify a time period per se but did stress interest as a factor. Dewey cited Rousseau when he wrote that Rousseau "preaches the necessity of being willing to lose time." "Do not save time, but lose it" (Dewey, 1915, p. 5). The concept of time becomes relative to the child. Childhood is a growing period, a period of developing (Dewey, 1915, p. 6).

Table 11:

A comparison of Dewey and Sousa relative to time

<table>
<thead>
<tr>
<th>DEWEY</th>
<th>SOUSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Method means that arrangement of subject matter which makes it most effective in use. Never is method</td>
<td>Shorter is better. Sousa presents a chart in which he breaks down the learning episode into two periods. One</td>
</tr>
<tr>
<td>DEWEY</td>
<td>SOUSA</td>
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<tr>
<td>something outside of the material” (Dewey, 1916, p. 194).</td>
<td>period is called prime-time 1 which is the first twenty minutes of the lesson. It is during this time that quality instruction should occur. After the prime-time 1 there is a ten-minute cooling off or downtime period. The last twenty minutes of the lesson is called prime-time 2. Sousa summarizes the concept by claiming &quot;we remember best that which comes first, second best that which comes last, and least that which comes just past the middle.&quot; (Sousa, 2001, p. 88)</td>
</tr>
<tr>
<td>Dewey emphasized the psychological principle of subject matter organization, to which his followers &quot;developed his system&quot; into &quot;the activity curriculum, the life-unit curriculum, or the project method&quot; (Tsun-Chen, 1961, p. 296).</td>
<td>Use the prime-time period for the introduction of new material. Since that period of time is so important Sousa does not think that time period should be contaminated with incorrect information. The prime-time 1 period and the prime-time 2 period are also labeled by Sousa as the &quot;primacy-recency&quot; effect. We will remember first and last information.</td>
</tr>
</tbody>
</table>
Considerations: Dewey wrote that method and material were not antithetical but in effect related. This may not translate to an exact time frame similar to Sousa's example, but it does imply a relationship between what needs to be presented (material) and how long (method).

When Colonel Parker was in charge of the Chicago Institute, an elementary school affiliated with the University of Chicago, he relied heavily on Dewey's *School and Society*, a book explaining Dewey's view of integrated curriculum construction. Based on that book, Parker organized the elementary school time periods around "doing" - making or constructing things or projects. "Concrete activities chosen in terms of pupils' needs and to cultivate their personal development have served unifying themes, or "projects, through which materials from a number of school subjects were brought together in broader departments" (Rugg, 1926, p. 99). In order to accomplish this, there was a longer time period that was needed.

The fundamental ideas of three reform forces - Parker, Dewey, and the work done at Teachers College (The Horace Mann School from 1887 and The Speyer School since 1899) was that the conventional curriculum changed to become more "laboratory or free" (Rugg, 1926, p. 107-109). The laboratory school expanded the elementary class day to a
"more leisurely and thoughtful atmosphere in the elementary classroom" as opposed to
the "large number of ten to thirty minute exercises operating in the public schools"
(Rugg, 1926, p. 110).

Indeed, shorter was not better for Dewey as young children needed more time for
instruction. One would argue that the instructional periods, rather than being longer,
were a longer period to incorporate more activities.

Question #4: In designing lessons, what concepts from Sousa's brain research are
needed for long-term retention, incorporating Dewey's theories?

Sousa is very clear about what is necessary for long-term retention. He states that
sense and meaning are required if information is to be stored into long-term memory. He
even provides a chart that has "sense" on the y-axis and "meaning" on the x-axis. "If both
sense and meaning are present, the likelihood of long-term storage is very high." (Sousa,
2001, p. 47) Educators who want their lessons to be stored in long-term memory to be
retrieved at a later date must take steps to incorporate these two Sousa concepts.

Sousa not only delineated the need for sense and meaning, but also declares "of
the two criteria, meaning has the greater impact on the probability that information will
be stored" (Sousa, 2001, p. 48). How then does a teacher strive for meaning? One way is
to start the lesson with an anticipatory set, causing the students to think about the
experience, activity, or example with which they are familiar in order to tie it into the
lesson. For example, if a teacher is teaching a lesson about leadership, the lesson might
start by asking students to think about a leader and write a list of the qualities of that
person to later be shared with the class. This activity would be the anticipatory set
causing students to make sense of the lesson.
Another factor in new learning, according to Sousa, is the effect of past experience. "What we already know acts as a filter, helping us attend to those things that have meaning (i.e., relevancy) and discard those that don't" (Sousa, 2001, p. 49). In the example above, the students are "thinking about a leader." The activity has meaning to the individual student since the leader may or may not be someone a fellow-student identifies as a leader. The students then bring in past experiences to help make the learning long-term.

Meaning, according to Sousa, "is so powerful that most states prohibit trial lawyers from using what is dubbed "the golden rule" argument. It asks the jury, "If you were in this person's situation, what would you have done?"

Table 12:
Analysis of Sousa's concept of sense and meaning and Dewey's concept of inquiry discovery

<table>
<thead>
<tr>
<th>SOUSA</th>
<th>DEWEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSE -</td>
<td>SENSE -</td>
</tr>
<tr>
<td>Brain scans have shown that when new learning is readily comprehensible (sense) and can be connected to past experiences (meaning) there is substantially more cerebral activity followed by dramatically improved retention. (Sousa, 2001, p. 48) (Macguire, Dewey said Pestalozzi's &quot;practical influence was confined to expelling from the school's reliance upon memorizing words that had no connection with things.&quot; (Dewey, 1915, p. 69) Dewey concluded, &quot;interest cught to be...&quot;</td>
<td></td>
</tr>
<tr>
<td>SOUSA</td>
<td>DEWEY</td>
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</tr>
<tr>
<td>Firth, and Morris, 1999 p. 1840</td>
<td>the basis for selection because children are interested in the things they need to learn.&quot; (Dewey, 1915, p. 299)</td>
</tr>
<tr>
<td><strong>MEANING -</strong></td>
<td><strong>MEANING -</strong></td>
</tr>
<tr>
<td>The enormous size and the strict separation of secondary curriculum areas do little to help students find the time to make relevant connection between and among students. Helping students to make connections between subject areas by integrating the curriculum increases meaning and retention.</td>
<td>Three typical evils prevail when presenting subject matter as a substitute for, or an external annex to, the child's present life:</td>
</tr>
<tr>
<td></td>
<td>- the lack of organic connection with what the child has already seen and felt and loved makes the material purely formal and symbolic.</td>
</tr>
<tr>
<td></td>
<td>- lack of motivation</td>
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<td></td>
<td>- the child's reasoning powers, the faculty of abstractor, and generalization, are not adequately developed (Dewey, 1902, p. 24).</td>
</tr>
<tr>
<td></td>
<td>The deviations and the difference between the child and the curriculum are widened by fundamental divergences: first, the narrow but personal world of the child against the impersonal but infinitely</td>
</tr>
<tr>
<td><strong>SOUZA</strong></td>
<td><strong>DEWEY</strong></td>
</tr>
<tr>
<td>-----------</td>
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</tr>
</tbody>
</table>
| extended world of space and time; second, the child's life against the specialization and divisions of the curriculum; third, the abstract principle of logical subject matter classification and arrangement against the practical and emotional bonds of the child's life. This fixation of subject matter separation places less importance on the child or the child's experiences and will have less meaning. There was a failure to take into account the needs and capabilities of the child. Certain subjects were considered intrinsically cultural or good for mental discipline (Dewey, 1938, p. 44). "The pupil must learn what has meaning, what enlarges his horizon instead of mere trivialities" (Dewey, 1902, p. 78). Subject matter "consists primarily of the meanings which supply content to
<table>
<thead>
<tr>
<th>SOUSA</th>
<th>DEWEY</th>
</tr>
</thead>
</table>
| Transfer allows the teacher to link something from the learner's past that helps add sense and meaning to the new learning. To accomplish this concept, Sousa states "the teacher makes the present learning situation as similar as possible to a future situation to which the new learning should transfer" (Sousa, 2001, p. 147). | It is part of the business of a teacher to lead students to extricate and dwell upon the distinctively intellectual side of what they do until there develops a spontaneous interest in ideas and their relations with one another - that is, a genuine power of abstraction, of rising from engrossment in the present to the plain of ideas" (Dewey, 1933, p. 226).  

"It is imperative that every energy should be bent to making the present experience as rich and significant as possible. Then, as the present merges into the future, the future is taken care of" (Dewey, 1916, p. 56). |
<p>| &quot;The critical factor for transfer of learning is that the connections are of | Dewey felt that all activity takes place in a medium, in a situation, and |</p>
<table>
<thead>
<tr>
<th>SOUSA</th>
<th>DEWEY</th>
</tr>
</thead>
<tbody>
<tr>
<td>value if they are relevant to the student's past, not the teachers&quot; (Sousa, 2001, p. 150).</td>
<td>with reference to its conditions.</td>
</tr>
</tbody>
</table>

Considerations: Dewey and Sousa were both in agreement in their writings when it came to what was necessary for lesson design - meaning. Sousa stated that meaning was necessary for lesson design and long-term retention. He developed a model for lesson design in which the lesson started with an anticipatory set. The teacher makes sense of the lesson and develops meaning for it. It is in this part of the lesson that the teacher initially captures the interest of the students by posing a question causing the students to think about experiences that will help them tie in their experience with the new learning. This activity starts with focusing the students' attention to a past experience (what we learned yesterday) and will be used as a springboard for the new lesson. Additionally, the purpose of the activity was to allow for a positive transfer of knowledge to the new learning.

Dewey saw the need for lesson design to include meaning as he wrote in *The Child and the Curriculum* (1900) about the "organic connection" between the child and the curriculum, such that absent such an arrangement, it would require the teacher to "trick" the student or to "sugar coat" the material so as to make it interesting (Dewey, 1902, p. 30). Dewey stressed the connection between the child's interest and curriculum because to separate interest from curriculum development constructs an "either-or" dualism.
Sousa and Dewey both identify the need for interest as a springboard for initial planning. Dewey sees the relationship as an organic connection and Sousa sees it as a necessary application.

Dewey champions the cause of experience for lesson development and in *Experience and Education*, describes the concept from the standpoint of development of educative experience. He is careful to state that unless the experience is meaningful, "it may be immediately enjoyable yet promote slack and the careless attitude" (Dewey, 1938, p. 25). Dewey states that the quality of the experience is important as "...there is its influence upon later experiences" (Dewey, 1938, p. 25). Sousa also felt that the interest developed from the anticipatory set would be useful in "setting a positive emotional climate for the lesson to follow" (Sousa, 2001, p. 277). Both educators agreed that the child's interest was important, and best engaged at the beginning of a lesson (Sousa) or in the initial planning of a lesson (Dewey).

Sousa had developed a very prescriptive, sequential model for educators to follow. From start to finish, Sousa's model is based on Hunter's well-researched lesson design model. Sousa then applies the research on how the brain learns as an overlay to Hunter's version.

Research has not uncovered a prescriptive design for individual lessons created by Dewey similar to Sousa's in-depth model.

Question #5: Using Sousa's model for lesson design, do the findings of brain research support Dewey's inquiry discovery mode for lesson design as a way to promote long-term learning?
In examining Sousa’s model for lesson design, one can see that he constructed nine components. The chart below will list his lesson design model and will incorporate Dewey’s mode of inquiry discovery.

Table 13:

**Incorporation of Dewey’s mode of inquiry discovery into Sousa’s lesson design model**

<table>
<thead>
<tr>
<th>Lesson Component</th>
<th>Purpose</th>
<th>Inquiry Discovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipatory Set</td>
<td>Focuses students on the learning objective</td>
<td>Tie-in of student experience with lesson or activity</td>
</tr>
<tr>
<td>Learning Objective</td>
<td>Identifies what learning outcomes are to be accomplished by end of lesson.</td>
<td>Organic connection of child and curriculum.</td>
</tr>
<tr>
<td>Purpose</td>
<td>Explains why it is important to accomplish this objective.</td>
<td>Integration of student experience with school activities.</td>
</tr>
<tr>
<td>Input</td>
<td>Gives students the information and skills they need to accomplish the objective.</td>
<td>Designed activities with the child in mind. (<em>Child and Curriculum, Schools of Tomorrow</em>)</td>
</tr>
<tr>
<td>Modeling</td>
<td>Shows the process or product of what students are learning.</td>
<td>Field trips. Integration of new learning with hands-on activities.</td>
</tr>
<tr>
<td>Check for Understanding</td>
<td>Allows teacher to verify if students understand what they are learning.</td>
<td></td>
</tr>
<tr>
<td>Guided Practice</td>
<td>Allows a student to try the new learning with teacher guidance.</td>
<td>Exploration of new learning under teacher direction.</td>
</tr>
<tr>
<td>Closure</td>
<td>Allows students time to mentally summarize and internalize the new learning.</td>
<td></td>
</tr>
<tr>
<td>Independent Practice</td>
<td>Students try new learning on their own to develop fluency.</td>
<td>Students try new learning on their own; bring home activities into the school.</td>
</tr>
</tbody>
</table>
Anticipatory Set

Dewey wrote that thinking is the method of an educative experience and "the essentials of the method are, therefore, identical with the essentials of reflection" (Dewey, 1916, p. 163). This process included a genuine situation of experience, define a problem, observe, develop resolutions in an orderly way, and test the ideas by application. Reflection was not, therefore, a trial-and-error experience for the child but instead deliberate. It is the "disposition to consider in advance the probable consequences of any projected step" (Dewey, 1930, p. 178). Reflective experiences, therefore, had general features of the problem method. In describing the reflective experience he listed:

- perplexity, confusion and doubt...
- a tentative interpretation of the given element;
- survey that includes examination, inspection, exploration, and analysis...
- elaboration of the tentative hypothesis...
- testing the hypothesis. (Dewey, 1916, p. 176)

The reflective experience, as noted by Dewey, causes the student to deliberately move in a prescribed course of action. Sousa uses this directed course of action as an anticipatory set and encourages teachers to begin the new learning with a focus on past learning so the new learning will make sense, have meaning, and have a better chance to be stored in long-term memory.

Dewey's mode of inquiry discovery was based on "scientific research" as his Laboratory School was operated "especially for the purpose of scientific investigation and research into the problems connected with the psychology and sociology of
education. Its aim was to further the application of scientific concepts and method of the conduct of school work" (Rugg, 1928, pp. 94-95).

Both Dewey and Parker in Chicago, the Teachers College at Columbia University, the Lincoln School/Horace Mann School in New York, and the Speyer School under Russell all made frequent reference to the need of using scientific method in the reconstruction of education (Rugg, 1921, p. 95). For example, Parker used the powers of "observation" and "attention" by asking children "What did you see on your way to school this morning?" (Tanner & Tanner, 1980, p. 245) to focus student interest into the subject matter being introduced. Sousa would call this "an anticipatory set" as it focuses the student's interest.

**Objectives**

Dewey's mode of inquiry discovery included unity of the school curriculum. According to Rugg (1926), "one of the central ideas in the theory of the Horace Mann and Speyer School was greatly similar to the hub of Colonel Parker's theory, and coincided with one of Professor Dewey's main contentsions. Unity in the school curriculum was to be sought by careful correlation of the work of the school subjects around central organizing themes" (Rugg, 1926, p. 102). Sousa's brain research claims that the objective is what the students are expected to accomplish during the lesson (Sousa, 2001, p. 277).

The Lincoln School staff developed a core of content and educational outcomes to which all students would be exposed throughout their school experience (Reynolds & Harden, 1933, pp. 550-651). This would be an attempt to unify subjects and subject matter (content and activities) into a desired program with specific outcomes planned.
Keeping objectives in mind, the next logical component would be purpose.

**Purpose**

The purpose, according to Baker, was "to induct the growing child into a changing and expanding adult culture with the greatest possible degree of harmony" (Baker, 1955, p. 137). The purpose of education was to capitalize on the child's experience, so the curriculum was interrelated with "cross-connections." Science and industry and mathematics were inseparable. Personal and social growth was sought. As Dewey (1933) stated in *The Educational Frontier*:

> Our philosophy while accepting the results of authenticated scientific work builds upon the idea that organisms, selves, characters, minds are so intimately connected with the environments, that they can be studied and understood only in relation to them. (p. 290)

The Modern School, New York City, developed by Abraham Flexner in 1917 to test the "new educational theory," used the accessible world as part of its laboratory: the harbor, Metropolitan Museum, the Public Library, the Museum of Natural History, the Zoological Garden, lectures, concerts, and plays. Children were taught in the class and used the surrounding environment to enhance their lesson.

Dewey was clear that purpose was the development of educational concepts which had social implications. Hence, his integration of the school and society.

**Guided practice**

Another concept supported by Dewey was guided practice that is supported by Sousa's research. Dewey stressed the need for order and control in the learning process to prevent random activity and chaos. The teachers in Dewey's school were "...to act as guides in the process of the growth of students toward harmony of individual traits with
social ends and values" (Baker, 1955, p. 137). Dewey knew "what gets to the child is dependent upon what is in the mind and consciousness of the teachers," and "it is through the teacher that the value of what is in the textbook is brought home to the child" (Dewey, 1969, p. 33). It is the role of the teacher and what the teacher selects for the student that Dewey stressed as being important.
CHAPTER V

Summary

Our tragic error is that we are so anxious
for the results of growth that we neglect
the process of growing (Dewey, 1915, p. 7). More than a century has passed since John Dewey and his wife were in charge
of a laboratory school at the University of Chicago. Dewey's philosophy was simple -
"Education is not routine, capricious or automatic; it is meaningful because a person
learns to secure future experiences that will foster his growth as an individual and as a
member of society" (Dewey, 1916, p. 99). For decades (from the time of the
laboratory school through the "progressive education movement" which purported to
put Dewey's ideas into practice), Dewey's philosophy was applied in schools. The
curriculum at these various schools was organized around Dewey's ideas of inquiry
discovery.

With the launching of Sputnik in October 1957, Dewey's philosophies would
be questioned and Bruner's Process of Education (1963) would become the new
roadmap. Inquiry discovery would now take a new approach - knowledge production

Scholars took advantage of federal government grants for curriculum writing. Over $100
million went for teacher workshops and $535,000,000 for curriculum
packages. There was tension between the progressive education movement and its
modes of inquiry discovery that used problem-solving methods and the specialized
knowledge production mode of the curriculum packages that stressed the structure of the discipline. After decades of debate and discussion, and millions of dollars spent on programs, we now can use the findings of brain research to determine how the brain learns and the best way to present lessons to ensure learning.

Although research had been done relative to the progressive education programs (Aiken, 1942; Ayer, English, Hosic, & Mossman, 1934; Baker, 1938; Bode, 1934; Bonsen, 1929; Campbell, 1976; Cooke, 1926; Dutton & Pearson, 1904; Meriam, 1959; Staff, 1927), the tension between these modes of inquiry discovery continued. Was the thinking of Dewey outdated? Was his mode of inquiry discovery no longer effective?

Finally, a century after Dewey had the opportunity to put his theories into practice, we now have technology to provide answers and insight into the learning process. Previously, the proponents of the knowledge production mode of inquiry discovery which stressed that the learner was a miniature scholar who subscribed to Bruner’s Process of Education (1963) thinking were able to ward off Dewey’s thinking (Wirth, 1966; Wirt & Quick, 1976; Welch, 1968; Wittrock, 1966; Schaffarzick & Sykes, 1979). Now, the technology is able to show how the learner learns. No longer will educational theories be just that - theories or learning fads.

Sousa, recognizing that brain-based learning has implications for teaching, developed a model for lesson-design. Working with Madeline Hunter for close to a decade, Sousa was able to construct a model for educators. Hunter’s model of clinical supervision was grounded in research and validated. So Sousa expanded her research
to develop a lesson design model that teachers can use in the classroom. Why, when, and how to apply various instructional strategies would be answered with his research-based lesson design model.

Using the Sousa model as a framework for a lesson, the research revealed that Dewey's method of inquiry discovery has merit. The tension between the conflicting schools can be resolved.

After examining Dewey's mode of inquiry discovery, we see that his insistence on meaningful experiences (meaning), having the child engage in experiences that take into account his or her needs and capabilities so the activity makes sense, and tying in interest and emotions are all consistent with brain-based learning. Having sense and meaning, according to Sousa are the two critical factors in long-term retention.

What are the implications for educators? The first implication is in the organization of curriculum into integrated, meaningful units. Schaad, Mc Knight, and Raizen (1997) criticized American curriculum in the Third International Mathematics and Science Study (TIMSS) as being expansive but not very deep, or a mile wide and an inch deep! American education offers many subjects but they lack meaning for the student.

The Carnegie Corporation of New York, in their published report "Turning Points: Preparing American Youth for the 21st Century," recommended an integrated approach because "too much of the traditional curriculum is fragmented and fragmenting, especially fostering students who cannot see the forest for the trees"
(Jackson & Davis, 2000, p. 45). The report went on to say, "Learners use their current knowledge to construct new knowledge and ... what they know and believe at the moment affects how they interpret new information" (Jackson & Davis, 2000, p. 48). What a clear statement of support for Dewey's mode of inquiry discovery and Sousa's brain-based learning. One sentence in a national study addresses the role of past experiences and its relation to new knowledge (Dewey and Sousa both wrote about the connection of new and past knowledge), the effect of emotion and interest in relation to how new knowledge is transferred, and the organization of data.

Another implication for educators is that lesson-design can be developed using a research base as Question #5 addressed in Chapter IV. Sousa used the model developed by Hunter to guide him in the construction of a lesson-design model for educators supported by brain research as illustrated in Question #2 of Chapter IV. The implications are that if teachers design a lesson based on credible research, this will lead to long-term retention of information by students. Now more than ever educators must design and develop lessons that are effective and meet the needs of children. Disenchanted parents looking for educational opportunities outside of public schools are investigating vouchers and school choice. Every time a student's needs are not met, alternatives such as magnet or charter schools are explored.

The State of New Jersey Professional Teaching Standards Board met on October 11, 2007 to develop a document on teaching standards. It is interesting to note that the purpose was to design appropriate learning experiences by making the content meaningful to the students. Listed below is the research model explored in
this paper and its relationship to the new state standards for professional
development.

In the column marked "State of New Jersey" the K stands for Knowledge
Indicators, and P for Performance/Skills Indicators.

Table 14:
The Sousa/Dewey model and its relationship to the new state standards for
professional development

<table>
<thead>
<tr>
<th>Sousa</th>
<th>Dewey</th>
<th>State of New Jersey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipatory Set</td>
<td>Tie-in of student experience with lesson or activity</td>
<td>K 1.3 The teacher understands how students’ prior knowledge influences their learning of a subject. K 9.2 The teacher understands how to plan instruction based on students’ needs, developmental progress, and prior knowledge.</td>
</tr>
<tr>
<td>Learning Objective</td>
<td>Organic connection of child and curriculum.</td>
<td>P 2.2 The teacher develops effective lessons by organizing ‘instructional</td>
</tr>
<tr>
<td>Sousa</td>
<td>Dewey</td>
<td>State of New Jersey</td>
</tr>
<tr>
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<tr>
<td></td>
<td></td>
<td>activities and materials to promote achievement of lesson objectives. P 9.1 The teacher establishes the focus for lessons by communicating objectives.</td>
</tr>
<tr>
<td>Purpose</td>
<td>Integration of student experience with school activities.</td>
<td>K 3.1 The teacher understands the principles and strategies of effective classroom management that promote positive relationships, cooperation, and purposeful learning in the classroom. P 3.1 The teacher maintains a learning community in which students assume responsibility for themselves and one</td>
</tr>
<tr>
<td>Sousa</td>
<td>Devey</td>
<td>State of New Jersey</td>
</tr>
<tr>
<td>-------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>another; participate in decision-making; work collaboratively and independently; and engage in purposeful learning activities.</td>
</tr>
</tbody>
</table>

**Input**
- Designed activities with the child in mind. *(Child and Curriculum, Schools of Tomorrow)*
- P 1.6 The teacher helps students to develop the knowledge and skills necessary for the practical application of the discipline.

**Modeling**
- Field trips. Integration of new learning with hands-on activities.
- P 8.2 The teacher models effective communication strategies in conveying ideas and information and in asking questions.

**Check for Understanding**
- P 2.8 The teacher adjusts strategies in response to learner feedback.
- P 4.1 The teacher reflects
<p>| Guided Practice | Exploration of new learning under teacher direction. | P 1.3 The teacher engages students in generating knowledge and testing hypotheses according to the method of inquiry and standards of evidence used in the discipline. K 6.3 The teacher understands how student learning is influenced by individual experiences, talents, and prior learning as well as language, culture, family, and community values. | State of New Jersey upon and analyzes the process of teaching based on student performance and modifies future plans and instructional techniques. | Dewey | Sousa |</p>
<table>
<thead>
<tr>
<th>Sousa</th>
<th>Dewey</th>
<th>State of New Jersey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closure</td>
<td></td>
<td>P 9.4 The teacher concludes lessons via summary, review, or similar closure practices.</td>
</tr>
<tr>
<td>Independent Practice</td>
<td>Students try new learning on their own; bring home activities into the school.</td>
<td>P 2.7 The teacher identifies strategies to create learning experiences that make subject matter meaningful for students, encourage students to pursue their own interests and inquiries, and help students connect their learning to personal goals.</td>
</tr>
</tbody>
</table>

The new federal legislation of No Child Left Behind (NCLB) (2002) has caused the model of professional development to become more research focused and prescriptive. No longer are one-day workshops acceptable. The federal government is seeking to advance teacher understanding of lesson design that is based on sound research. Dewey's mode of inquiry discovery and Sousa's model for lesson design fill this criterion.
The new professional development standards established by the state can be tied to every component of Sousa's model for lesson design and much of Dewey's mode of inquiry discovery.

Can these models be applied in practice? More and more professional workshops are being offered in brain research with many websites established for educators. Because of increased teacher accountability to make lessons meaningful, Sousa, Jensen, and a host of researchers have offered workshops.

Practical Implications

There are exciting implications for students as more and more legislation is geared to meeting student needs. With the No Child Left Behind legislation (2002), there are severe consequences for school districts that do not make progress for two consecutive years. This includes intra-district choice, supplemental services, corrective action and "restructuring." Restructuring means replacing the staff who teach the children, fully implementing a new curriculum, and as a severe measure, a state takeover. The takeover can use the services of a private management contractor or convert the existing school to a charter school!

In conjunction with the new state requirement for professional development, we see a high degree of accountability being thrust on educators. At this critical junction we must address how teachers teach and how students learn. We have the benefit of legislation mandating a change in staff development from short term to long-term. Specifically, professional development activities "are not one-day or short-term workshops or conferences" (NCLB, 2002). Instead, administrators can
plan monthly workshops for staff in lesson design. We have research that shows how the brain learns, and a model of lesson design grounded in research that can be used for staff development. Furthermore, we have decades of curricular implementation using Dewey's mode of inquiry as a model for guidance in curriculum construction. Tying into all of the above, we have the Carnegie Corporation Turning Points model (similar to what Dewey stressed for curriculum construction) to develop study groups, dialogue groups and leadership groups. These groups can look at the current curriculum construction in the school, keeping in mind the research on an integrated disciplinary approach.

The next step is on-going staff development using the brain-based model that was researched. There is a natural fit in the interdisciplinary approach advocated in Turning Points (and used as Dewey's mode of inquiry discovery) and federal legislation supporting staff development, with the emphasis on how teachers teach.

Administrators need to be trained in lesson design and brain research so they can provide leadership for their staff. The staff training can be done during faculty meetings, during the summer, and/or as part of inservice days set aside throughout the school year. Once administrators have been trained, they, in turn, share the information with staff, then observe classroom lessons to ensure that there is carryover in the training they have provided. To further ensure carryover, central office administrators who support principals should review the principals' observations and evaluations. This addresses principal accountability for what goes on in the classroom. Furthermore, the new federal legislation has raised the bar for
accountability. All children are expected to do well and be successful. Additionally, any curricular change or program will need to be supported by research. The benefit of all the studies done regarding Dewey's mode of inquiry discovery (Banta, 1972; Benne, 1948; Brownell, 1942; Burks & Josselyn, 1903; Carpenter, 1956; Dutton & Pearson, 1904; Eddy, 1965; Flexner, 1923, 1927, 1960), as well as Sousa's brain-based research is the support it gives for endeavors in curriculum construction and application.

Implications for Administrators

As noted in Chapter I, Sergiovanni & Sturratt (1998) identified various administrative models. In their text, Supervision: A Redefinition, they indicated four different types of supervisors:

Type A: Scientific Management Style – Classic autocratic philosophy that emphasizes control, accountability, and efficiency in an atmosphere of clear-cut manager and subordinate relationship.

Type B: Human Relations Style – Meet the social needs of workers providing opportunities for interaction, treating them decently, and involving them in the decision-making.

Type C: Human Resources Style – Represents a higher regard for human needs potential, and satisfaction in a supportive manner.
Type D: Neoscientific Management Style – Similar to scientific but highlights shared values. (Sergiovanni & Starratt, 1998, pp. 8-21)


McGregor proposed two distinct theories, labeled as Theory X and Theory Y. In Theory X, subordinates must be directed and threatened with punishment by the manager. Therefore, all decisions are from the top down. In Theory Y, the manager is seeking a dynamic relationship, collaboration, and bottom up involvement.

Douglas McGregor’s Theory X and Theory Y provided a dualism for supervisory tasks. A Theory X supervisor would embrace the Scientific Management and Neoscientific Management models, while Theory Y supervisors would encompass human relations and human resources.

Knowing that, within a continuum, administrators will operate under one of two different management styles to supervise teachers in lesson design and execution, listed below are ways apply this research effectively according to the two styles.

Theory X Supervisors

This model represents a classic autocratic philosophy. A supervisor who works within this philosophy would:
- Schedule training sessions for staff relative to the lesson design model.
  One training session would be devoted to each aspect of the lesson design.
  The first week would involve training in the use of the anticipatory set.
  Sessions would continue each week and conclude with guided practice.

- After providing training for teachers, the supervisor would arrange follow-
  up meetings to discuss the training with them. This would ensure that
  everyone is aware of how the teaching is expected to go.

- Supervisors would perform evaluations of lessons taught based on the
  lesson design model. To ensure there would be fidelity to the model, the
  supervisor might "script-tape" the lesson (specifically writing what the
  teacher says and does). This aspect is important for the supervisor during
  the post-observation conference.

- During the post-observation conference, the supervisor gives specific
  details regarding the lesson, and shares how well the teacher applied the
  model.

- Specific suggestions for improvement will be based on the adherence to
  the model.
**Theory Y Supervisors**

This theory embraces a collaborative, cooperative approach to supervision. A supervisor operating under this philosophy would:

- Meet with teachers to discuss the lesson design model to ensure that the teachers understand its philosophical basis. Once teachers grasp the underpinnings, the next step is training.

- The training sessions will be devoted to each aspect of the lesson design model. During training sessions, it is advisable for the teacher to talk about the process so they feel comfortable with how to apply it in the classroom. The supervisor may show videotapes to illustrate exactly what the behavior would look like. This is called modeling.

- After the teachers engage in training, they should develop a short mini-lesson. This allows for practice using the model and applying it.

- The next phase involves supervision of staff. To lower staff members' consternation, the supervisor can do an informal observation of the teacher. The supervisor would conduct the observation of the staff member and follow up with a conference. The written observation will be used for informational purposes only. The observation will serve as a
“coaching” experience whereby the evaluation is given to the teacher to be used as a reference, and is not filed as a formal observation.

- After the teacher and administrator have developed an understanding of how the lesson design is applied, formal observations can begin.

In either case, administrators and supervisors can monitor how the program is progressing by reviewing the observations that are filed. A central office administrator can see if the supervisors have noted the lesson design terminology in the text of the observation. The central office administrator can assess if fidelity to the process is ensured. This would hold true for both Theory X and Theory Y administrators. The central office administrator can then provide support and/or resources as needed, such as workshops, conferences, supplemental resources, supplies, especially in the budget process.

It is interesting to note that a study done on successful urban schools identified eight “Abbot” schools that outperformed other Abbot schools, and “performed well when compared to all New Jersey schools.” (Urban Schools That Work, 2002) The report was prepared under contract to Seton Hall University, the Department of Leadership, Management and Policy and the Center for Urban Leadership, Research and Renewal. Principal researchers Dr. Daniel Gutmore and Dr. Elaine Walker listed in the findings:
Leadership:
Finding 1 — "All the schools have principals who focus on creating management structures and a climate where teachers and staff maximize their abilities through collegial leadership. [The principals] provide teachers with maximum opportunities to participate in the decision making process."

Teacher Professionalism — "Using a common framework for observation, teachers tended to provide instruction at the proficient and distinguished level with only marginal performance at the basic or unsatisfactory level." (Urban Schools That Work, 2002 p. )

Keeping the above points in mind, administrators need to understand the dynamics of change as done in a collegial atmosphere, and the role of teacher involvement in the decision-making process. The Theory Y approach to implementation of the study would appear to be a more effective model to embrace as it provides more teacher empowerment.

Administrator Workshops

The following is a series of workshops for administrators that incorporate the research findings. The objective is to ensure that administrators know how to support teachers as they carry out instruction in ways that will enhance long-term retention. These sessions are meant to be 45 minutes in length - easily incorporated into administrators' busy schedules.

Session 1: Introduction to brain research
Session 2: How the brain learns
Session 3: Brain research and its implication for lesson design
Sessions 4-6: Components of brain-based lesson design
                      (anticipatory set, learning objective, purpose)
Sessions 7-9: Components of brain-based lesson design
                      (input, modeling, check for understanding)
Sessions 10-12: Components of brain-based lesson design
                      (guided practice, closure, independent practice)
Session 13: Implications of brain-based lesson design for curriculum
                      (Dewey and Sossa)
Session 14: Implications of brain-based lesson design relative to federal legislation
Session 15: Action research using brain-based lesson design in the classroom

A follow-up to the first fifteen weeks would be a month of action research activity with each week devoted to a problem taken from Sessions 2 through 12.

After the action research activities, additional workshops are proposed:
Session 1: Discussion of learning theories, i.e., Parker and Dewey
Session 2: Understanding student learning styles.
                      (discussion of Gregorcie Style Delineators, and Myess-Briggs)
Session 3: Understanding student learning styles.
(discussion of Silver and Hansen learning inventory, and Bernice McCarthy 4MAT system)

Session 4: Understanding brain-based research

Session 5: Application of learning styles and integration of Dewey’s mode of inquiry discovery (planning hands-on activities, projects within an integrated curriculum theme, i.e. history, English)

Session 6: Application of learning styles and integration of Dewey’s mode of inquiry discovery (planning hands-on activities, projects within an integrated curriculum theme, i.e. math, science)

Session 7: Construction of lesson plans that reflect learning styles using Dewey’s mode of inquiry discovery as the curriculum base with lessons based on brain research.

Between Sessions 2 and 5 there would be a week in which teachers would apply in their classroom what was discussed in the training session. For example, week two, the teachers would be taught the Gregoric Style Delineator. Then they would spend a week exploring its application in the classroom. In this manner, they can apply what they have learned so as to have a better understanding of how it works.

The above models were chosen because they have already been applied in the South Plainfield, NJ school district with visible success. In addition, the Gregoric Style Delineator is used at the Union County Magnet High School. Upon admission to the school, students are given the inventory to identify their learning style. Each
teacher then develops the curriculum and lesson plans that address each of the four styles that reflect the way students learn.

The Bernice McCarthy 4MAT system is used in school districts throughout New Jersey. Several Seton Hall doctoral students have reported using the McCarthy System in their respective schools to illustrate that it can become common practice.

These two indicators of learning styles can be incorporated with the Dewey/Sousa research model developed. This has been implemented in South Plainfield where workshops for administrators, and all non-tenured teachers have been provided on brain research. The Curriculum Director and Staff Developer provide m-service opportunities for all staff on lesson design.

Once a workshop has been presented to the administrators, the expectation is that the administrators will share the information with all staff. Non-tenured teachers are then jointly observed by the administrator and the assistant superintendent and conferenced jointly. The administrator's written evaluation of the teacher is reviewed by the assistant superintendent to see if practical applications of lesson design are incorporated into suggestions for improvement for the teacher.

Further Research

There are additional questions that further research can answer and other areas of further study. One would be a quantitative study to assess the effectiveness of the theories. A control group could be matched with an experimental group being trained in lesson design and implementation. A pre- and post-test will show if students
exposed to lessons constructed with an understanding of the brain research make greater academic gains.

Questions for Further Study

- What are the implications for learning for children with disabilities as it relates to inquiry discovery mode of learning and what we know from the findings of brain research?

- What are the implications for lesson design using Dewey's mode of inquiry discovery based on brain research which shows us how children learn when a school district has financial limitations?

- What are the implications for curriculum construction using Dewey's mode of inquiry discovery and Turning Points 2009?

- What are the implications for the magnet school concepts that address students' needs to become the educational norm?
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