Knowledge Area Module 3

Principles of Organizational and Social Systems

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Knowledge Area Module 3

Principles of Organizational and Social Systems

Breadth Component

SBSF 8310: Theories of Organizational and Social Systems

Abstract

The theme for the Breadth of KAM 3, Organizational and Social Systems, centers on the ideas of theorists as they refer to systems thinking philosophies within organizations. The foundation of the Breadth section compares and contrasts three theorists of systems and organizational thinking: Ludwig von Bertalanffy, Howard Gardner, and Peter Senge. A critical analysis of the systems thinking approach is described as it applies to the broad perspective of educational institutions.

Knowledge Area Module 3

Principles of Organizational and Social Systems

Depth Component

EDUC 8321: Social, Legal, Political, and Economic Systems

Abstract

Synthesizing the theories of organizational and social systems in an analysis of subsystems of educational institutions offers insight into where in the systems approach design consideration for students with disabilities is or is not incorporated. The theme for the Depth section of KAM 3 is the possible breakdown of the systems approach in educational institutions regarding the California High School Exit Exam (HSEE) and students who are learning disabled. Does the system fail if the students fail to graduate? How will students who are learning disabled pass the HSEE to fulfill graduation requirements if not properly prepared?

Knowledge Area Module 3

Principles of Organizational and Social Systems

Application Component

EDUC 8331: Professional Issues in Organizations and Systems

Abstract

The Application of KAM 3 demonstrates the combination of the Breadth analysis of organizational and social systems theories with the Depth theme, an investigation of the breakdown of the systems approach in educational institutions regarding the California High School Exit Exam (HSEE) and students with learning disabilities. The results produce a report dealing with concerns of how to properly prepare students, specifically students with learning disabilities, for the state mandated high school exit exam in Mathematics. The report will be based on a study completed in 2000, involving symposium reports from high school and middle school Mathematics teachers, along with special education and district level representatives. A realignment of the Mathematics curriculum with the California State Standards to properly prepare all levels of students for the HSEE ensued.

Copy of signed Learning Agreement Approval Form

I am pleased to inform you that the learning agreement for KAM 3 has been received and approved by the Office of the Registrar. **Please save this email for your records.** 02/07/06

REMINDER TO FACULTY ASSESSORS: In the interests of courtesy and better tracking, always copy your student when you forward approved LA's to la@waldenu.edu.

Please contact me if you have any questions.

Regards,

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Student Self-Evaluation: Knowledge Area Modules (KAMs)

This area is intended for submitting the final version of your KAM Self-Evaluation form to your assessor(s), faculty mentor, and the Office of Student Records.

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KAM Number	3
KAM Title	Principles of Organizational and Social Systems

1. What knowledge/experience did you bring to this KAM? How did you capitalize/expand on this base?

Life experiences in multiple arenas provided a base of knowledge for KAM 3: Principles of Organizational and Social Systems:

- 21 years classroom experience with middle school and secondary students and educators
- Instructional Assistant with special needs high school students
- High school teacher of regular education and special needs students
- 5th grade teacher of inclusion and English as a second language students (ESL)
- Teacher of Confirmation classes for at risk students
- Mentor for two of my four brothers with special needs: inability to learn to read
- Counselor/instructor for religious medals for Boy Scouts of America
- Mother of two sons and a daughter (one diagnosed with ADD; one with ADHD)
- BA in Human Development
- MA in Education
- 37 years of marriage
- raised in a family with four brothers and two sisters

The wealth of knowledge from many years of life experiences within a variety of formal and informal organizations and systems, coupled with formal education, provided ample insight to ask the questions in the areas of organizational and social systems needed for research.

2. Describe the quality of the **Breadth** section in the light of the intellectual and communication skills demonstrated in this KAM.

According to the statement by Ludwig von Bertalanffy (1967), "The will is free and individuals can make a difference" (p. 211), the individual impact of each and every member of society is significant as established with empirical evidence in KAM 3 Breadth. The quality of the synthesized and integrated information provided in the well documented narrative in the Breadth section reflects how a systems approach to problems in the school system can improve the quality of education for all levels of learners. A basic understanding of systems thinking in organizations is captured in the summary, easy for the reader to understand and interpret from the comprehensive quality of the report.

3. In the **Depth** section, what key ideas/concepts most engaged your thinking and imagination relative to your area of study?

Educators' hands are tied when it comes to rendering the most successful educative practices for all levels of learners due to political, social, and economical systems in the school organization. Rather than working together in support of the best educational practices, the multiplicity of systems often work against each other, leaving the students with less than the best of what educators have to offer.

A systems approach to creativity is quashed by the academic conditions of standards based education. Providing accommodations for learners mainstreamed into the regular education environment is perceived as a threat to teacher expertise rather than an asset to all levels of learners. Pressure from multiple testing requirements, the need to alter curriculum, and overcrowded classroom conditions forces more didactical teaching methods, ignoring students needs for diversity in the teaching and learning processes.

4. Expound on the most meaningful theoretical construct studied and applied to your professional setting in the **Application** section. What can you do differently/better as a result of this KAM?

The systems approach to education is accepted in various subsystems of school organizations, but as a whole, the system of education operates under an archaic approach. Peter Senge's (1990) *learning organizations* and Howard Gardner's (1999a) *teaching for understanding,* two theoretical constructs that if applied to the educational system, enhance the Dewey (1915) approach to education. Dewey's idea for a more coordinated effort of manual activities, a mind body dualism, should be stressed. More interactive curriculum will build skills to foster what is needed for 21st century thinkers--that of self directed independent learners. As a result of KAM 3, recognizing the need for more self directed teaching and learning is more readily apparent. I can now involve students more actively in self learning processes through curriculum adaption. Accommodation for all levels of learners within the mainstream environment is now seen as an asset to all students, not just a select few, as a result of KAM 3 research.

5. Briefly describe the most important **Social Issue** covered in this KAM.

Failure to pass the California High School Exit Exam (CAHSEE) to fulfill high school graduation requirements is an urgent social issue in education. State mandated standards were not carefully aligned with curriculum leaving a gap in the efforts to properly prepare all students, regardless of levels of learning. The diversity of the population of learners in a mainstream environment requires that accommodations be made, not just in the preparation requirements but also in the assessment process. Curriculum realignment will help to alleviate the gaps in student preparation, thus leading to a higher percentage of passing scores for the CAHSEE. An enormous social issue facing educators is the need for curriculum realignment with the state standards to properly prepare all students within the mainstream classroom environment for required mandates in assessment across the educational spectrum.

Press the "submit" button below to send the final version of this form to your KAM Demonstration assessor(s), your mentor, and the Office of Student Records. Please note that the file will be sent as an attachment to any email address you have specified above. A copy will also automatically be sent to Student Records.

Contents

Introduction

An analysis and comparison of the broad scope of the theoretical foundations of systems and organizations will be the focus of the Breadth component of KAM 3, opening a window into a subsystem that further scrutinizes the state standards: the special education community of teachers and learners. *Free and Appropriate Education* is a right afforded to all students of educational institutions regardless of any physical, emotional, or intellectual disability. The California High School Exit Exam (HSEE), dependent upon national and state mandated policies is scrutinized by individual schools that operate under the systemic process. *Free and Appropriate Education,* mandated through national legislation, along with The Americans with Disabilities Act (ADA), Section 504, and Individuals with Disabilities Education Act (IDEA), makes demands of systems and subsystems to fulfill policies to meet graduation goals.

Historically, decisions in education pass through the systems approach, eventually reaching the subsystems that directly affect the clients, the students with learning disabilities. The Depth component will provide insight into how or why broader congressional mandates sometime neglect to consider the individual needs of the students. Currently, special education students face a breakdown of the social systems theory in the educational organization. The inability to pass the HSEE to graduate indicates a flaw in the school system in need of change.

The Application section will demonstrate a compilation of the Breadth and Depth research applied to the needs of students with learning disabilities to reach graduation goals. Realigned curriculum fulfills requirements for HSEE preparation in Mathematics, through the dictated steps of the system: National→ state→ district→ school board→ school→ principal→ IEP→ Resource Specialist→ mainstream classroom teacher→ Special Needs student.

Knowledge Area Module 3

Principles of Organizational and Social Systems

Breadth Component

SBSF 8310: Theories of Organizational and Social Systems

Contents

Breadth Component

Introduction

Each generation is challenged with a purpose to make sense of the world by making it a better place for human beings to exist in society. In a traditional society individuals as members of families exist because of groups, tribes, or clans which in turn make up nations of people. It is inconceivable not to be a member of a group that develops into a pluralistic society. Following historical accounts in scholarly literature, society is influenced by theoretical principles of organizations and is in a continuous flexible state. Systems thinking ties individuals together within society indicating that interdependence with one another exists to preserve posterity, as expressed by Gardner (1999a), "And we may discover why we must join forces, in a complementary but synergistic way, to make sure that Nature and Culture survive for future generations" (p. 219).

In the development of Knowledge Area Module (KAM) 3 Breadth component, an analysis and comparison of the broad scope of the theoretical foundations of social systems and organizational perspectives demonstrates assumptions of the systems approach theories of Ludwig von Bertalanffy, Howard Gardner, and Peter Senge. Several other classical and contemporary systems theories and philosophies are cited. Each represents an area of differences in systems thinking approaches that exists in present day society.

Society consists of many different types of individuals who must learn to exist together. A unifying force must be present to prevent potential chaos that could challenge a symbiotic relationship, as stated by Kilpatrick (1992), "Like a common stock of knowledge, a common set of ideals seems necessary to any society that hopes to socialize its youth" (p. 118). Viewing

chaos or challenges as opportunities to solve problems sheds light into the need for the unifying forces of a variety of systems thinking theories. "Systems thinking does not mean ignoring complexity. Rather, it means organizing complexity into a coherent story that illuminates the causes of problems and how they can be remedied in enduring ways" (Senge, 1990, p.128). Solving problems meets challenges in society, building a better future for humanity. Social scientists evoke change through research to meet the 21st century demands for a more self managed environment as evidenced in the next section of KAM 3 Breadth.

Implications for Social Change

Change is certain, but progress is not unless the change reflects the common good of organizations within society. The reigning organizational paradigm reflects that of a *parent to child* relationship: the parent tells the child what to do and the child obeys, as McGregor (2000) uses Theory X and Theory Y to describe the differences, "It is worth noting that this difference is the difference between treating people as children and treating them as mature adults" (p. 141). Contrary to the *parent to child* relationship that is currently seen in organizations, the advancements of the 21st century demand a more self managed environment. Less directed instruction from managers to workers in organizations requires self starters who think independently (Cheyne, 1999). Current practices that dictate social order must be challenged to reflect an *adult to adult* relationship. Without change, the reigning organizational paradigm will not meet the demands of the 21st century. McGregor (2000) reiterates that changes in thought processing require training and practice before mastery is attained, but warns that "we cannot expect to shift to the latter overnight" (p. 141).

Educational organizations need to challenge the present teacher *to* student relationship. The new millennium demands more keenly developed schools that learn, 'schools that attempt to learn, grow, and reinvent themselves using the principles of *learning organizations*" (Senge, Cambron-McCabe, Lucas, Smith, Dutton & Kleiner, 2000, p. 5). A paradigm shift suggesting a teacher *with* student relationship needs development to implement less didactical teaching currently utilizing the lecture/take notes format. A more hands-on interactive curriculum will build skills that foster self directed behavior. Initiating individuals to take responsibility for actions will affect the common good of organizations in the future. According to Gardner (1991) and Senge et al. students are not properly prepared to step into a 21st century society of self starters and independent thinkers needed in organizations.

Education is a microcosm of the larger society as a whole (Kilpatrick, 1992). The reality that decisions must be made politically, socially, and economically cannot escape members of organizations in education, or anywhere in society. Strong foundations are needed on which to base decisions. Systems based theories provide guidelines through general observations of human behavior, but theories cannot establish everything beyond all doubts. "There are probably things that human beings can't know and ways that human beings can't think" (Gardner, found in Senge et al., 2000, p. 559). A theory can be modified or disproved by observation, testing, and reflection as social scientists continue to demonstrate through learned experiences. Learning can only take place through reflection on experiences.

Reflection expands knowledge bases that may disprove or modify a theory, and as the need for new theories arise, implications for social change are imminent. Human beings need answers found through reflection. The answers become constructs for new ideas and new ways

of thinking about past theories. With social change come new theories creating schema that enables testing and modification of classical theories, building and improving a stronger, healthier society along the way. Society as a whole needs social change for the strength and health of the social systems and organizations within society, as Senge (1990) observes, "It is interesting to note that the words *whole* and *health* come from the same root (as in the Old English *hale and hearty*). So it should come as no surprise that the unhealthiness of our world today is in direct proportion to our inability to see it as a whole" (p.68). Systems thinking theories aid in the ability to see society as a whole.

The next section of KAM 3 Breadth defines what systems thinking is and how system thinkers approached the changes reflected by society in need of revision. School systems in need of change are offered theories to consider, but ultimately the school systems must choose what is best for all learners. Theoretical choices to consider are described through challenges that face society today.

Overview of Theoretical Perspective

Systems thinking theories in the Breadth component of KAM 3 are explored by how organizations are affected through differing descriptions, behavior, shaping forces, and societal demands, describing by the various systems approaches of Bertalanffy, Gardner, and Senge. A critical analysis of the systems thinking approach is described as it applies to the broad perspective of educational institutions.

For the sake of organization for KAM 3 Breadth the theories of Bertalanffy, Gardner, and Senge will be used as the primary tenets to explain systems thinking as it applies to organizations and social systems. Factors examining the assumptions and broad implications of various other

theoretical systems thinking approaches will be included. The broad scope of the Breadth component interpreting systems theories will be used to interpret and develop the groundwork preparing for the narrower approach in the Depth component, that of school systems and subsystems in education.

Each generation is challenged to make sense of the present, questioning whether the current school system is readying students for the challenge. The new millennium generation sees a modern Western society that has significantly influenced the rest of the world, dominating cultures for several hundred years. The view of society at the turn of the 21st century brought with it a significant need for change. Twentieth century assumptions are seen in a new light through 21st century social scientific research and perceived as severely limiting, in need of radical revision to meet new demands. The new millennium generation is challenging the status quo of society with the prospect of adopting system thinking theories to solve societal demands. The view of the world as a mechanical system, the view of the human body as a machine, the view of life as a competitive struggle, and the belief of unlimited progress achieved through economical and technological growth (Bertalanffy, 1967; Capra, 1996; Gardner, 1991; Senge, 1990) no longer remain unchallenged.

When it is critical for all learners to master tasks, the systems approach is utilized in stages with the use of structures such as diagrams, flow charts, and committees. The military, business, and industry are the largest users of systems theory because, "Our nation's defense or a company's profits largely depend on people performing their jobs" (Hunkins & Ornstein, 1998, p. 6). It is extremely critical for all learners to master tasks in education, so why systems theory approaches are not commonly practiced in education raises controversy. The systems approach

in any organization creates changes in behavior which perhaps leads into why educational organizations resist system theories. School systems commonly reject change (Gardner, 2004; Senge et al., 2000) despite the urgency for all learners to master tasks.

The term *system* implies an interrelatedness of various components that function independently and contribute to the wholeness of something as defined in the Merriam-Webster 11th Collegiate Dictionary (2003). The universe, the human body, and the American government are three very unique examples of systems that consist of many components dependent upon interactions to regulate the entire operation of the whole organization. If one component of any of the subsystems is off balance because a problem exists, the whole system is affected and in need of a resolution before chaos ensues (Bertalanffy, 1967; Capra, 1996; Gardner, 1991 & Senge, 1990). An unexplained asteroid in the solar system, or an abnormal reading of the blood in the circulatory system, or a miscommunication in the judicial system can each create a problem for the system itself, which in turn upsets the whole organization.

Systems thinkers challenge the current social paradigm of organizations. Due to technological advances over the last few decades some organizations have adopted systems thinking reflecting that revisions are in progress. Social scientific researchers are challenged with a dilemma to generate the changes necessary to make the world more competitive in the global market. The organizations that have not accepted the systems thinking approach to problem solving are not accepting that change is necessary to compete in the global market of the 21st century.

School systems question if the adoption of a systems thinking approach is the right solution for revisions needed in educational organizations. KAM 3 Breadth continues by

comparing differing descriptions of the broad theoretical perspectives and assumptions of General System Theory (Bertalanffy, 1967). An investigation into society as an interrelated whole system will be followed by an explanation of the relationship of human beings to the whole system of society.

Differing Descriptions of General Systems Theory

The range and diversity of systems in society require some type of uniformity and regulation due to the far reaching implications of organizational operations. Social scientists in the 1950s and 1960s recognized that systems were developing simultaneously across many fields, fragmenting society. The nature of social science is to explore and develop new theories that interpret phenomena as it emerges (Reynolds, 1971); therefore numerous theories exist and will continue to develop as needs demand new interpretations.

An interpretation of the birth of systems theory from the 1950s to the present day use of General Systems Theory (GST) developed by Ludwig Bertalanffy in 1968 offers an explanation for shifting paradigms in the scientific arena. The transference of the new idea from Bertalanffy (1968) for a shift from individualism an all encompassing system to guide the fields of science evoked controversy for change. Perceived as a challenge to organizations and social systems, change was resisted, but Gardner (1999a) expresses the necessity for change, “And to remain viable, all organizations will have to continue to learn and to change” (p.202).

Social scientists have been trained to think in regards to the larger picture of life, unlike individuals who are often confused by the holistic concept of life. Confusion causes controversy, but stories often diffuse the controversy (Gardner, 2004). If a story is attached to the early pioneers of systems theory, perhaps making it easier to comprehend, the confusion lessens.

Kilpatrick (1992) relates stories to the relationship between individuals and the larger picture of life, "The narrative thread of our lives is woven in part out of strands that preexist us, and we can never hope to understand ourselves without knowing about the stories we belong to; nor can we ever fully understand why we must sometimes act against our own self-interest for the sake of something larger" (p.205).

The story of the early pioneers of systems theory, each from different fields, describes visionaries who foresaw a need for the improvement of humankind. Four scientists through a collaborative effort perceived how science evolved. Fields of study in science fragmented the human cause. Disjointed and disorganized, each scientific field operated and developed theories in a piecemeal fashion, often duplicating work with no idea of what another field accomplished. In 1954, at Stanford University, Bertalanffy from the field of biology, Boulding from the field of economics, Gerard from the field of psychology, and Rapaport from the field of mathematics discussed a need to bring the communities of science together (Bertalanffy, 1968).

At a meeting of the American Association for the Advancement of Science (AAAS) in 1956 the society for the Advancement of General Systems Theory was born. The name was later changed to the Society for General Systems Research. Systems theory scientists explored how a general system of science could serve humanity. The idea of a GST was received with either rave reviews or vehement resistance. It was a bold move on the part of the founding fathers of GTS to imagine that an all encompassing theory could cross the boundaries of myriad scientific communities.

Realizing that a science of everything would be impossible to achieve, the early systems theory scientists established four major functions to be applied to the theoretical research: "(1)

investigate the isomorphy of concepts, laws, and models in various fields, and to help in useful transfers from one field to another, (2) encourage the development of adequate theoretical models in the fields which lack them, (3) minimize the duplication of theoretical effort in different fields, and (4) promote the unity of science through improving communication among specialists" (Bertalanffy, 1968, p.15). Rather than the robotic view of scientists collecting facts and reporting data in a commercialistic world, Bertalanffy (1967) wished to present the human side of science creating a deeper respect for humanity.

Historically, at the same time Bertalanffy (1968), Boulding (1956), Gerard (1954), and Rapoport (1968) came to an agreement recognizing the need for the establishment of GST research, three other significant contributions in social science surfaced. First, game theory in 1947, then Cybernetics in 1948, and information theory was developed in 1949. Each was compared to GST. To closely identify any of the three with GST limits the overarching concept of Bertalanffy's vision for the reorganization of science from a fragmented view to the view of science as a whole.

Other developing theories have a relationship to GTS, and using a family analogy as a comparison, GTS is the head of the family. Scientific contributions such as cybernetics, information theory, and game theory could be considered sisters to GTS. Regardless of the numerous developing theories of systems, Bertalanffy's GTS remains prominent in explaining systems theory from its conception in 1956 to the present when analyzing the fragmentation of society.

The basic fragmentation of the scientific community was widespread, and can be detected through historical accounts, demonstrating that more than a band aid approach was needed for

society to develop and operate as a whole system. The whole of science needed repair, according to Bertalanffy (1968), not simply the parts. Examples of what Bertalanffy saw as a vast array of systems needing to be connected included, but were not limited to: "static structures, clock works, control mechanisms, open systems, lower organisms, animals, man, sociocultural systems, and symbolic systems" (Bertalanffy, 1968, pp. 28-29). He used his studies of humanity from a biological point of view to explain why changes were needed to repair a fragmented society. Senge's (1990) vision for society was similar as observations indicated that a single system view connected problems and revealed solutions, "Systems thinking shows us that there is no outside; that you and the cause of your problems are part of a single system. The cure lies in your relationship with your 'enemy'" (p. 67).

In 1967 Bertalanffy spoke freely in non scientific terms of the accumulation of ideas that spanned 45 years of biological study, combining ideas from "biology, psychiatry, sociology, linguistics, economics, the arts, and other fields" (Bertalanffy, 1967, p. 18). The notion of humankind perceived as a machine, a mere collection of parts where change is gradual, was met with growing dissatisfaction from the general population. The concept of the mechanistic robotic model of humanity gave rise to an opposing view of "man as an active personality system" (p. 18); an organismic model interrelated in a close relationship to the all encompassing environment in which humans exist.

Bertalanffy (1967) stressed the need for understanding society as a whole, seeing human beings as contributing parts to the whole system, and not simply a collection of parts as the mechanistic paradigm reflected. Suggesting that an organismic paradigm shift of new ideas was necessary, Bertalanffy outlined a new theoretical worldview. The behavior of human beings

contributes to the whole of the systems thinking philosophy as Bertalanffy (1968) intended, but to fully understand GST, an explanation of the interacting parts is necessary. “A system is more than the sum of its parts; it is the product of their interactions” (Ackoff, 1999, p. 117). The developing behavior of human beings as part of the whole world of systems reflects an interdependence of systems. The new way of human thinking that gradually developed, as a system of using symbols, between the parts and the whole is described in the next section of KAM 3 Breadth.

Systemic Behavior of Humans

Human behavior, distinctly different from animal behavior, is evident in the way that humans developed the use of a symbols system. Bertalanffy (1967), a practicing theoretical biologist in Canada, later in his career used systems to explain human development and behavior, from the biological point of view. Before GST came upon the scene, new ideas regarding human development referred to how symbols were used as objects (Gardner, 1991). A symbols system was a developmental breakthrough, reaching far beyond a trendy inclination or fad soon to be swept aside.

The idea of humankind as a mechanistic robot began to shift to the idea of human beings as purposeful organismic beings, able to make choices from the association of objects in the environment. Ackoff (1999) recognized the shift in human beings and coined the term *animated* systems for humans. An animated system is described by Ackoff as the whole human person having purpose but the parts have no purpose except to help self-maintain the whole organism for survival (p. 24). Bertalanffy (1967) coined another term for humankind in regards to the

symbols systems of how choices are made by identifying objects with certain names when there is no biological foundation for such reasoning. The term is referred to as *freely chosen*.

The transference of knowledge using symbols occurs through learned experiences *freely chosen* (Bertalanffy, 1967) by humankind. Bertalanffy defines *freely chosen* through the human learning process as symbols that are representative of consistent world experiences, and become part of a symbolic universe based on the tradition of symbols. As intellectual development transpired, "It was decisive that man, in some way, *disassociated* something from himself which was to stand in for something else" (Bertalanffy, 1967, p. 37). Gardner (2004) refers to the phenomenon as "knowing one's own mind" (p. 148), supporting Bertalanffy's theory of *freely chosen* by stating, "The will is free and individuals can make a difference" (p. 211).

Human beings invented symbolism, separating humans from animals, and over the period of half a million years used a symbols system until linguistics was formed. Gardner (1993) defines a symbol system as "a culturally contrived system of meaning which captures and conveys important forms of information" (p. 16). Rapid development of language to an organized symbols system fast forwarded humanity into a world that, according to Betalanffy (1967), "made man both better and worse than other species with their inbuilt drives and controls" (p. 44).

Humankind, at the mercy of its own symbol systems development, adopted a worldview that reflected a mechanistic universe. Bertalanffy (1967) observed a negative developing impact, a world accidentally moving at random like robots with no uniformity. Humans were communicating, but confusion ensued. The system of communication that was born through language development advanced mankind from individualism into a new *freely chosen*

responsibility. Bertalanffy (1967) sensed that the shifting focus of communication from outside of the individual person added responsibility, confusion, and potential chaos to the world.

Chaos Theory (Lorenz, 1963), a non linear systems theory that takes the patterns of complexity and irregularity into consideration (found in Rae, 1999), had not yet been uncovered from the journals of meteorology and was not yet applied to problems facing humanity in 1956. Chaos Theory is discussed in further detail on pages 29-31 indicating that randomness, "blind laws of nature," (Bertalanffy, 1867, p. 56) may actually lead to uniformity, as Gardner (1999a) interprets, "The human brain seems to have evolved to process certain kinds of symbols efficiently" (p. 38).

No longer perceived as an individualistic system, mankind was held to a larger task of attending to the whole of the universe as Einstein (found in Eves, 1977) envisioned:

> A human being is a part of the whole, called by us "Universe," a part limited in time and space. He experiences himself, his thoughts and feelings as something separated from the rest . . . kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty. Nobody is able to achieve this completely, but the striving for such achievement is in itself a part of the liberation and a foundation for inner security. (Einstein, found in Eves, 1977)

A transformation was taking place and a shift in the model of the mechanistic robotic behavior of humans as individualistic to the organismic model of "man as an active personality system" (Bertalanffy, 1967, p. 18) created tension. Capra (1996) describes the building tension that gradually transformed humanity and the world surroundings to a new way of thinking:

> The basic tension is one between the parts and the whole. The emphasis on the parts has been called mechanistic, reductionistic, or atomistic; the emphasis on the whole holistic, organismic, or ecological. In twentieth-century science the holistic perspective has become known as "systemic" and the way of thinking it implies as systems thinking. (p. 17)

The systemic way of thinking, first introduced by Bertalanffy (1967) gradually shifted the way that humankind was perceived in relationship to the rest of the world. The holistic concept grew through the human development behavior of a symbols system. The idea of an interrelated universe was creating an impact, as shaping forces changed behavior. Systems thinking became a changing force, too new and uncomfortable for some to accept. New forces reshaped old worldviews, and more changes transpired. An exploration through world, business, and school systems in the following sections of KAM 3 Breadth introduces Peter Senge's (1990) systems thinking theory as a shaping force in support of Bertalanffy's GST (1968).

Shaping Forces Alter Worldviews

Before Bertalanffy (1968) broke through fragmented scientific barriers with the concepts for GST, the worldview of hard science was perceived as a mysterious other world of unrelated theoretical discussions and discoveries, "General system theory, therefore, is a general science of 'wholeness' which up till now was considered a vague, hazy, and semi-metaphysical concept" (p. 37). The holistic, organismic, and ecological terminology used to describe GTS produced an understanding of patterns that began to shape modern science. Senge (1990) observed that "systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static 'snapshots'" (p. 68).

A self proclaimed systems thinker, Peter Senge (1990) began graduate work at Massachusetts Institute of Technology (MIT) in 1970 with little interest in business management. Senge's vision was that the world needed a basic understanding of the complex

systems within it. The vision developed into Innovation Associates (IA) Leadership and Mastery for anyone in organizations interested in learning. What started out to be workshops for business organizations in need of training for systems thinking leadership, soon became "relevant for teachers, public administrators, and elected officials, students, and parents" (Senge, 1990, p. 16). Senge openly admits that public education was not mentioned in any of his systems thinking literature on learning organizations, much like how Gardner's Multiple Intelligences (MI) (1983) developed without education in mind. The theories developed by Senge (1990) and Gardner (1983) have become instrumental in systems thinking protocol considered for educational reform for the 21st century.

The *learning organization* first conceptualized as a management fad by Senge in 1987 has become the "prominent fad of the first half of the 1990s" (p. xi). Realizing "that the world we live in presents unprecedented challenges for which our institutions are ill-prepared" (p. xii), Senge's (1990) vision included "destroying the illusion that the world is created of separate unrelated forces" (p. 3), much like Bertalanffy's (1967) vision of the world as a fragmented robotic mechanistic society in need of a more holistic organismic worldview.

In the learning organization, according to Senge's (1990) worldview, inventions turn into innovations only when a new industry is created, or an existing industry is transformed. Bertalanffy (1967) saw the transformation of an invention to an innovation when GST shifted the paradigm from a mechanistic view of humankind to an organismic view. In comparison, "learning organizations have been invented, but they have not yet been innovated" (Senge, 1990, p. 6). Just as GST has been in an incubation period from the 1950s, so learning organizations are

continuing to develop and improve in an incubation period. Time will tell of the lasting effects of GST and learning organizations as forces that shape worldviews.

Systems thinking, personal mastery, mental models, building shared visions, and team learning are the five components of Senge's learning organizations, each developed separately, converging into a holistic focus. Senge (1990) defines the components as disciplines, meaning "a body of theory and technique that must be studied and mastered to be put into practice" (p. 10). Some will master the disciplines through innate gifts, but others will need practice. Lifelong learning involves practice, never fully achieved, but always leading to "a new wave of experimentation and advancement" (Senge, 1990, p. 11). Worldviews are questioned and begin to change as new systems thinking philosophies emerge as evidenced throughout history.

Gradual emerging patterns of change are difficult to interpret within developing social systems, creating problems with how to adapt to the changes of the shaping forces. Bridging the mysteries of metaphysics with science altered worldviews in the thirteenth century when Thomas Aquinas (1273) wrote of the nature of humankind in terms of a holistic universe (O'Donnell, 1995, p. 93). Another example of altering worldviews came when Bertalanffy (1967) generated the idea for a need to change the perception of the individualistic nature of humankind to a broader interpretation where each human being is perceived as a shaping force in a systemic process. Capra (1996) captured the essence of the difficult transformation from individualism to holism with the statement, "Identity, individuality, and autonomy do not imply separateness and independence" (p. 296).

Social scientists develop new visions from the shaping forces within the environment, forming new theories to address emerging problems. Gradual independence between the systems

used to develop the emerging theories brought a separateness to the way humankind viewed nature and the environment (Capra, 1996). Abstract concepts as well as the concrete physical components of nature and the environment are applicable to the way problems are viewed by human beings. Social systems and organizations are comprised of problems, in Ackoff's (1999) view of systems thinking:

> Problems are to reality what atoms are to tables. We experience tables, not atoms. Problems are abstracted from experience by analysis. We do not experience individual problems but complex systems of those that are strongly interacting. I call them *messes*. Because *messes* are *systems* of problems, they lose their essential properties when they are taken apart. Therefore, if a mess is disassembled, it loses its essential properties. Furthermore, as in any new system, if each part taken separately is treated as well as possible, the whole is *not* treated as well as possible. (p. 117)

Taking problems apart allows the exploitation of the environment by special interest groups that promote a negative shaping force, weakening society as a whole. Independence to think using abstracts, according to Ackoff (1999), was a monumental accomplishment for human beings, but at a huge cost to humankind. Human beings became diminished and alienated from each other, and the negative shaping force was in need of reckoning. A reminder that "Independence is a political, not scientific term" (Margulis and Sagan, 1995, found in Capra, 1996, p. 296) indicates that escape from social, political, and economic decisions in any system or organization is unavoidable.

When research incorporating a systemic worldview began to develop within social systems and organizations a harmonious whole evolved (Bertalanffy, 1967, p. 71). Organizational worldviews were reshaped, altered from individualistic thinking patterns to systemic thinking patterns. Systemic thinking reveals that a system as a whole works differently than the parts of the system. The parts alone cannot do what the whole system can. The term

general in general systems theory is an important concept to consider as it refers to the generalizability of theories about social systems (Bertalanffy, 1967).

Theories develop to address the problems within systems according to what has been characterized as the general systems paradigm: the skeleton of science, where there would be "a science in which material and mental, unconscious and conscious, physiology and psychology could be encompassed by similar, highly abstract constructs or models. Whatever else these constructs may be, the concepts of system and organization will have a central role" (Bertalanffy, 1967, p. 101).

The GST framework developed because of the significant differences between systems and organizations and served as a central role for the skeleton of science. For example, differences between a solar system, an ecosystem, and a school system, require differing theories, to solve different kinds of problems. GST centralized society from fragmentation as new theories emerged. New theories cross boundaries and form patterns, uniting systems together strengthening the whole of humanity into a shared worldview. The mechanistic worldview gradually shifts, and continues to shift, as organizational systems change to an organismic worldview. When Bertalanffy (1968) contemplated how to unite many educated people within the systems of hard scientific inventions regarding the theory of relativity and quantum physics, the Copernican model of the universe, and the functions of the human body, the idea for a GST was revealed. Science became a science of systems and Bertalanffy's (1968) premise of GST still holds as a solid shaping force in how to view the nature of the environment through emerging patterns.

Recognizing how patterns in nature are seen as part of systems throughout history relates systems thinking to a global worldview belief. A new emphasis from individual *things* to how *patterns* emerge affects the whole of anything, as Capra (1996) observes, "The universe is no longer seen as a machine, made up of a multitude of objects, but has to be pictured as one indivisible dynamic whole whose parts are essentially interrelated and can be understood only as patterns of a cosmic process." (p. 6). The recognition of patterns in systems throughout history is not a new one, although Bertalanffy (1968) and Capra (1996) saw it as an important concept to grasp in the understanding of how systems theory behavior in organizations changed worldviews, "The understanding of patterns is crucial to understand the living world around us" (Capra, 1996, p.153).

Culturally and spiritually, evidence can be found that systems thinking is a shaping force on the essence of humankind. Dating back to the early Greeks, science and philosophy evolved into separate belief systems. When the noted philosopher and scholar Thomas Aquinas, student of Plato and Aristotle, merged scientific beliefs with church doctrine controversy in both worlds erupted (O'Donnell, 1995). Plato suggested that leadership in organizations may arise within enlightened philosophers, kings, and queens who understand the mystical principles of systems. Church doctrine espoused leadership from a superior being, "The entire human race has always and everywhere believed that a superior being (or beings) exists upon whom the material world and everything in it depend" (O'Donnell, 1995, p. 27). Conflict arose between the opposing worldviews of science and philosophy in how to view leadership, raising tension in society.

The thought of the natural progression of growth for humanity leading to the merging relationship between science and philosophy was met in ancient times with controversy. The

same fury of controversy is seen with the emergence of a systems thinking theory that suggested a shift in worldviews from a mechanistic to organismic belief. Human beings have choices, *freely chosen* according to Bertalanffy (1968), to believe in whatever assumption or system creates harmony for the betterment of society.

Laszlo (1996) states that obligations to the whole of humankind come with the freedom of choice, "this freedom is bounded by the limits of compatibility with the dynamic structure of the whole in which one finds oneself" (p. 58). According to Laszlo (1996), "The supreme challenge of our age is to specify, and learn to respect, the objective norms of existence within the complex and delicately balanced holarchic order that is both in us and around us. There is no other way to make sure that we achieve a culture that is both viable and humanistic" (p. 92).

Another example of ancient shaping forces of systems thinking comes from Confucianism and Taoism which guides the conduct of people in relationships to society and nature (Laszlo, 1977). Similar to the earliest system found five thousand years ago, the essence of the Chinese Yin/Yang system is about movement or flow. Systems in history reflect the shaping forces of movement or flow according the behavior of societal demands, and are reflected in the subsystems that surround human beings on a daily basis (Capra, 1996; Laszlo, 1977; McGregor, 2000 & Senge, 1990).

The movement and flow of society is interrelated to business and social organizations that are an integral part of the subsystem structure that Senge (1990) referred to as "also systems. They, too, are bound by invisible fabrics of interrelated actions, which often take years to fully play out their effects on each others" (p. 7). Given time, organizations that trust in natural self organizing will thrive when the effects of the relationships, patterns, and merging beliefs are

allowed to play out. Unfortunately, due to fast paced 21st century demands, humanity may miss the perspective of the integration within the surrounding systems that play a part of the larger social and ecological systems. Since the biological nature of humanity depends upon systems that maintain life within individuals, "we tend to focus on snapshots of isolated parts of the system, and wonder why our deepest problems never seem to get solved" (p. 7). When focusing on parts of the system, so much is missed, weakening the movement and flow of society as a whole.

Remembering that everyday decisions and events are shaped by forces within systems and subsystems surrounding individuals, leads to what Bertalanffy (1968) questioned: whether human beings *define the system*, or whether the *system defines us*. "Events seem to involve more than just individual decisions and actions and to be determined more by socio-cultural 'systems,' be these prejudices, ideologies, pressure groups, social trends, growth and decay of civilizations, or what not" (p. 8). The essence of mastering systems thinking lies in seeing patterns where others see only events and reacting forces that demand change.

Events in society have created actions in education demanding change, but often emerging patterns have been ignored. Self organization can arise spontaneously if given time through pattern recognition. The KAM 3 Depth component will further explore Bertalanffy's (1968) questioning of the defining nature and affects of systems thinking in the examination of the systems of educational organizations. The KAM 3 Depth will follow a narrower focus examining the current predicament in the educational system with high school students' inability to pass the CAHSEE in mathematics. The emerging patterns will be explored in detail in the Depth component.

In the next section of KAM 3 Breadth, Howard Gardner's (1990) systems theory approach to educational and business systems will be introduced. Comparisons of Gardner's theory with Bertalanffy's (1968) GST and Senge's (1990) learning organizations will follow. Comparisons of the systems theories of Bertalanffy, Gardner, and Senge in contrast to educational organizations indicate that society demands change. An exploration into whether a shift to systems thinking defined by GST (Bertalanffy, 1968) applies to the demands of society regarding issues in education ensues. Descriptions of Gardner's (1993) and Senge's (1990) theories demonstrate how more specific goals offer suggestions to meet the societal demands for change in educational organizations.

Societal Demands Foster Change

Civilizations are ultimately seeking a balance in life throughout the world, as societies search for an understanding of what is best for humankind. Traces of different lifestyles, religions, and politics have shaped and reshaped organizations indicating that differences will continue to exist, but maintaining a *steady state* is the ultimate goal. A "self-maintaining and repairing system is called a 'steady-state.' It is a state in which energies are continually used to maintain the relationship of the parts and keep them from collapsing in decay" (Laszlo, 1996, p. 32).

Scientific concepts and theories within organizations that have developed over time possess limitations and approximations, some lasting centuries, others only decades, but always causing controversy. The concept of a general system with one theory that fits all systems continues to evolve and change as societal demands change within organizations, as Bertalanffy (1968) intended with the introduction of GST in 1956. A new systems theory approach that life

and cognition are inseparable fits the behavior of the 21st century demands for unification of knowledge and action (Laszlo, 1977, p. 397).

Howard Gardner's (1993) theory on multiple intelligences (MI) was a contribution to psychology in 1983, however education, and teaching and training communities in industry soon embraced it as a unifying force of knowledge and action. It took on unexpected implications in the education community, as Gardner (1999a) suggested "the use of MI theory to enhance student understanding" (p. 164). Simply stated, Gardner's Theory of Multiple Intelligences (MI) claims that "seven 'core' forms of intelligences are an effort to lay out seven intellectual regions in which most human beings have the potential for solid advancement" (Gardner, 1993, p. 372). Society hungered for changes in educational reform, and MI theory opened the eyes of educators as a possible solution.

Defining *intelligence* became the initial criteria for the development of the theory. According to Gardner (1993), previous to MI theory, intelligence focused on what works best for a law professor, using a combination of only two intellectual strengths. A working definition of *intelligence* developed as Gardner incorporates a more holistic approach, "the ability to solve problems, or create products, that are valued within one or more cultural settings-a definition that says nothing about either the sources of these abilities or the proper means of 'testing' them" (Introduction: 10th anniversary edition, p. x).

Considering the intellectual strengths in more human beings than just the law professor types that use linguistic and logical intelligence answered a cry from the community of special education, a subsystem of educational institutions. More and more students are identified with difficulties in the learning process leading Gardner (1993) to add to the linguistic and logical

intelligence. The formulation of MI as linguistic, logical, spatial, bodily kinesthetic, musical, interpersonal, and intrapersonal strengths presents a more balanced holistic view of human characteristics. “Human beings have evolved to exhibit several intelligences and not to draw variously on one flexible intelligence” (Gardner, 1993, p. xii).

The Teaching for Understanding systemic framework was developed by Gardner (1999a) from the vantage point of MI to connect knowledge with action. Beginning with an observational phase that includes “stressing of generative topics that are both central to the discipline and attractive to students” (p. 165), the framework systematically leads into a hypothetical phase of “how to go from an observation to a hypothesis and back again to fresh observations that will ultimately yield further hypotheses” (p. 165). Gardner (1999a) recognized that the individuality of learning comes through the uniqueness of each human being.

The special education community of educators saw a chance to meet the needs for changes from societal demands for all learners with Gardner’s (1999a) Teaching for Understanding theory. Incorporating the MI theory through the use of Teaching for Understanding would benefit not only a specific group of students with identified disabilities, but the entire system of education could benefit. Teaching for Understanding effects are felt from sources outside and inside the educational system. A multiplicity of contributions results from the sharing of cultural experiences, an integral part of Gardner’s theory. Families throughout the cultures of the world are parts of groups, tribes, or clans and by sharing cultural experiences humankind is tied together into a more holistic worldview. Societal demands were beginning to elicit results as the MI theory and Teaching for Understanding concepts met the needs for reform in educational systems and organizations.

Similarities to Gardner's MI (1993) and Teaching for Understanding (1999a) are found in the circular patterns of Senge's (1990) learning organizations theory. The need for change, according to Senge (1990), that meets societal demands for growth can be experienced through circular patterns of reinforcing and balancing feedback, "Reinforcing (or amplifying) feedback processes are the engines of growth" (Senge, 1990, p. 79). Feedback from within organizational systems, not just trickled down from higher authorities, fostered a much needed change in business organizations.

Gardner's (1999a) research in educational systems uses the term *understanding* and Senge's (1990) research in business systems uses the term *growth,* supporting what Bertalanffy (1967) envisioned for GST as one of the four major functions to be applied to theoretical research, "encourage the development of adequate theoretical models in the fields which lack them" (p. 15). Each developed models with factors necessary to adapt to the systems and organizations in need of revision of the transference of knowledge for learning. Gardner's (1999a) and Senge's (1990) systems thinking models met the four general guidelines developed by Bertalanffy in 1956 for GTS, listed on page 11.

How knowledge is related to learning, and who is ultimately responsible for learning leads many scholarly discussions. If action is unified with knowledge as Laszlo (1977) suggests, does system thinking affect knowledge, action, and learning? Senge (1990) describes a pattern of action for *learning organizations* that assigns responsibility for learning, "In a learning organization, leaders are designers, stewards, and teachers. They are responsible for building organizations where people continually expand their capabilities to understand complexity, clarify vision, and improve shared mental models—that is, they are responsible for learning" (p.

340). Leaders then, according to Senge (1990), are indirectly responsibly to the organization for learning, relating action and learning, but leaving out knowledge in relation to action and learning.

Knowledge represents independent existing facts or images of cognition (Capra, 1996). An ancient model, the symbols systems of early humankind (Bertalanffy, 1967) also represents images, derived from the development of linguistics. The symbols system is discussed earlier in the previous section describing the systemic behavior of humans found on page 10 and 11. Similar to the symbols system for language development, the Chinese language continues to use pictorial characters, ideograms, two of which represent "the quality of being wholly human within the whole of human society" (Laszlo, 1977, p. 390). The symbol for man, *jen*, represents upright human posture and the symbol for humanity is composed of two symbols: man, *jen*, combined with *two*.

The unity of the two symbols tying humankind with humanity parallels the unity of knowledge and action, a central belief in Chinese thought, as Laszlo explains, "Knowledge is the beginning of action, action the completion of knowledge" (p. 390). Thus a relationship forms between symbols in linguistics and the philosophy of Chinese thinking. Humanity, knowledge, and action are linked through ancient and modern systems thinking. The process of knowledge and action is also the process of life, "being wholly human within the whole of society" (Laszlo, 1997, p. 390).

Another factor that influences systems thinking from Senge (1990) includes the variables of focus and energy along with a sharing of knowledge. A connected vision tied together by a common aspiration must be present, "a vision truly shared when you and I have a similar picture

and are committed to one another having it . . . Shared vision is vital for the learning organization because it provides the focus and energy for learning" (p. 206). The connectedness of systems theory that life and cognition are inseparable takes shape through a unification of many theories, past and present. As long as the vision is shared and the openness to change is not resisted, the focus and energy to meet the demands by society for change will transpire.

The final section before the conclusion of KAM 3 Breadth will focus on the broad perspective of educational systems and organizations, leading into the discussion for KAM 3 Depth. Factors that influence decisions in school systems will be compared to the theories of Bertalanffy (1968), Gardner (1999a), and Senge (1990). The conflicts that block needs in education contrast the current beliefs in systems thinking theories.

Systems in Teaching and Learning Organizations

Education in school systems currently operates under a linear system of human action and functions within a bilateral relationship between the larger society and the school system. The terms linear, meaning one dimensional, and bilateral, meaning having two sides (Merriam-Webster, 2003) are in a constant struggle with one another, weakening the goal of school systems: education. Mark Twain in 1907 may have been more serious than humorous when he said, "Never let schooling get in the way of a good education." Is it asking too much of the future to have both Tom Sawyer and Huck Finn wake up in the morning and exclaim, "It's a great day, and I'm not going fishin', I'm going to school!"? Obvious humorous exaggeration exists in Mark Twain's comparison of school and fishing at the turn of the previous century. A current dilemma that beckons systems thinkers and educators is to examine whether schools are getting in the way of education, as Twain's humor eluded.

The current school system continues to operate under a mechanistic worldview driven by the Industrial Age (Senge, 2000) when all of the rest of America has moved out of the Industrial Age into an age driven by technological advances. "Our large social institutions, subscribe to the concepts of an outdated world view" (Capra, 1996, p. 4). Researchers are developing a new vision of reality with the notion of learning as an essential condition of growth, espoused by Senge's (1990) learning organizations and Gardner's (1999a) Teaching for Understanding. An outdated worldview does not mesh with the new visions for reality, so it seems that schools are getting in the way of education. Changes are needed in the education system, but often times learning is blocked due to a strong unified resistance to change.

Survival, gaining, and retaining competitiveness are obvious urgencies felt in the business environment more than in the traditional closed school environment and its supporting institutions. Most schools are not learning communities (Gardner, 1999a & Senge, 1990). They are simply closed organized structures designed to turn uneducated individuals into educated ones. There is a tremendous capacity to often totally ignore and resist change (United Nations Educational, Scientific and Cultural Organization (UNESCO) (1996), leading to a conclusion that would justify that schools have been designed *not* to learn.

Facilitating learning through schools that support organizational learning as profit making institutions challenges educators to the task of how to best teach under an antiquated system. Developing *learning communities* (Senge, 1990), rather than just learning individuals, is a crucial elements of change needed in education to adapt to the changing worldview. Complex adaptive systems are currently best exemplified by the *learning organizations* (Senge, 1990) seen in business environments. Most schools remain closed systems resistant to change.

School systems are over stressed with under paid educators working in over crowded classrooms that reflect dynamic, nonlinear systems (Gardner, 1999b). The following hypothetical example demonstrates an every day occurrence in school systems that has lasting effects. For example, if a linear decision, "a means-end view . . . whereby a means is determined to achieve a desired end" (Hunkins & Ornstein, 1998), is made to add one new student to an already over crowded classroom then what appears at first to be a small change, in reality has large effects. To further explain, a relatively small change by adding one new student can largely impact the dynamics of a 5th grade class of 35 students that has been in session for four months. Not only do changes in the classroom occur, but changes on the school playground impact the entire school system. The entire 5th grade population of the school is largely impacted where 120 5th grade students from three other 5th grade classes socialize.

In the overstressed classroom when one new student is added late in the school year changes occur that affect the teacher and the 35 students. Along with the changing behavior patterns on the playground, one student who is adjusting to a new system in a new school causes, and is affected by, the change. "Every influence is both *cause* and *effect*. Nothing is ever influenced in just one direction" (Senge, 1990, p. 75). Cause and effect is multidimensional, showing the interrelatedness of the systems of education through the example of the impact caused from adding one new student.

When the principal and the parents ask for *feedback* from the teacher regarding the new students' progress, another dimension to the *cause* and *effect* aspect of the system is added. Feedback or iterations in any system makes exact precision impossible (Bertalanffy, 1968; Gardner, 1990 & Senge, 1990), yet, systems are based on feedback. Feedback is "a reciprocal

flow of influence" (Senge, 1990, p. 75) in systems thinking terminology. Feedback comes from inside and outside the immediate environment of the new student. Further examination into the decision to place the student in a new school requires feedback to other subsystem in the systems of the school organization. The interrelatedness of the school systems comes into play through outside sources.

A counselor, parent, or school psychologist requires feedback to support the decision for transfer of the individual student, affecting the cause and effect of the new school placement. Political, social, and economical forces drive bilateral decisions to be made, not always in the best interests of the students, the clients in the school system. The end result from a linear decision leaves a chaotic situation to the already overstressed classroom teachers, operating under the outdated non linear system. The liner decision makers are often politicians driven by monetary values. Chaos results, unbeknownst to the political decision makers because they are often out of touch with the effects of the non linear school system. Political aspirations can foster negative change (Bertalanffy, 1968; Gardner, 1999a; Senge, 1990).

Decisions that must be made politically, socially, and economically sometimes force educators to work backwards out of a chaotic system created by politicians uncommitted to the heart of the problems in teaching and learning. When budgets are cut and programs eliminated educators take what is offered by politically driven revenue to make the subsystems work, often counter productive to the whole school system, "The better before worse response to many management interventions is what makes political decision making so counterproductive" (Senge, 1990, p. 60). Individual educational organizations struggle to find cohesive holistic solutions within the subsystems, eventually gaining momentum by working together, but not

always in a positive direction. Strength gained through the struggles that educators endure has produced an educational monopoly within the school systems formed as "an impressive institutional infrastructure that links to a firmly established network of interests. Teachers constitute the 'largest single group of trained professionals in the world'" (UNESCO, 1996, p. 1).

Educators forced to fend off crisis after crisis within the existing chaotic system of educational reform have become a major facilitating factor (Hunkins & Ornstein, 1998), often producing a positive outcome from a negative situation. Unfortunately, a negative outcome has surfaced out of the chaos of reform and is leading a force of educators against change. Any alternative to the mainstream delivery of educational practices, the teacher-lecture-textbook-standardized test modality, has to "fight a hard battle to achieve even a minimum of recognition" (UNESCO, 1996, p. 1). Loyalties lie within the subsystems, so change is avoided, and resistance to change generates negativity in organizations (Bertalanffy, 1967; Capra, 1996; Gardner, 1990 & Senge, 1990). Resistance to change, when there is not a shared vision for reform is described by Senge (1990) as a "response by the system trying to maintain" (p. 88).

Problems are taken apart in education allowing the exploitation of the subsystems by special interest groups, *an implicit system goal* (Senge, 1990), specifically seen in the special education community of teaching and learning. The passage of special education laws mandating a *Free and Appropriate Education* through national legislation, along with The Americans with Disabilities Act (ADA), Section 504, and Individuals with Disabilities Education Act (IDEA), makes demands of the systems and subsystems. Perceived as a threat to the whole school system, some teachers and educators see the special education subsystem decisions to mainstream students with disabilities as an *irregularity* to the mainstream classroom

environment. The negative feedback and iterations from educators outside the subsystem of special education in regards to the mainstreaming of special education students produces more *irregularity* to the whole system of the school environment (Gardner, 1999a & Senge, 1990). Details in the Depth component will discuss where in the systems approach design consideration for the students with learning disabilities is or is not incorporated.

Close examination of the *irregularities* in the school system or in any other system, reveals patterns that can be detected as complex or sometimes easily arranged into themes. Complexity need not be feared or ignored, as noted by Senge (1990), "Systems thinking does not mean ignoring complexity. Rather, it means organizing complexity into a coherent story that illuminates the causes of problems and how they can be remedied in enduring ways" (p.128). The problem with the patterns of complexity and irregularity are considered in Chaos Theory (Lorenz, 1963). Chaos Theory attempts to explain the fact that complex and unpredictable results can and will occur in systems that are sensitive to their initial conditions. It is a non linear systems theory that states "small changes can result in large differences and that there is an underlying order in all that surrounds us" (Lorenz, 1963; found in Rae, 1999). The possibility of applying Chaos Theory to school systems indicates that there is a message of hope for over-stressed school systems.

The subsystem of special education in a school organization is sensitive to learning needs which differ from the mainstream teaching style, setting off a chain of events that fit Ackoff's (1999) definition of a system in operation:

> A system is a set of two or more elements that satisfies the following three conditions: 1. The behavior of each element has an effect on the behavior of the whole. … 2. The behavior of the elements and their effects on the whole are interdependent. …3. However subgroups of the elements are formed, each has an

> affect on the behavior of the whole and none has an independent effect on it. (pp. 15-16)

The affects from mainstreaming special education students changes the whole system of the school. Changing the behavior of the whole school will affect the behavior of the subsystem of the special education community of teachers and learners, according to the definition used by Ackoff (1999).

A common example used to explain sensitivity in a system is known as the Butterfly Effect (Lorenz, 1963). In theory it states that the flutter of a butterfly's wings in China could, in fact, actually affect weather patterns in New York City, thousands of miles away. In other words, it is possible that a very small occurrence can produce unpredictable and sometimes drastic results by triggering a series of increasingly significant events. This phenomenon, common to chaos theory (Lorenz, 1963), is also known as sensitive dependence on initial conditions (found in Rae, 1999). A small change in initial conditions can drastically change the long-term behavior of a system.

Following the line of thinking from the Butterfly Effect (Lorenz, 1963), Gardner (1993) describes a connection to Chaos Theory from Isaac Newton's desire to describe the world, "At the height of his powers there was in him a compelling desire to find order and design in what appeared to be chaos" (p. 151). The conditions under which Newton worked were often chaotic, but patterns emerged initiating the idea that an order must be hidden somewhere if sensitivity to initial conditions are realized. Chaos Theory in relationship to school systems means developing sensitivity to initial conditions politically, socially, and economically with a willingness to change.

Resistance to change in any system or organization exists, and is an extremely sensitive issue in education due partly to "the ranks of the faculty . . . loaded with tenured individuals who have scant incentive to change their attitudes or behaviors" (Gardner, 2004, p. 94). Without change, school systems will continue to get in the way of education. The process of the system in education reflects the "kind of society into which we evolve" (Hunkins & Orenstein, 1998). Conflicts exist between the process of systems in education and an evolving society in need of strong leadership.

A sound system to improve the educational organizations trains and develops strong leadership for a future on which society can depend. "When dealing with problems of dynamic complexity" (Senge, 1990. p. 79), as seen in the current educational organizations, a simple linear view focuses on a locus of responsibility that *he, she or it* is to blame. If a systems thinking philosophy is considered using a feedback approach to problems, then the responsibility for problems is shared by the system. Sharing the responsibility for problems may entice educators towards a new systemic approach, as "Scholars place great value on consistency and continuity" (Gardner, 2004, p. 190) and "new evidence alters beliefs" (p. 190).

A shift in the basic philosophy of school systems from the rote memorization of individual fragmented facts of knowledge to a system that views knowledge with a broad scope of *Teaching for Understanding* is needed. The systemic approach developed by Gardner, in collaboration with educational researchers (Gardner, 1999a, p. 165), uses a generic baseline for the problems that students have with understanding fundamental concepts. The Multiple Intelligence (MI) theory developed by Gardner in 1983 was not designed to be to used solely on its own merit and principles, but "it is better thought of as a handmaiden to good education"

(Gardner, 1999a, p. 166). Keeping in mind, according to the MI guidelines, that human minds have strengths and weaknesses in at least seven cognitive areas, teaching and learning should reflect diversity. The current one size fits all approach in education has not successfully established a system that gains optimal potential for all learners (Gardner, 1999a; Senge, 1990).

The term *unschooled,* coined by Gardner (1999a), refers to students who cannot demonstrate abstract thinking when asked questions regarding the currently adopted curriculum under which teaching was designed. The past decade reflects educators and social scientists formulating questions through studies, and when asked outside of the classrooms "most students in most schools—indeed, many of the best students in the best schools—cannot exhibit appreciable understandings of important ideas" (Gardner, 1999a, p. 162). Businesses and schools are both dramatically affected by the results because both organizations are fundamentally concerned with learning. The Depth component will explore alternatives in the broad implications of systems thinking that further explain the need to develop independent thinkers for the new millennium.

Conclusion

Systems thinking ties individuals together within society indicating that interdependence with one another exists. The 21st century demands an interrelatedness of knowledge and action in larger and smaller social organizations. What is presently found in schools systems is inconsistent with what society demands. Unfortunately, some larger social institutions such as school systems subscribe to the old objectives and worldviews of analytical strategies dissecting and fragmenting humanity. The outdated worldview disassociates humankind from understanding the need for operating through wholeness (Capra, 1996):

> Our conventional model of knowledge is a part of the process of life, of a dialogue between subject and object. I believe that the worldview implied by modern physics is inconsistent with our present society, which does not reflect the interrelatedness we observe in nature. To achieve such a state of dynamic balance, a radically different social and economic structure will be needed; a cultural revolution in the true sense of the word. The survival of our whole civilization may depend on whether we can bring about such a change. It will depend ultimately, on our ability to...experience the wholeness of nature and the art of living with it in harmony. (p. 7)

Understanding the character of teachers, workers, colleagues, and students is especially important for organizational leaders in today's school systems. The current mechanistic, detail oriented non systems approach is not successful in teaching all levels of learners (Gardner, 1991). Human beings are complex, and not easily manipulated. Research by Ackoff (1999), Bertalanffy (1967), Capra (1990), Gardner (1993, 1999a), Laszlo (1997), and Senge (1990) indicates that learning is possible for all levels of learners if changes are made.

"School are incredible complex institutions, located in incredible complex environments" (Gardner, 1999a, p. 112) with systems and subsystems influenced and affected politically, socially and economically. In 1956 Bertalanffy (1968) saw the influences as shaping forces, "Events seem to involve more than just individual decisions and actions and to be determined more by socio-cultural 'systems,' be these prejudices, ideologies, pressure groups, social trends, growth and decay of civilizations, or what not" (p. 8). Uniting the fragmented shaping forces of the world in 1956 with a general theory was a vision realized when General Systems Theory was introduced. GTS continues to guide the quest of systems theorists to unite the subsystems of the world.

The KAM 3 Depth component will further address the complexity of the school system as it relates to systems thinking theories. The fragmentation of schools fails to relate to students who learn outside the realm of logical and linguistic teaching (Gardner, 1993). Needs for

increased attention, self-direction, and increased visual and verbal skills require changes to be made. Change is certain, but progress is not, from Gardner's (1999a) perspective, "The recess of the mind remain private, and no one can tell the mind exactly what to do. The challenge to the mind is to make sense of experience, whether on the street or in the classroom" (p. 112).

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Knowledge Area Module 3

Principles of Organizational and Social Systems

Depth Component

EDUC 8321: Social, Legal, Political, and Economic Systems

Depth Annotated References

Barbetti, V., Barriga, A., Doran, J., Newell, S., Morrison, E. & Robbins, B. (2002). Relationships between problem behaviors and academic achievement in adolescents: The unique role of attention problems. *Journal of Emotional and Behavioral Disorders, 10, 233-240.*

Reported from a systemic point of reference, the relationship between attention problems and academic performance from the 2002 study found that a reciprocal influence exists. Problem behaviors and academic achievement were compared using extensive statistical analyses, including MANOVA, ANOVA, multiple regression analyses, and post hoc analyses. Standardized test scores from 58 students ages 11-19, attending an alternative school in an urban area of large eastern city, were collected and compared with Teacher Report Forms (TRF) for ages 5-18. The TRF is a multidimensional behavior rating scale used by teachers to report behavior problems. The inverse relationship between problem behaviors and academic achievement often reported in other studies was not found in the Barbetti et al. study.

The alternative school setting reveals that an explicit bias exists due to the unbalanced numbers of male and female students. Only 17 out of 58 of the participants in the study were female, far fewer than in a normal school setting.

Many problem behaviors are not related directly to underachievement, but are associated with attention problems. The attention problems have a negative effect an academic achievement. The results indicate that a clear understanding between problem behaviors and academic achievement will help generate appropriate assessment, prevention, and intervention strategies for at-risk or troubled youth.

Bolland, J. (2001). In search of a few hundred good kids: Three months in the life of a community-based survey research study. *Families in Society: The Journal of Contemporary Human Services, 82, 79-109.*

The author reports of the serendipitous results of a five year project to develop, implement, and evaluate an intervention designed to reduce risky behavior in adolescents that live in public housing in Huntsville, Alabama. The study initially began as a collection of information for a survey, but soon developed into an ethnographic research study. The community based survey had to be read to the participants because most were school drop outs without the ability to read. A variety of topics from the survey included experience in school, self esteem, expectations about the future, and feeling about the neighborhood. The conclusions produced alarming results that American society had not improved living conditions for members of the public housing system.

The survey was conducted from within the community of youth living in the area, with parental permission granted. The first hand observations of the author created biases due to the stressful conditions that took place in regards to the collection of survey participants. Personal interviews from door to door interviews threatened the well being and safety of the author.

The article reveals valuable information to future researchers in need of information that must be obtained in ways not taught within the textbooks. Real life situations became the education from which the author learned, indicating that the connections outside of the classrooms are necessary to expand the learning process. The contextual environment provided the basis of the evaluation necessary to develop and implement the suggested interventions.

Bonny, A., Britto, M., Hornung, R., Klostermann, B. & Slap, G. (2000). School disconnectedness: Identifying adolescents at risk. *American Academy of Pediatrics, 106, 1017-1029.*

A longitudinal study examining target populations for school based intervention programs lacked statistics for the highest at risk for health issues, thus leading to the study. The connectedness to school score (SCS) was a compilation of an in health survey from 7^{th}-12^{th} grade students in eight public schools. Seven out of twelve variables associated with school connectedness entered the regression model, and six were significant: race, extracurricular involvement, cigarette use, health status, school nurse visits, and school area. Gender was not significant. Identifying factors that relate to youth who do or do not feel connected to school leads into the development of school based prevention strategies for the highest at risk for behavioral and health issues.

The cross sectional survey of self reported data does not include direct measures of behavior, an explicit bias, but suggests that connectedness is malleable. Mention of a well documented recent study reported that interventions had positive effects of school bonding when interventions are started early in the school career. A detailed reference list is provided to aid in the validity and reliability of the data.

Adolescents found to be in need of assistance to better connect to school were frequent visitors to the school nurse. Using the school nurse as a resource to identify disconnected youth, indicates that the school system through the basic organizational structure provides built in remedies for areas of potential need. Data needed for target population studies for behavioral or health issues were found within the system, eliminating the need for outside intervention.

Bui, Y., Deshler, D., Schumaker, J. & Vernon, D. (2000). Promoting success in the general education curriculum for high school students with disabilities: The context as a whole. *Research Synthesis Series: Institute for Academic Success*, 1-24.

Despite myriad laws to support special education, factors within the school environment prevent learning from taking place. Standards based education was enacted at the same time special education students were mainstreamed into the regular education classrooms. Confusion as to the role of the special educators has devalued, creating a new role as a paper pusher support person who sits in the back of a general education classroom as an Instructional Assistant. General education course requirements have become more stringent to meet standards based testing, with text book levels up to 17th grade reading in some government courses required for graduation. Students with disabilities can learn, but the training for teachers is non existent to meet the needs of the learners, so inadequate teaching strategies are still being used.

The authors cross reference from an extensive five page list of references, validating that the report represents accurate and current information. The reliability of the data can be checked and researched further through the citations. The format is an analytical reporting of the status of the high school general education classroom and how students with disabilities struggle within the confines of the current environment.

The value of the report is immeasurable. The picture of the current status of high school education is dismal and unreachable for the students with disabilities due to legislation outside of special education. The legislation in favor of students with disabilities is in place, but due to mandates for more testing, state standards, and more rigorous goals for regular education, unrealistic expectations for special education students exist. The mainstream environment is where the students with disabilities are programmed to study, but the teachers are not trained.

Davey, L. & Neill, M. (1991). The case against the national test. *Practical Assessment, Research & Evaluation.* Retrieved from http://PAREonline.net.getvn.asp?v=1&n=10

Education reform is a struggle facing schools in the United States, and a national test will only inhibit student growth, a cart of testing placed before the horse of educational reform. The authors report on testimony to the House subcommittee on Select Education that indicates harmful effects from national testing will impact low income and minority group children. An alternative plan to national testing from the National Goals Panel and the National Council on Educational Standards and Testing suggests performance assessment. The standardized exam driven efforts for school reform in the 1980s failed, thus substantiating the outcry against another national testing mandate.

Explicit biases include false claims by proponents of a national test stating that other nations have national tests or exit exams similar to what is proposed for the United States. Significant references are included to back the authors' claims against national testing that validates the report, giving it reliability for future use in citing the sources.

Educators, parents, teachers, and anyone interested in education reform will profit from the information in the report. Communities with low income and minority group children will be especially interested in the arguments against national testing. Another serendipitous group to be impacted by the values of the article is the special education community of teachers and learners. More hands on interactive curriculum that can be evaluated through performance based assessment directly effects learners outside of the logical and linguistic realm of teaching. The report suggests proposals regarding performance based assessments are out there for consideration. Specific groups that propose the New Standards Project are designing model exams for states and districts to adopt for more individual goals related to the needs of learners.

Echternacht, G. (1989). Interpreting test scores for compensatory education students. *Practical Assessment, Research & Evaluation.* Retrieved from http://PAREonline.net.getvn.asp?v=1&n=10

Rules must be followed when interpreting test scores, according to the author, as objective measures are necessary in choosing students for compensatory programs. Supplemental educational programs although under funded are an important part of school systems, so careful placement into the programs is necessary. Multiple measures of testing gives a more accurate account of student progress, so if standardized scores are the only acceptable means of evaluation, then using a sequence of assessments is recommended. Study teams used to evaluate student progress can use standardized scores if an understanding of how to interpret the scoring process has been taught. Definitions for out of level testing, grade level testing, and degree of error are listed in the article. Few administrators properly interpret the degree of error in individual and group test scores.

The article has no reference list, no citing within the reported information, and under the name of the author is listed Educational Testing Services. Hidden biases indicate that more testing is recommended because the author is affiliated with the testing services company. Doubt is raised as to the validity of the reported information. The definitions can be validated through dictionary cross referencing, thus adding credibility to the information presented.

Educators at all levels from administrators to classrooms teachers need valid and reliable information regarding standardized testing. Mandatory testing has become a staple in education, and an accurate understanding of the testing process should be a requirement of teacher preparation. The article reports information clarifying terms used in testing that may be helpful to anyone reading or interpreting the scores.

Kim, J. & Sunderman, G. (2004). Increasing bureaucracy or increasing opportunities? School district experience with supplemental educational services. *The Civil Rights Project at Harvard University, Cambridge MA.*

The federally mandated policy for schools, No Child Left Behind (NCLB) enacted in 2002, demands feedback to evaluate the success or failure of the program. Developments often answer the call for feedback, but may not be the answer the bureaucrats wished to hear. The study was conducted to evaluate the follow up phase of NCLB, supplemental educational services for students not meeting defined learning goals. A nationwide survey concluded that a flawed system exists due to myriad paper trail requirements, lack of funds, and a poor response from the target population of students intended to reap the benefits of the services.

The study provided an extensive reference list with ample citing throughout the documentation to substantiate the findings. Fairness in the collections of data and reports gives credibility to the results, making it believable and reliable to use for future resources in regards to NCLB.

Organizations interested in establishing a supplemental educational services plan as prescribed by the NCLB guidelines will find the information useful. School districts in collaboration with outside community resources will find pros and cons to the supplemental educational services systems used across the nation, with a focus on the local monetary impact. Insufficient funding led the complaints, so that aspect will assist future program developers. Lack of connectedness between the service providers and the classroom teachers, another flaw, will need to be improved so that a successful system can be established to offer supplemental educational services for students not meeting defined learning goals.

O'Neal, J. (2004). Learning difficulties: A clearer path to reading fluency. *Biological Psychiatry: Vital Signs:* 1-2.

Students with dyslexia ages six to nine, considered poor readers, were studied comparing the amount of remedial instruction time to the improvement made in reading fluency. A group of 37 received a more aggressive treatment for two hours a week using systemic, phonics based curriculum. A comparison group of 12 students received the normal remedial help provided by the school: about one hour a week. Published information supports that the intense teaching group made up half the reading gap, where the other students fell further behind.

An area of the brain known as the word-form region indicated more activity in the group that was taught with the newly formed systemic curriculum. A before and after evaluation was conducted using results from standardized reading tests and brain scans. Yale Doctor Sally Shaywitz (2004), one of the authors of the study, called the study a success by stating that an effortless change yielded crucial results.

The author did not list sources or references, indicating an explicit bias to the results. The referenced text from within the article provides options to aid in checking the credibility of the information to eliminate hidden biases.

Students with dyslexia are the clear winners with the published study results, indicating that not only reading may be improved with the results of the newly activated brain function found in the scans. The successful use of a more intensive systemic curriculum supports educators in a quest to reevaluate current practices for a more aggressive approach to students with learning difficulties.

Perkins-Gough, D. (2005). The perils of high school exit exams. *Association for Supervision and Curriculum Development: Educational Leadership, 63,* 90-91.

The timely research reported in the article mirrors the hotly debated topic of an exit exam requirement to attain a high school diploma. According to the author, multiple measures of assessment should be the norm and not a single standardized test. Multiple choice short answer tests that are currently used to measure standards in some states narrow the curriculum and instruction focus resulting in less emphasis on complex thinking and problem solving. The author cites a report out of a Stanford University School Redesign Network by Linda Darling-Hammond entitled Multiple Measures Approach to High School Graduation. Testing experts warm against single test results as sole sources of information for decisions in education. High stakes testing pressure takes precedence over performance oriented assessment due to high costs of NCLB mandates for annual testing in grades 3-8.

The article is well cited and is validated by direct reference to the availability of the article on which it is based. That schools and students are harmed by the exit exam requirements is substantiate by facts from the National Center for Educational Statistics (NCES). The absence of hidden or explicit biases deems the information reliable.

Parents, teachers, administrators, counselors, and students can use the information from the article as a springboard for discussions and debates on the timely issue in education regarding high school exit exam requirements for graduation. Examples of 19 states that are developing alternative means of multiple assessments to be used along with the standardized test gives the reader choices to research further. Policy makers can use the information to form more informed opinions regarding the decision of some states to require an exit exam for graduation, where other states do not.

Reilly, D. (1999). Diplomates in school psychology: Architects of effective learning. *Education: Project Innovation, Summer 1999*, 1-9.

The primary role of schools is to promote learning of all students. Key factors presented by the author are flexibility, training, internal and external demands, increased testing, effective learning, and learning organizations all of which fall under the expertise of the trained diplomate school psychologist. Schools are based in linear curriculum presentation, but students are in need of flexible non linear teaching styles. Effective student learning is blocked because teachers and policy makers do not understand how learning occurs. Research about learning has emerged in cognitive science (Gardner, 1985), but schools have not translated the information to teacher training programs or curricula.

The author promotes the role of the school psychologist as the catalyst to change the school environment to a learning organization, as the school psychologist has the precise training in how students learn. The explicit bias is that the author is a school psychologist, but the information presented in the report is cited extensively throughout, and the reference list is three pages long. The reference list validates the report, and the facts are reliable based on reputable citations.

Interested parties in educational reform will find the report interesting, with substantiated facts and challenging ideas. Thus far, education reform has not succeeded. Fresh ideas such as the author presents, although egocentric on the part of the author, are thought provoking. Chaos theory is introduced as a basis for student learning, linking much of the research from social scientific theories to the current state of schools pressured to improve student achievement through increased testing. Learner centered programs are the focus with the school psychologist playing the leading role in assisting schools with the transformation into learning organizations.

Schlozmans, S. (2003). The shrink in the classroom. *Educational Leadership, 60, 91-94.*

The author conducted a study to support the Health in Education Initiative by collecting information to keep teachers apprised of current practices with psychosocial difficulties concerning school age children and adolescents. The practice regarding the use medications to control behavior and attention gives rise to question whether schools should have input into the treatment of the child. Schlozmans (2003), a clinical instructor in psychiatry, interviewed a learning specialist regarding when to treat a child with learning problems from the point of view of the teacher. The results stress that careful communication between the parents, school, teacher, clinician, and the student be continually monitored for maximum benefit of any prescribed medications.

Two rules of when to treat should be considered, as the article states medication is not the end all to address student problems in school and a careful balanced approach to each individual child's situation must be considered. First, careful assessment to psychiatric treatment is serious; some may require only monitoring while others may need medical intervention. Second, parent, educator, and student input are important, and follow up from school counseling or psychotherapy best supports medical interventions.

The author reveals only minimal sources for classroom behavior feedback leaving room for doubt and hidden bias. There is no listed source for the descriptions of medication, and the author openly admits that the United States Federal Drug Administration does not approve all medications currently prescribed for school age children and adolescents.

The list of medications and related side effects that may surface in classroom situations provided in the article is invaluable to anyone in education looking for interventions or solutions.

Schubert, W. (2006). Seeking educational insights from autobiographical and artistic sources: reflecting on *Speak, Hands* as educational text. *Educational Horizons*, 84 (3), 130-135.

Looking to sources outside of education for insight into enhancing curriculum and teaching in education is the focus of the article. Literature, art, prose, and poetry unexpectedly serve as a hidden wealth of information to educators. Research in education is the focus of the article as the author explores *Speak, Hands* by Lillian Moats (2006) to offer educational insights. The pressure of test based curriculum distracts teachers from the real focus of what it means to teach. A discovery of self understanding with purpose and direction in life should be taught to all students, regardless of mandated testing. The autobiographical narrative reveals a self understanding, as the author relates to Dewey's (1915) view of education as a coordinated effort of manual activities. Mind body dualism, a Dewey concept, is stressed as a fact to be taught along with teaching that the individual is part of a larger system of the whole of humanity.

The author has a hidden agenda as he has written books that are quoted. Regardless of a hidden bias, the purpose of the article is well supported with a list of references and citations throughout the text. Finding insight into teaching from unnatural sources usually unrelated to education opens broader horizons to educational research. The article is valid and reliable to the field of education.

Educational researchers, curriculum specialists, teachers, and district level policy makers will find the information interesting and useful. Connecting art, literature, music, and other forms of artistic expression to educational systems bridges gaps for educators from school to real word experiences. Searchers for alternative forms of assessment to counterbalance the mandated standardized tests will find the article a useful source on which to base student performance.

Sroufe, J. & Wurtz, S. (2003). The institute of education sciences: What is different? What differences does it make? *American Educational Research Association-Organization of Institutional Affiliates, RPN, 1-13.*

The very lengthy and wordy report was filled with rhetorical information outlining the organizational structure of the new legislation compared with the old, but had very little with systems in educations. Educators are not listed anywhere in the report as members of any of the committees or subcommittees in which the members are all appointed, directly relating back to the White House. The comparison of the new Institute for Education Sciences (IES), signed into law by President Bush in 2002, replaces the old Office of Educational Research and Improvement (OERI), an eight year old organization. Changes in leadership were established to initiate a six year appointed term to the directorship, replacing shorter terms that crippled long term research goals from being established. Field initiated research is eliminated (p. 5).

A brief list of references was included that leads the reader to other scientific based information regarding research. More directly, it was cited by the director of the newly established IES that the bill is relatively modest in its expectations for school reform. The Panel on Improving Education Research (PIER) recommended a peer reviewed process to assure the quality of the research, but the legislated requirements only call for a narrow band of methodologies. Thus, the reliability and validity of the research will be compromised.

The usefulness of the article is limited to gaining an insight into the basic organizational and systems structure of governmental legislation. Government appointed positions are created to support interests directly related to the White House agenda. Rhetoric and sophistry cloud the issue of the need for research in education, revealing that expectations for its work seem unrealistic and designed to result in disappointment.

Thornton, S. (2001). New approaches to algebra: Have we missed the point? *Mathematics Teaching in the Middle School, 6, 388-392.*

The author examines curriculum reform in Mathematics raising questions as to the success of the changes in teaching the fundamentals of algebraic thinking. The Curriculum and Education Standards for School Mathematics (National Council for Teachers of Mathematics [NCTM], 1989) and A National Statement on Mathematics for Australian Schools (Australian Education Council [AEC], 1991) both challenged the conventional view of algebra, stressing that algebra is a study of patterns and relationships. The author provides eight different figures with charts, diagrams, and graphic descriptions to explain alternative ways of viewing the same formulas. Regardless of the changes, the author insists that the power of algebra is in the understanding of the nature of algebra so that algebraic knowledge transfer can be applied for a purpose.

The author assumes that the reader has a basic understanding of algebra as some concepts are not defined clearly. An extensive reference list is provided so cross referencing can be done to better understand the mathematical concepts of the article.

As algebraic curriculum is currently scrutinized in regards to the California High School Exit Exam, the article is invaluable to parents, teachers, and administrators for a better understanding of why changes in algebra have surfaced. The changes described in the article are approached from the algebraic angle of patterns, symbols, and functions, with detailed diagrams and charts explaining how to teach each new approach. One important concept involves critics of algebra continuing to stress the variable approach in which letters stand for numbers: one of the most difficult for beginning algebra students. Fruit Salad Algebra uses objects instead of letters.

Wenning, R. (2005). A look at growth models. *Northwest Evaluation Association, 4, 1-4*.

Assessment and accountability in conjunction with fairness is the central issue presented by the author. While No Child Left Behind (NCLB) brought federal expectations of universal proficiency, the fairness of NCLB is a hot debate in and out of the courtrooms. Educators cannot control that snapshot test scores are used annually to measure the effectiveness of schools under NCLB legislation. Students come and go within districts and NCLB provides nothing for the flux. Teachers want and need a measure of productivity that is fair, that follows individual student progress, and can be used for accountability. The measurement of proficiency for growth set to standards can be evaluated with longitudinal growth models.

There are no references listed with the information provided in regards to growth models, but what is mentioned within the article can lead to additional cross referencing to validate the claims made. Pro and con information is stated so that a balanced view can be gleaned from the report. The need for expert scrutiny is also suggested to meet the needs of what proficiency really means from the vastly different bars states have set.

The report addresses an urgent need in education regarding the practice of using an annual test score that is not a fair measure of school effectiveness. The suggestion for using growth models to track the individual progress of students regardless of the very different starting point levels can be invaluable to teachers, parents, and administrators. Where students need to improve can easily be addressed and what resources are needed to meet the needs can generate from a growth model report. Measuring growth against goals for proficiency for each individual student provides a picture for everyone involved with the student within the many systems of the school: teachers, counselors, coaches, special educators, or administrators can all benefit.

Depth Component

Introduction

The depth component of KAM 3 will examine the breakdown of the systems approach in educational institutions regarding how or why broader congressional mandates often neglect to consider the individual needs of the students. One result is the inability of students with disabilities to pass the California High School Exit Exam. Organizational and systems theories by Ludwig von Bertalanffy, Howard Gardner, and Peter Senge as discussed in the Breadth section, offer guidelines that provide a basic understanding of the systems thinking approach to educational organizations. Contemporary research conducted by social scientists examines where in the systems thinking approach design consideration for the learning disabled student is or is not incorporated. Factors including social, legal, political, and economic aspects play a critical role in the organizational process of education (Reilly, 1999), and will be considered in the depth analysis.

A student identified with a learning disability in the early 1980s sat in the same classroom all day under the one room fits all systems approach to special education. Peers also identified with learning disabilities felt the sting of the visual identifying factor of one classroom designated for all the students in need of support outside of the mainstream environment. Embarrassed and humiliated, the students with disabilities tried to remain anonymous to protect individual self esteem as the school system fails to attend to the needs of individuals as human beings. School systems attend to the mechanics of education, but often ignore the needs of the individual. There was a constant struggle to conceal individual identity, in hopes that no one would recognize the needs for special education accommodations (Guskey, 1996; Senge et al., 2000).

In stark contrast, a student with a learning disability in the 1990s was somewhere on a high school or middle school campus attending mainstream classes, not easily identifiable by the general population. Special education, a subsystem in the educational organization of multiple systems and subsystems in flux, is in the process of a shifting paradigm (Bui, Deshler, Schumaker & Vernon, 2000; Gardner, 1999a) in need of educational reform. A study conducted in 2003 by school psychologist Schlozmans found that "a careful balanced approach to each individual child's situation must be considered" (p. 93).

Gardner (1999a) and Senge (1990) recognized that the general systems thinking philosophy developed by Bertalanffy in 1968 is the shaping force of the future in the educational system. Societal demands for more independent thinkers motivated the development of two theories that apply to teaching and learning: *teaching for understanding* (Gardner, 1999a) and *learning organizations* (Senge, 1990). Unfortunately, the holistic view of the systems thinking theory (Bertalanffy, 1968) has not reached fruition in the organization of education as a whole, leaving gaps in a system that do not include all levels of learners. The gaps have a profound effect on the success of the whole system as a negative shaping force in the physical environment (Slowik, 2006) of the organization.

The behavior of the school system is affected by interactions of the surrounding systems within the social and physical environment of the school. Often the physical environmental gap that exists is ignored, "few reviews have focused on the environmental or contextual factors . . . and how those factors interact" (Bui et al., 2000). In a study conducted by Bolland in 2001, conditions of the environment are both affected by and affect the behavior of the systems it contains. "Connections outside of the classroom are necessary to expand the learning process"

(p. 88). Outside of the classroom, decisions to expand the learning process are made on paper, driven by policy makers, but regardless of how good a decision may look on paper, what really matters is the real life application. If papers pushing political mandates do not connect to real life improvement in the educational environment then a positive impact on the systems will not be reflected according to Bolland's ethnographic study in 2001.

The social environment of the educational system, controlled by the political paper pushers that shape educational reform, is in a state of chaos. Real life applications of revenue driven political agendas do not support teaching and learning organizations, "with all the swings of the pendulum, there is no forward motion, only a further retreat; education will continue to go nowhere unless it can turn off its limited track and move toward a wholly different mode of understanding human action" (Kilpatrick, 1992, p. 111).

The need to understand human action was described by Dewey (1915) to recognize that education is a necessity of life through the socialization of individuals:

> Individuals should be educated as social beings, capable of participating in and directing their own social affairs. This means a freer interaction among social groups, as well as attention given to developing all the potentialities an individual may have for future growth. He looked on education as a way to free the individual to engage in continuous growth directed toward appropriate individual and social aims. (Dewey, 1915, found in Craver & Ozmon, 1999, pp. 150-151)

An exploration into whether a shift to the systems thinking theories of Gardner (1999a) and Senge (1990) applies to the chaos in educational reform will follow. An examination of a current predicament in educational institutions, the inability of high school students identified with disabilities to pass the CAHSEE in mathematics, will be the focus. Exploring political, social, and economical developments in the systems of education will reflect where breakdowns may occur that thwart the efforts of educators to meet the need of all levels of learners.

Educational Institutions

America has moved out of the mechanistic system of the Industrial Age and so has the business world (Bertalanffy, 1968; Gardner, 1993; Senge, 1990). The current shifting paradigm is moving into what Bertalanffy (1968), a biologist, recognized as a general theory of an interrelatedness of all of the systems of the world, calling it General Systems Theory (GST). The universe is viewed as an organismic whole where human beings and the environment interact with each other, in a continuous cycle of feedback (Senge, 1990). Unfortunately, however, our educational system has not moved into the organismic worldview way of thinking and continues to operate from a linear teaching style (Reilly, 1999). Studies conducted inside and outside of educational organizations (Echternacht, 1989; Wenning, 2005) reflect the need for school systems to shift the focus to a systems thinking design where consideration for all levels of learners is incorporated.

Senge argues persuasively with his theory of *learning organizations* that we must abandon Industrial Age assumptions about schools (Senge, 1990; Senge et al., 2000), backed by Gardner's (1999a) *teaching for understanding* theory. Centering learning on the students meets the needs of the shifting paradigm, suggesting that curriculum revisions will address current societal demands on educational institutions for more independent thinking. A study conducted by Barbetti, Barriga, Doran, Newell, Morrison & Robbins (2002) indicates that "intervention strategies for at risk or troubled youth will help generate appropriate assessment" centering on performance assessment rather than standardized assessment which reflects a mechanistic approach to teaching and learning.

Treating schools like living systems instead of machines (Bertalanffy, 1968), discouraging homogenizing student learning (Senge, 1990), and getting away from rote memorization (Gardner, 1999a) are three suggestions of how to introduce a new thinking process to address the flaws in educational institutions in urgent need of change. Challenges of 21st century systems thinkers focus on meeting the current school crises by examining the political mandates from government systems, as explained by Senge (1990), ". . . the crisis in American schools and 'gridlock' in Washington—a wake up call that the world we live in presents unprecedented challenges for which our institutions are ill prepared" (p. xii).

Political, social, and economic decisions shape organizations within the environment of the school systems reflecting a system in need of reform. Societal systems are interrelated. To succeed in understanding any part of society surrounding the school system, it is necessary to develop an understanding of the interactions of individuals within the systems of education, politics, and the economy (Bertalanffy, 1968; Capra, 1996; Gardner, 1993; Laszlo, 1996; Maslow, 1998; McGregor, 1985; Senge, 1990). As changes emerge within a developing society, various contemporary social scientists conduct studies and formulate approaches ranging from philosophical hypotheses to mathematical formulas.

When paradigm shifts emerged in the evolution of a society, at the time America began a gradual shift from the Industrial Age to the Information Age around the 1950s, worldviews changed and problems emerged. Not all systems are as readily open to change as others, as seen in the confusion of activity within the social systems of educational reform that continue to operate by the design of a bygone era (Gardner, 1999a; O'Neal, 2004; Senge, 1990). Schools operate in a continual crisis mode, as a study conducted by Bui et al. (2000) reveals numerous

pieces of legislation that negate each other, "These initiatives can be used to create a potentially positive climate for students with disabilities in high school; however, some of the other trends and factors may create barriers that will prevent a positive climate from becoming a reality" (p.5).

The recognition of the need for reform in education is not a new concept. During the past four decades educational reform efforts have been a hallmark of American educational organizations, "As long as society is dynamic and composed of a conglomeration of cultural and social groups, the debate over the aims of education will stir up controversy and change. Perhaps this is good; perhaps this is what makes a society viable and able to resist decay" (Hunkins & Ornstein, 1998, p. 167).

The acceptance or resistance to change rests in the hands of whoever has the controlling power of feedback. Power controls whether potential chaos or steady state reigns in an organizational or social system (Cronin, Houser, Houser, Kingsbury & Olson, 2003). Established norms may not always reflect what is best for social systems and organizations, but if the power lies with the wrong authority to control decisions, resistance to change generates negativity in organizations (Bertalanffy, 1967; Capra, 1996; Gardner, 1991; Senge, 1990). Resistance to change, when there is not a shared vision for reform is described by Senge (1990) as a "response by the system trying to maintain an implicit system goal" (p. 88):

> Resistance to change is neither capricious nor mysterious. It almost always arises from threats to traditional norms and ways of doing things. Often these norms are woven into the fabric of established power relationships. The norm is entrenched because the distribution of authority and control is entrenched. Rather than pushing harder to overcome resistance to change, artful leaders discern the source of resistance. They focus directly on the implicit norms and power relationships within which the norms are embedded. (Senge, 1990, p. 88)

The subsystems of an organization may have ingrained and interdependent goals previously established in the organizational structure, and the loyalty from the supporting subsystems, often the controlling power forces, create resistance to change (Cronin et al., 2003).

"Don't push growth; remove the factors limiting growth," (Senge, 1990, p. 95) may be easier said than done in the current school system. The school calendar operates under a design formulated at the turn of the last century to help farmers harvest crops by allowing time for children to work in the fields and attend school (Guskey,1996). Gardner (1999a) "suggests that any uniform educational approach is likely to serve only a small percentage of children optimally" (p. 91). Rather, Gardner espouses an idea for the complex system of education that will take hard work if long term success is to reflect growth, "But instituting a new practice in any domain is hard work, and the process of bringing about fundamental changes in educational practice takes years" (p. 142).

In Western society, politicians have the power to dictate what types of teaching and learning occur in school systems (Hunkins & Ornstein, 1998; United Nations Educational, Scientific and Cultural Organization [UNESCO], 1996). The shaping forces of schools and educational organizations are controlled by political prowess driven by societal demands. Sroufe and Wurtz conducted a comparison study in 2003 on old and new legislation and found that "governments appointed positions are created to support interest directly related to the White House" (p.2). Unfortunately, politicians are not educators, more directly: politicians are well trained, but not necessarily well educated, leaving the fate of the social system of education in the wrong hands (Gardner, 1991; Kilpatrick, 1992).

When politicians make decisions in education the premise is not necessarily based on how students will benefit, but instead based on the amount of revenue a decision will generate for the political agenda (Cronin et al., 2003). Society makes demands for educational reform and politicians generate reports on education in hopes of securing votes with politically based promises that respond to the demands. Instead, if real world connections experienced within the community were considered in political reports, then an understanding of student needs would reflect legislation that "provided a profound understanding of the contextual environment that is being studied" (Bolland, 2001, p. 29).

In the study, Bolland (2001) lived in the community and interviewed students in real life situations showing that contextual education came from outside the system of school. The systems of the environment interrelated with the school systems indicate that the connections outside of the classrooms are necessary to expand the learning process (Bertalanffy, 1968; Gardner, 1999a; Senge, 1990). The contextual environment provided the basis of the evaluations necessary in Bolland's (2001) study to develop and implement the suggested interventions. The results indicate that at risk students are "in need of flexible non linear teaching styles" (p. 82). Boland describes at risk students in need of interventions to transfer knowledge in a manner that "must be obtained in ways not taught within the textbooks" (84).

Teaching styles that reflect flexibility when schools systems are based on linear curriculum presentations introduce change into an already established pattern. Change often generates chaos, but a study by Bui et al.(2000) on the context of schools as a whole explains, "a dramatically new approach to educating students with disabilities in high school is going to be necessary" (p. 2). Classroom environments are highly variable aspects of dynamic, nonlinear

systems which mean that linear curriculum is a mismatch for what is needed in the teaching and learning system for all students to succeed.

A breakdown in the educational system may be found in the conflict between the already established curriculum procedures verses the needs for a new approach, as the Bui et al. (2000) study reveals, "American schools have not prepared students with disabilities to succeed in high school" (p. 1). Another recent study by Reilly in 1999 found similar results about research that reveals learning has emerged in cognitive science (Gardner, 1993), "but schools have not translated the information to teacher training programs or curricula" (Reilly, 1999, p. 3). Another systems breakdown may be the need for teacher training to accommodate the "students who have disabilities and who have the capacity to learn and function successfully with the rigorous general education curriculum when they receive supportive instruction" (Bui et al., 2000, p. 1). Currently, the minimal supportive instruction is in a chaotic state.

Chaos Theory (Lorenz, 1963, found in Rae, 1995) explains that small changes can have large effects. If leadership changes are made with the training of teachers, then the effects could essentially fill in the gaps in educational institutions for the changes needed to reduce the failure rate of high school students attempting to pass the CAHSEE. A look into leadership descriptions and theories follows to connect possible solutions to the lack of consideration for teacher training leading to the systems breakdown of teaching students with disabilities.

Leadership in Education

New thinking, knowing, and doing within educational organizations, based on a new worldview, reflects a new era of the millennium in need of new kinds of leadership (Gardner, 1997). The influence of one person upon another is risky according to Gardner, who espouses a

rather broad view of leadership without a specified need to attain goals or contemplate challenges. The influence of behaviors from Gardner's view of effective leadership relies on attributes and characteristics of the leader, not on empowerment, as a successful leader is the one who "most keenly senses the wishes of a potential audience" (Gardner, 1997, p. 17).

Applying the leadership attributes from Gardner's (1997) view to classroom teachers supports the notion that the leader (teacher) must have an ongoing, active relationship with the follower (student). Indeed, ongoing conversation between the leader and the follower is essential to the teaching and learning process. Ancient Chinese literature (Gardner, 1997) reveals a proverb in regards to leadership that would serve as an example for teachers to follow:

> A good leader is one whom the people respect, the poor leader is the one whom people hate; but the great leader is one who, when the people have finished, they say 'we have done it ourselves.' Therefore, a great leader may be seen as one who leads in such a way that people are empowered. (found in Gardner, 1997)

Flexibility in teacher leadership affords the students a chance to think independently, a quality needed to meet the demands of the new millennium. According to Gardner, 1997, there needs to be a dynamic exchange where participants listen occasionally, interact frequently and spend a significant portion of time applying concepts to real challenges. This is called *action-oriented learning* and has a real-world connection, rather than just a theory without connections to the environment. A similarity was found in the Bui et al. study (2000) that indicates students "need to be independent learners who are able to recruit the help they need" (p. 8).

The effects of too few special education teachers, and the mainstreaming of the students with disabilities, places more responsibility onto the learners to elicit the help necessary to succeed. Effective teacher leadership is needed through training programs to provide students

with role models to prevent breakdowns in the systems of education (Bonny, Britto, Hornung, Klostermann & Slap, 2000). High school students with disabilities are educated within the context of regular education, with a deluge of initiatives to ensure that an adequate education is provided. Unfortunately, the national, state, and local policies do not always operate using a systems approach to interrelate with each others decisions and mandates.

The multiple mandates of legislation often conflict with each other, causing a breakdown in the system, and as a result of the failure of the system to properly prepare the students the students fail to pass the CAHSEE (Cronin et al., 2003). A discussion of some of the policies of legislation at all levels, national, state, and local, is included below. The most influential factors of the process to meet the needs of students with disabilities are often lost within the multiple systems of educational reform due to the failure to communicate with each other.

Mandated Legislation

The full gambit of legislation and litigation concerning individuals with disabilities to assist in the learning process often collide with each other rather than accomplish what the intentions of the mandates require (Echternacht, 1989; Perkins-Gough, 2005; Sroufe & Wurtz, 2003; Kim & Sunderman, 2004). The Sroufe and Wurtz study (2003) found that often when a bill is passed "the bill is relatively modest in its expectations for school reform" (p. 3).

The 1975 legislation, Education for All Handicapped Children Act, as well as the Title VI of The Civil Rights Act of 1964, and Title IX of the Education Amendments in 1972 were all adopted to assist students with special needs. In 1965 government interventions took special needs students out of the one room for all students with disabilities, but a greater impact was felt

for every classroom teacher in 1975 when the first Individuals with Disabilities Education Act (IDEA) was adopted (California Education Code, 2006).

Serving the needs of the diverse population of students in the new millennium presents a challenge to everyone involved in education. Parents, teachers, administrators and the community are all faced with the question of how to best educate the future leaders of tomorrow. Public education had been the answer up until A Nation at Risk slammed it with reports of failure in 1983. Comparing the results globally showed that the students from the United States placed "dead last in most areas" (Craver & Ozmon, 1999). In a scramble to come up with solutions to the negative findings, organizations began an all out effort to replace rather than repair the flaws in the established system (Hunkins & Ornstein, 1998).

A Nation at Risk (1983) revealed a deficit in student achievement in the United States sending politicians into action with political platforms regarding education that have played an integral part in every presidential election since. A Nation at Risk made such an impact that it became necessary to teach with dynamic practices. Attempts to produce more acceptable learning outcomes and assessments are evidenced by a succession of new legislatures, for example, National Goals for Education (1990), The Americans with Disabilities Act (ADA), Section 504, and amendments to (IDEA). These efforts have not been successful (Bui et al., 2000).

The dynamic system of education in America operates through a process that is governmentally subsidized and controlled through systems at the national, state, and local levels (Hunkins & Ornstein, 1998). Mandated as a right and enforced as a legal requirement for every individual (through grade 12), the system of education is currently under fire from almost every

corner of the country. The state of chaos in the dynamic system of educational organizations is real, in need of urgent answers. Our children, families, and schools are already facing painful cutbacks in light of growing enrollments, outdated facilities, and the escalating costs of complying with No Child Left Behind (NCLB).

The No Child Left Behind Act of 2001 (NCLB) retained the idea of supplemental educational services as one of the school improvement alternatives available to students in low performing schools. The idea was not based on previous experience or research but represented a political compromise between supporters and opponents of vouchers. "Some lawmakers took advantage of the disaster caused by the hurricanes to push their own political agenda. The federal voucher program offered aid to students with one hand, and took money from under funded public schools with the other" (Weaver, 2006, found in National Education Association [NEA], 2006).

The problems lie in the hands of the trained politicians, the shapers of the educational system, who are not educated, but simply trained to find pencil and paper solutions to fit the political agenda. Senge (1990) comments on the counter productivity of the political process that is driven by power, "By 'political decision making,' I mean situations where factors other than the intrinsic merits of alternative courses of action weigh in making decisions, factors such as building one's own power base, or 'looking good' or 'pleasing the boss'" (p. 60).

The process of teaching and learning is often misplaced in the political arena where it is not necessary to apply the educational reform on which political platforms are based. Educational platforms were typically developed by non-teachers, largely unaware of factors that would limit successful integration into the curriculum (Sroufe & Wurtz, 2003).

In politics it is only necessary to process the paperwork that reads well enough to push through blanket statements of change until the next election requires a review of the previous legislation, evidenced by the myriad of reports on education. Thirteen such reports were developed between 1983 and 1991 (Hunkins & Ornstein, 1998, p.166). Reaching conclusions for reform in educational systems and organizations should mirror how Socrates scrutinized processes looking for the right answers, "Truthfulness, goodness and rightness need to characterize not only our conclusions but also the means by which we get to our conclusions" (Wilkins, 1995, p. 196). A study conducted in 1999 by Reilly reflects the opposite of what guided Socrates, "Effective student learning is blocked because teacher and policy makers do not understand how learning occurs" (p. 5).

By looking at a time line of educational reform through presidential efforts, we see where Johnson's Great Society from the 1960s brings us up to Clinton's Build a Bridge to the 21st Century in the late 1990s. The 1980s and 1990s included programs called Project Head Start, Talent Search, Magnet Schools, Upward Bound and the key terms *mainstreaming*, *bussing*, and *bilingual* programs. Unfortunately, what happened as a result of the inclusion efforts of the 1960s and 1970s was a leveling effect on overall achievement (Craven & Ozmon, 1999).

Back to the Basics (1995) refers to the report that United States students graduating from high school and college do not know the basics of reading, writing, and basic math (California Education Code, 2006). The bill was introduced to strengthen parental, local, and state control of education in the United States by eliminating the Department of Education and redefining the federal role in education. The report found that parental involvement has been victimized since

the 1980s. More single parents due to divorce, more working moms, and parents too tired to teach basics at home are three defining factors found in the report.

The theme for education reform in the 1980s and 1990s was Search for Excellence. Adding to the three basics of reading, writing, and arithmetic is now technology training due to the technological explosion in the 1990s. Other attempts of equality of education for all learners included such dynamic practices as bussing and portfolio assessment. Students needs to be addressed in the search that were previously left out were bilingual, special needs, and socioeconomic. A fallacy exists that the federal government is in full financial support of all school reform programs.

Social values have changed, the economy has changed, the world has changed, knowledge of learning has changed, children have changed, but schools remain the same. Pressure is on the school system to change, and the necessity is urgent as students continue to fail to meet the requirements of the CAHSEE. The students with disabilities, according to the study by O'Neal (2004), succeed through "the use of a more intensive systemic curriculum that supports educators in a quest to reevaluate current practices for a more aggressive approach to students with learning difficulties" (p. 1). Another study by Davey (1991) found that specific groups such as "the New Standards Project are designing model exams for states and districts to adopt for more individual goals related to the needs of learners" (p. 5). Studies emerge for students with disabilities, but high stakes testing continues to take precedence, as Perkins-Gough (2005) reveals in the study exploring the perils of high school exit exams.

Struggling student needs are ignored as the lawmakers continue with political agendas that reflect the lack of connectedness between the service providers and classroom teachers for

supplemental programs. Another flaw in the system that leads to a breakdown to support students with disabilities will need to be improved so that a successful system can be established to offer supplemental educational services for students not meeting defined learning goals (Kim & Sunderman, 2004). With an election year approaching, lawmakers are paying close attention to their constituents. Let them know how they vote next week will affect how you vote in November.

It has been repeatedly observed that every system we study is part of a larger system (Bertalanffy, 1968; Gardner, 1999a; Senge, 1990). The interconnectedness in the systems thinking approach to educational organizations outlines a foundation for better methods to prepare students for state mandated policies. The knowledge of what students need to know to be successful and how educators can best facilitate the teaching and learning process is described in the next section.

Student Needs Related to Education

Recognizing the level of cognitive skills of students is an invaluable tool in teaching all students, especially students with disabilities (Thornton, 2001). Learning to help students use strengths rather than concentrating on weaknesses enables teachers to reach all levels of learners. The transference of knowledge relates to systems in education through theories from systems thinkers and social scientific research, recognizing that the systems thinking philosophy is the shaping force of the future in the educational system (Gardner, 1999a; Senge, 1990). Unfortunately, the holistic view of the systems thinking theory has not reached fruition in the whole organization of education adding pressure to educators to meet the needs of the students who struggle. Students with disabilities are affected by the pressures of not meeting the

requirement for high school graduation, a loophole in the educational system design that does not include accommodations for the CAHSEE.

Dewey's (1915) view of education is a coordinated effort of manual activities. The educative value of manual activities "depends upon the extent in which they aid in bringing about a sensing of meaning. In effect . . . they are dramatizations" (Dewey, 1915, p. 237). Mind body dualism, a Dewey concept, is stressed as a fact to be taught along with the concept of the individual as part of a larger system of the whole of humanity (Bertalanffy, 1968; Gardner, 1999a; Senge, 1990). A more hands-on interactive curriculum will build skills that foster self directed behavior (Gardner, 1999a).

In relationship to the mind body dualism that Dewey espouses, the author Lillian Moats (2006, found in Schubert, 2006) suggests an especially creative image of "an entity of self understanding" (p. 119) that she calls a Hidden Chronicler. Used as a literary device to express personal growth, Moats (2006) writes of the Hidden Chronicler as an extension of self. Another example of a literary extension of self is called the Mystical Traveler, "First you learn who you are. And when you learn who the real self is, the false images fall away rapidly light" (John-Roger, 1970). Finding insight into teaching from unnatural sources usually unrelated to education opens broader horizons to educational research. Broadening the research offers consideration for the students with disabilities for better preparation to pass the CAHSEE.

Students with disabilities continue to experience positive self esteem with the mainstreaming schedule, but lack of full support from the entire faculty is evident from a study conducted by Wenning (2005). Mainstream education is didactical, thus only high achieving logical and linguistic learners can succeed unless accommodations become part of the regular

curriculum. Literature, art, prose, and poetry unexpectedly serve as a hidden wealth of information to educators, if the pressure of test based curriculum does not distracts teachers from the real focus of what it means to teach. “A discovery of self understanding with purpose and direction in life should be taught to all students, regardless of mandated testing” (Schubert, 2006). If teachers do not incorporate self understanding then learners who struggle find it more difficult to grasp concepts, and a breakdown in the systems occurs.

All learners deserve equity in education, not simply equality. The claim for the least restrictive environment is met when a student is mainstreamed into a regular education classroom. Equal educational access for all is not met without providing accommodations for the variety of learners in classrooms today (Reilly, 1999). Another study by Bui et al. (2000) found that in the general education environment, the teachers focus on their high achieving learners, leaving the slower students without enough time to process the information into knowledge for long term memory recall (Dembo, 1994). Without schema on which to attach information, the result is possible failure of mandated testing.

A trend in educational environments that affect students with disabilities is the fallacy that prescription drugs are the end all to address student problems. “Prescribing psychiatric medications to children may ignore possible social and environmental causes of childhood problems” (Schlozmans, 2003, p. 1). The results produced from the Schlozmans (2003) study reveal “careful communication between parents, school, teacher, clinician, and the student is continually monitored for maximum benefit of any prescribed medications” (p. 93). A careful balanced approach to each individual child’s situation must be considered. First, careful assessment to psychiatric treatment is serious; some may require only monitoring while others

may need medical intervention. Second, parent, educator, and student input are important, and follow up from school counseling or psychotherapy best supports medical interventions (Schlozmans, 2003).

Many problem behaviors are not related directly to underachievement, but are associated with attention problems. The attention problems have a negative effect an academic achievement. The results indicate that a "clear understanding between problem behaviors and academic achievement will help generate appropriate assessment, prevention, and intervention strategies for at-risk or troubled youth. The inattentive subscale was a significant predictor of academic performance, whereas the hyperactive-impulsive subscale was not" (Barbetti et al., 2002, p. 236). By addressing attention problems, students receive needed assistance in learning how to learn.

In California an influx of language learners provide the richness of the cultures that individual bring, describing what Gardner (1999a) stresses in the *teaching for understanding* sharing of cultures. It is the responsibility of educators to teach all students regardless of levels or languages. Using multiculturalism as strengths offers all learners a bridge in the gaps in the misinformation and stereotyping that exists today. Incorporated into the curriculum, when a family custom is explained in a report on ethnicity, then all learners within the class have a deeper connection to the presenter. As the web of understanding is spun throughout each cultural sharing, students appreciate more about peer relationships substantiating the interconnectedness of systems thinking (Bertalanffy, 1968; Gardner, 1999a; Senge, 1990).

A debate exists that there is no time for cultural education due to the rigidity of standardized test preparation (Perkins-Gough, 2005). Building a respect for the heritage of each

student does not take away from the existing curriculum, it enhances it (Gardner, 1999a; Schubert, 2006). Each classroom can become a microcosm of the world and respect for all learners sets up respect for global diversity.

Teachers becoming mediators, coaches, and facilitators rather than dictators allows students to feel that what they say matters. Asking for opinions, seeking prior knowledge on which to base future lessons, and allowing group discussions along with working with peers all build self confidence in students. Armed with adequate self esteem, they can forge ahead with questions, knowing that it is safe to yearn for answers to whatever questions arise (Levine & Swartz, 1995).

Alternative Assessment

Some interesting phenomenon has taken place on the high school campus that builds the self understanding of the students with disabilities as regular education are students begging to get into the Special Education Study Skills classes. The regular students see the assistance that the resource students receive, and see how having a period of Study Skills has improved mainstream classmates grades. The regular education students see no difference between themselves and the students with disabilities, thanks to the mainstreaming mandated legislation of IDEA with the least restrictive environment clause (California Education Code, 2006). A reciprocal effect occurred from 15 years previous when special education students were embarrassed to enter a resource room for additional assistance.

The rapid changes in education to improve learning for English Language Learners (ELL) is a bonus for special needs students, adding to the interesting changes on the high school campus. Specially Designed Academic Instruction in English (SDAIE) lessons are now being

taught in the mainstream environment. SDAIE is exactly what Special Day Class teachers and resource teachers have been using every day for decades.

SDAIE incorporates hands on lessons with visual aids that can stimulate students of all levels by reaching their optimal level of learning. Vygotsky (1978, found in Cheyne, 1999) teaches that the Zone of Proximal Development starts with some confusion on the part of all learners. The secret to the success of teaching not just the ELL students, but all students, is to keep the balance between the confusion stage and the comfort zone.

The challenge to assess in a non-judgmental way is one that effective teachers must meet. Learning to balance and use a variety of assessment in order to reach all levels of learners can be a key to successful teaching, learning, and grading. By dividing the grading process into two categories: formative and summative (Hunkins & Ornstein, 1998), more effective teaching transpires. Formative work done by students should be recognized as completed, but not necessarily graded. The students are in the process of learning, so grading formative work is more time consuming than productive. Summative work such as quizzes, tests, and portfolios are measures of what is needed for assessment to meet legislative mandates. Oral presentations, plays, skits, and art projects can be used for measures of knowledge. Incorporating new measures of assessment keeps all levels of students interested and involved, as Perkins-Gough (2005) discovered in the exploration of performance based testing as opposed to multiple choice standardized tests.

A portfolio is a file or folder containing a variety of information that documents a student's experiences and accomplishments. Portfolios are used to involve students in self evaluation, to promote independent thinking. An alternative measure of student achievement,

students monitor their own progress as they complete long term assignments. The portfolio method of self evaluation changes the traditional passive role of the student to the role of a more active participant (Gardner, 1999a; Perkins-Gough, 2005). Portfolios can be used for evaluations in all subjects and reflects consideration for learners with disabilities.

The current trends in assessment are being debated by educators as indicated in recent studies (Bui et al., 2000; Davey, 1991; Echternacht, 1989). Performance assessment, otherwise known as authentic assessment, uses strategies for assessment based on individual accomplishments geared to real life circumstances (Dembo, 1994; Gardner, 1999a; Senge, 1990). How a student applies the academic knowledge acquired in a classroom to his or her own life is performance assessment. It can be used in standardized testing and teacher-made tests, but can be difficult to evaluate (Hunkins & Ornstein, 1998). Strengths in favor of performance assessment are higher level thinking skills of analyzing, as synthesizing and evaluating are developed. Weaknesses of performance assessment come as complaints that it lowers SAT scores due to basic skills not being taught (Hunkins & Ornstein, 1998).

The term, tacit knowledge, is one of many terms used to discuss the type of knowledge that is best acquired in context and through learning experiences such as apprenticeships, cases, mentoring, anchored instruction, and other forms of authentic learning. It is involved in Sternberg's (1985) distinction between *practical intelligence* which emphasizes tacit knowledge and *academic intelligence.* Sternberg's (1985, found in Santrock, 1999) *triarchic theory of intelligence* has three basic components: conceptual, creative, and contextual. Contextual aspects of intelligences can be thought of as practical intelligence or common sense. Practical intelligence is based on tacit knowledge, “the informal knowledge one needs to get ahead in

specific situations but that rarely is taught explicitly" (Santrock, 1999, p. 526). Tacit knowledge is also part of Gardner's (1993) concept of multiple intelligences. The notion of learning communities is also closely related tacit knowledge, recognizing that all learning involves socially organized activity (Gardner, 1999a; Senge, 1990).

Incorporating social learning, tacit knowledge, and the idea for learning communities (Senge, 1990) and teaching for understanding (Gardner, 1999a) involves changes, not easily accepted in the educational system. A key factor to change lies in the element of time, a scarcity in the new millennium of teaching where federal and local legislation is mandated to teach rigid standards based curriculum. A discussion of curriculum reform will follow indicting the need to make changes to accommodate the CAHSEE requirements.

Curriculum Reform

Curriculum planning, sometimes referred to as curriculum engineering (Hunkins & Ornstein, 1998), is coordinated in educational institutions in the same manner as planning used by business organizations (Senge, 1990). Entire school districts take the macro approach to curriculum revision. Planning is not done by particular grades or subjects but by long term planning fused with short range goals. Centralized curriculum is planned through the school board; decentralized planning bypasses the school board and goes straight to the school. A study in 1991 by Davey, completed before the CAHSEE was introduced, explored ideas for more hands on interactive curriculum that can be evaluated through performance based assessment.

Three different approaches to curriculum planning involve humanistic, behavioral, and managerial styles (Hunkins & Ornstein, 1998). The humanistic approach focuses on the individual verses the actual curriculum. The individual, hands on, student centered approach is

difficult to assess and to quantify, but is a necessary part of curriculum revision to counterbalance the overuse of standardized testing (Perkins-Gough, 2005).

The state standards do not accept individualized program adoption, but see curriculum as a one size fits all plan (Cronin et al., 2003). Alternative assessment through portfolios demonstrates higher level thinking skills as students demonstrate analyses of completed work, synthesized by the process of putting the portfolio together. After an evaluation of the portfolio the curriculum can be adjusted accordingly to fill in any gaps in learning that may exist.

The behavioral approach to curriculum is technical, based on the teacher as the expert dictating terms and text. The students are considered robotic, passive, and should be ready to spit out rote memorization of facts, much like the mechanistic robotic society that Bertalanffy recognized in 1967. No interaction with other students is considered, and certainly no active role from the students is considered in the behavioral approach to curriculum.

The most common approach to curriculum is the managerial approach. It is based on the organizational aspects of teaching and not the content of the curriculum. Students and teachers are interactive, and a *success for all* interpretation means success across grade levels, not success for individual learning styles.

The successful use of a more intensive systemic curriculum, reported in a study completed in 2004 by O'Neal, supports educators in a quest to reevaluate current practices for a more aggressive approach to students with learning difficulties. Students with dyslexia ages six to nine, considered poor readers, were studied comparing the amount of remedial instruction time to the improvement made in reading fluency. A group of 37 received a more aggressive treatment for two hours a week using systemic, phonics based curriculum. A comparison group

of 12 students received the normal remedial help provided by the school: about one hour a week. Published information supports that the intense teaching group made up half the reading gap, where the other students fell further behind. “A study showed that dyslexic students who were tutored with typical methods made limited gains but continued to use cumbersome mental pathways” (O’Neal, 2004, p. 1), indicating a need for a more intensive systemic curriculum as the O’Neal study revealed the success after its use.

A systems approach to creativity, a requirement for what Gardner (1993) calls *fruitful asynchrony*, is a condition quashed by the academic conditions of standards based education. An analysis of education's purpose across time, distance, and discipline was developed by Gardner. “When it comes to learning, less is more” (Gardner, 1993, p. xi).

Gardner, the Harvard psychologist who pioneered the theory of multiple intelligences, gathered evidence from a wide range of fields, including anthropology, psychology, history, and economics, to argue that education's ultimate goal should be to pass on a culture's beliefs about three essential subjects, truth, beauty, and morality, to its children. Gardner claims convincingly that any curriculum that races from Plato to NATO merely stuffs students with facts they will rapidly forget (Gardner, 1999).

What is needed in the age of the Internet, he says, is *teaching for understanding*, one that not only encourages students to determine what is worth knowing amidst the unlimited amount of information now available at the click of a mouse, but also enables students to apply their understanding to new situations (Gardner, 1999). In an effort to reconcile conflicting educational viewpoints, he proposes the creation of six different educational pathways that, when taken together, could satisfy people's concern for student learning and their widely divergent views of

what knowledge and understanding should be, indicating that an interrelatedness exits between the educational pathways (Gardner, 1999; Senge, 1990).

Gardner (1999a) has created what he considers the best method for teaching students, an idea he calls *teaching for understanding*. He believes that each culture needs to identify the truths, beauties, and virtues that it values and then transmit the values to students, who can then understand and master them. He recognizes the difficulty in attaining complete understanding in any area and points out some of the obstacles students would face. Different people learn best in different ways but also an individual can learn in multiple ways. Gardner (1993) has previously posited that humans have at least eight separate forms of intelligence.

Gardner (1999) outlines different approaches to understanding and shares how his theory on multiple intelligences can enhance understanding. It would take a major overhaul to the current American education system to turn Gardner's theory into practice, and educators will have to decide whether the changes are worth the efforts. Considering the failure rate of students with disabilities to pass the CAHSEE, Gardner's *teaching for understanding* deserves consideration (Thornton, 2001).

A claim that precious curriculum time is taken from regular education students when extra time is needed for students with disabilities is disproved with the results from the Schubert study (2006). The exact opposite was discovered with "the pressures of test based curriculum distracting teachers from the real focus of what it means to teach" (p. 132). Using the innate creativity and talents to be great educators, teachers can and will figure out ways to use interruptions in favor of teaching opportunities. Students learn from everything in the environment, not just from textbooks and rigid curriculum from standards.

An Internet magazine designer and a consultant for Fortune 500 clients states, "to communicate effectively across markets, not only a site's language but it's cultural and brand connotations must be translated as well" (Anonymous, 2006). If we do not prepare students for what they will be facing when they leave school, then an injustice is the result. The world market demands a multicultural education, one that speaks from the diverse backgrounds that surround humanity.

It has been proven time and time again that human beings learn more by doing an activity, as opposed to just hearing, writing, or speaking it (Gardner, 1999a). If we introduce more *doing* activities into teaching, then more effective teachers emerge. "I hear, I forget; I see, I remember; I do, I understand" became the motto of a pilot program in San Jose CA. The students became involved in a hands-on program based on the California Standards of Education. The program which was originally designed to promote self esteem became much more academic than it was originally designed to do. As the program evolved, each year it became stronger and more popular with the students and their parents. The students were learning in a very unorthodox fashion, but they were learning. They were learning by *doing*.

All students are capable of learning at a level that engages and challenges them. Only by including all students in accountability measures will certain unintended negative consequences be avoided. For example, we know from research that when students with disabilities are allowed to be excluded from school accountability measures, the rates of referral of students for special education increase dramatically (National Center for Educational Outcomes: Synthesis 26, 2006).

In addition, students with disabilities accrue positive benefits when they are included in school accountability systems. Educators realize that these students also count, just like all other

students; they understand that they need to make sure that these students learn to high levels, just like other students. When students with disabilities are part of the accountability system, educators' expectations for these students are more likely to increase (Bui et al., 2000).

Conclusion

Historically, decisions in education pass through multiple systems, eventually reaching the subsystems that directly affect the clients, the learning disabled students. Broader congressional legislation adopted through the political system neglects to consider the individual needs of all of the students in the school system, resulting in a breakdown of the social systems theory, the inability to pass the California High School Exit Exam (CAHSEE) to graduate.

The fragmentation of the school system fails to relate to students who learn outside the realm of logical and linguistic teaching (Gardner, 1993). Needs for increased attention, self-direction, and increased visual and verbal skills require changes to be made, but school systems are reluctant to accept change. The subsystems of the educational organization do not operate systemically, thus creating chaos in the national mandated legislation of accountability, where breakdowns result in failure of students and failure of the school system to provide an education.

Teachers are frustrated, students are frustrated, and the system of education is in chaos. Consideration for students with disabilities exist is some subsystems, but not in others reflecting an urgent need for uniformity. Interrelatedness of the systems thinking approach holds promise for the school system, if consideration for learning organizations (Senge, 1990) and teaching for understanding (Gardner, 1999a) are given a chance. It is time to unify principles in the true Bertalanffy tradition of general systems theory, not as disjointed and competitive systems, but as systems united to provide an adequate education for all levels of learners, the future of America.

So "intelligence, the scholastic mind" becomes the heart and soul of education, and other aspects of multiple intelligence become shadows too difficult to diagnose, treat, and assess. (Gardner, 1993)

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Knowledge Area Module 3

Principles of Organizational and Social Systems

Application Component

EDUC 8331: Professional Issues in Organizations and Systems

Contents

Application Component

Introduction

The Application of KAM 3 consists of two parts. The first part includes a ten page report with an introduction, background information for the California High School Exit Exam (CAHSEE), and symposium results demonstrating the need for revision of Arcadia Unified School District (AUSD) high school mathematics curriculum. Part one previews the second part, Appendices A, math curriculum realigned, and B, examples of lessons used within the new curriculum guidelines. The ten page report clearly outlines the process that was completed in 2001 to fulfill the need to properly prepare students of all levels for the CAHSEE (California Education Code, 2006) within the California State Standards (California Education Code, 2006). The Application of KAM 3 serves as an example of how subsystems in a school community worked together to create improved curricula for all levels of learners, assisting in improving the failure rate of the CAHSEE.

The report is examined through a curriculum study completed in 2001 involving a group of high school and middle school mathematics teachers, along with special education and district level representatives. Potential failure to meet graduation goals for all students in mathematics, specifically students with learning disabilities, was a topic of the symposium discussion. In the completed 2001 study, after state mandated requirements were reviewed, flaws in the educational system pointed to a variety of needed changes. The report demonstrates why curriculum realignment was enacted to better meet the needs of all students, focusing on the students with identified disabilities.

The Application component report and symposium results combine the organizational and systems thinking synthesis of the Breadth section, based on theories from Ludwig von Bertalanffy, Howard Gardner, and Peter Senge, with the contemporary Depth research focusing on the possible breakdown of the systems approach in educational institutions. Regarding the CAHSEE, the curriculum study fulfilled a need of the Arcadia Unified School District (AUSD) in Arcadia, California to properly prepare all levels of students to meet the high school graduation requirements in mathematics.

Two studies independent of each other found that much of education reform reflects a belief that teachers are not competent professionals (Bui, Deshler, Schumaker, Vernon, 2000; Cronin, Houser, Houser, Kingsbury, Olson, 2003). Experts of one sort or another are making decisions about *what* should be taught and *how* it should be taught. The national standards movement, state and national curricula, performance based teacher pay, and national testing are all current expressions of legislative mandates taking away from how teachers teach (Davey, 1991). The impact felt by teachers and students influences the entire system of education, as indicated in a study by Perkins-Gough (2005). Systems theories developed by Gardner (1999a) and Senge (1990) indicate that there are no universal solutions and no national standards that can be meaningfully adopted for all children in all school systems. Research reveals that there are no national tests that can measure all the important goals of schooling, and no objective, standardized way of comparing teachers ((Bui et al., 2000; Cronin et al., 2003; Davey, 1991), yet national legislation continues to mandate policies for more accountability through standardized testing.

The No Child Left Behind Act (NCLB) adopted in 2002 is national legislation demanding testing results to measure success of schools in the United States, regardless of levels of learning. Individual schools demand performance scores from students through testing to reflect success of the teachers. The CAHSEE demands testing results to meet district graduation requirements to report feedback to the NCLB mandates for measurement of all student learning. The circular process of feedback (Senge, 1990) required as a result of testing is spiraling out of control leaving a negative impact on students forced into the top down system approach to educational reform.

Students are not succeeding with the deluge of mandates from national, state, and local levels. A study conducted by Wenning (2005) recognized that national legislative mandates do not work, "Educators cannot control that snapshot test scores are used annually to measure the effectiveness of schools under NCLB legislation" (p. 1). Standardized tests with only an Adequate Yearly Progress (AYP) indicator for assessment are unfair to students with disabilities struggling to succeed in the mainstream environment.

Students with disabilities must meet demands from an Individualized Educational Plan (IEP), a federal document demanding feedback and documentation for the Individuals with Disabilities Education Act (IDEA, 1997). IEP mandates are enforced in addition to the feedback demands required for national, state, and local organizational requirements. The breakdown in the multiple systems approach in educational organizations from national→ state→ district→ school board→ school→ principal→ IEP→ Resource Specialist→ mainstream classroom teacher→ special needs student is overwhelming. As a result of the multiplicity of the systems, misunderstandings as to the needs of students often lead to neglect or complacency. "Sadly,

many of the policy changes being enacted across the country are based on policy makers' sense of adult perceptions, and not on the experiences of children in school" (Bui et al., 2000, p. 13).

The impact of testing demands decreases the effectiveness of teacher experience. The increase in social, legal, political, and economic systems in educational institutions making demands of educators is filtering down to the students. National, state, and local demands made on teachers to test and retest in order to meet current legislation consumes the time required for trial and error processes which is necessary for schema building in teaching and learning. The lag time between stimulus and response requires more time than is available due to current legislative requirements for immediate response answers. The time needed for reflection to convert learning to knowledge (Gardner, 1999a; Senge, 1990) is gone out of the classroom, replaced by drill and practice to prepare for multiple choice short answer standardized tests. Alternate forms of assessment are an urgent need (Gardner, 1999a).

Crises in education are developing, forcing quick responses from students for standardized answers. The result is a limited relevant knowledge base that is partly responsible for the failure of students to meet the goals set by national NCLB legislation and state CAHSEE requirements (Bui et al., 2000; Cronin et al., 2003; Perkins, 2005). School systems are desperate, teachers are desperate, and students are failing to meet criteria to graduate from high school (Arcadia Unified School District [AUSD] Symposium, 2001).

Several considerations were introduced at the beginning of the symposium as valuable points to keep in mind as important decisions are made within educational organizations. Nationally available materials like textbooks and other resources should be open and flexible so that teacher educators can revise and adapt them to their context as revealed in a study conducted

by Bolland in 2001. “The contextual environment provided the basis of the evaluation necessary to develop and implement the suggested interventions” (p. 100). Related theories of learning argue forcefully that isolated learning, learning out of context, is generally not as useful or as valuable as learning in context (National Conference on Teacher Quality, 1998, found in Gardner, 1999a).

Material created for local use should allow for differences from group to group and year to year (Bonny, 2000). Approaches to instructional design and organizational change reject the idea to begin with a well formulated plan of action to solve all problems. The beginning is not the place for well formed visions, goals, and objectives. Instead, the plan should emerge, evolve, and change over the life of a project or program (Reilly, 1999; Senge, 1990), reflecting what is more commonly called nonlinear systems theory, also known as chaos theory (Lorenz, 1963, found in Rae, 1999). The need to recognize patterns out of a chaotic project or program is essential to the understanding of where the problems exist, leading to possible solutions.

Sharing ideas and experiences for possible solutions to problems does not necessarily lead to rigid standards or inflexible requirements that cannot be adapted to local needs and conditions (Bui et al., 2000). Hunkins and Ornstein (1998) discuss localization for curriculum planning relating to how curricula and resources are developed. For example, the failure of AUSD students to pass the high school exit exam in mathematics is a critical local context issue. The local participants, the teachers of high school mathematics, were involved in the planning and implementation of the mathematics curriculum, as suggested by Hunkins and Ornstein (1998).

As the discussions in the AUSD Symposium (2001) commenced, ideas were shared from all grade levels throughout the district as to possible reasons that the current mathematics curriculum was deemed inadequate to meet the goals for the CAHSEE. Possible solutions were contemplated as ideas and experiences were shared. One week before the symposium commenced all members were provided background information regarding the establishment of the CAHSEE. A shortened version of the background follows, with added citations and comments in regards to appointed policy forming committees.

California High School Exit Exam Background

After determining that local proficiency standards established pursuant to Education Code Section 51215 (California Education Code, 2006) were generally set below a high school level and were not consistent with the state's content standards, the state legislature indicated its intent to set higher standards for high school graduation. In proposing the CAHSEE, the primary goal was to "significantly improve pupil achievement in high school and to ensure that pupils who graduate from high school can demonstrate grade level competency in reading, writing, and mathematics" (Senate Bill 2, Section 1[b]).

State Superintendent of Public Instruction Jack O'Connell authorized Education Code Section 60850 (1999-2000) for the development of the CAHSEE in accordance with the State Board of Education (SBE) adopted content standards in language arts and mathematics. The CAHSEE was developed based on recommendations of the High School Exit Examination Standards Panel, whose members were appointed by the State Superintendent of Public Instruction, Jack O'Connell, and approved by the SBE. Interestingly, a recent study on government appointed committees conducted by Sroufe and Wurtz in 2003 found “that

government appointed positions are created to support interests directly related to the White House agenda" (p. 2). Rhetoric and sophistry often cloud the issues of research in education, revealing that "expectations for its work seem unrealistic and designed to result in disappointment" (p. 4).

The following description of the system of evaluation, provided in the California Education Code (2006) for the CAHSEE is included to better understand the legislative mandates. Education Code Section 60855 required the California Department of Education (CDE) to contract for an independent evaluation of the CAHSEE beginning in January 2000. Each evaluation report must include the following: (1) an analysis of pupil performance, broken down by grade level, gender, race or ethnicity, including any trends that become apparent over time, (2) an analysis of the exam's effects, if any, on college attendance, pupil retention, graduation, and dropout rates, including an analysis of the effects on the subgroups.

The evaluation reports must include recommendations to improve the quality, fairness, validity, and reliability of the CAHSEE. The first report of the independent evaluation was completed and presented to the CDE, SBE, the governor, and other control agencies on July 1, 2000. Subsequent evaluation reports are due to the same parties by February 1st of every even-numbered year. Related information to the fairness of the evaluation report is found in a study conducted by Bui, Deshler, Shumaker, and Vernon (2000). Research found that unfairness exists when promoting the success of the general education curriculum, as high school students with disabilities often cannot succeed with short answer multiple choice tests.

The context of the school system as a whole ignores current legislation (IDEA) that is in place for students with disabilities due to legislation (CAHSEE) mandated outside of special

education. "More testing, state standards, and more rigorous goals for regular education inflict unrealistic expectations for special education students" (Bui et al., 2000). In California on May 12, 2006, Alameda County Superior Court Judge Robert Freedman ruled that the exit exam is discriminatory. The 2006 graduating class is the first required to pass the exam to get a diploma. Earlier in 2006 special education students won a one year reprieve on the requirement. Judge Freedman is scheduled to hear arguments in a third suit which claims state officials failed to consider alternatives to the test as the law required (Leff & Young, 2006). The special education system of teachers and learners reap the benefits of the judicial system which reflects the interrelatedness of systems that Bertalanffy explained in 1968 with General Systems Theory.

Symposium Report of California State Standards and Exit Exam Requirements:
AUSD Curriculum Development Project (January, 2001)

The mathematics portion of the CAHSEE addresses state standards in grades six and seven and Algebra I. The exam includes statistics, data analysis and probability, number sense, measurement and geometry, mathematical reasoning, and algebra. Students are also asked to demonstrate a strong foundation in computation and arithmetic, including working with decimals, fractions, and percents to establish that proficiency has been reached.

Nine members of the AUSD high school math department, three middle school mathematics teachers, along with three special education and district level representatives began the process to examine the need for realignment of the AUSD mathematics curriculum with the California State Standards to properly prepare all levels of students for the CAHSEE. The district office was the optimal location for easy access to the California State Standards to begin discussions for new curriculum for the high school.

A target group was assigned to discuss at risk regular education math students and the special education mainstreamed math students. A review of what standards were expected at the different grade levels below the high school level proved necessary. In the review it was discovered that the lowest level of regular education math at Arcadia High School consisted of the state standards from the 6th through the 9th grade. As a result, an inconsistency in the curriculum was discovered, indicating that many gaps existed in the needs to properly prepare students for the CAHSEE. The gaps were often below the 6th grade level state standard.

With scissors in hand, the most efficient way to adapt what was needed for the new curriculum in the regular education classroom was to literally cut and paste from the printouts of the four levels of state standards 6th through 9th. Although time consuming, the cut and paste process allowed each member of the committee participation in the project. The process consisted of dividing the standards by grade levels, completely assessing and analyzing the needs of the students at each grade level, and then setting new curriculum guidelines aligned with the standards. The newly realigned curriculum was adopted by the school board as mathematics curriculum for the 2001-2002 school year.

In May 2001 the AUSD special education department formed a committee to perform the same task as the district symposium task earlier in the year, to discuss the need to adapt the state standards to form a new AUSD curriculum. The special education department combined the discussion for a new curriculum in English and mathematics. An open forum discussion began with seven members of the special education department. A realization soon emerged that to afford the opportunity to all of the students from varied levels to succeed in mathematics and

English, and to reach projected goals written into IEPs, a new curriculum more closely aligned with the California State Standards was needed.

The goals in English were more difficult to define because the AUSD did not have the newly aligned standards for the regular education department in English. The district system for realignment aided the departmental system indicating how interdependence between systems exists (Bertalanffy, 1968; Gardner, 1999a; Senge, 1990). The consensus was to concentrate on the level of the students in the resource classes, rather than the previous curriculum that stated all students had to be taught the core material for the grade level. New curriculum development continued throughout the summer months, using the state standards as a guide.

In the discussion of how to approach the development of new mathematics curriculum for the special education students, the district level symposium results were utilized as examples of how the math department members previously aligned curriculum from the state standards. The decision was not difficult because the newly adopted curriculum for the regular education math students addressed the same needs as the students in special education. Using modifications with the regular curriculum, the special education needs to prepare for the exit exam can be met, once again substantiating that the interdependence between systems is vital to school organizations (Bertalanffy, 1968; Gardner, 1999a; Senge, 1990).

Examining the needs of the students at all levels, the requirements of the state exit exam, and the standards on which to base the curriculum in the process of curriculum realignment was not an easy task. Aligning the curriculum to properly prepare students to not only pass the CAHSEE, but to stay abreast of the ever changing developments of the 21st century impacts what teachers do every day in the classroom. In a systems thinking approach to education developed

by Gardner (1999a) and Senge (1990), all schools would become *learning organizations* (Senge et al., 2000) with a *learning for understanding* (Gardner, 1999b) that adequately prepares all teachers for the cognitive and social development of all levels of learners. Unfortunately, the systems thinking approach developed by Bertalanffy's (1968) introduction of a General Systems Theory has not been adopted in educational organizations, making tasks such as curriculum realignment more complicated than need be (Bonny, 2000; Gardner, 1999a; O'Neal, 2004; Senge et al., 2000).

Conclusion

As demands for more effective education rise, teachers rise to the challenge. Risks are taken by trying new methods in how to manage classrooms, in how to assess students, in inventing new ways to reach all levels of learners, and in constantly reassessing to become better life long learners. By recognizing that the qualities of an effective teacher will be forever changing to meet the needs of the students, teachers grow to become more qualified professionals. As growth and improvement as professionals continue, the cycle of learning passes from teachers to students, evolving into more effective programs (Gardner, 1999a & Senge, 1990).

Each generation improves the teaching and learning process, and with ardent efforts on the part of educators, the qualities of effective teachers reach greater heights. Sorting through the myriad of mandated policies, breakdowns in the multiple systems often require closer examination of the mandates to find the best possible outcomes for all levels of learners. Eventually, the best possible teaching and learning solutions are gleaned from the mandated legislations in educational reform, in a continuous cycle of feedback needed for improvements in

the educational system. Bertalanffy (1967) relates the importance of the responsibility of the professor to the systems of the world added as a conclusion to the KAM 3 Application to reaffirm and to inspire educators that the efforts of today are necessary for the future of an educated society:

> Ideas do move matter; and in a sense professors are the hidden marionette players of history—those who create worldviews, values, problems and solutions; in short, that symbolic backdrop against which every scene of the great drama of history is enacted. It is we who, in the last resort, manufacture the glasses through which people look at the world, and at themselves—little as they may know it, and little as they are aware of who put the glasses on their metaphorical or metaphysical nose. I dare say we are the great spectacle makers of history. This is the reason why the intellectual endeavor is more than gathering facts or making clever gadgets. It is a tremendous responsibility; and we have to face it. (pp. 51-52)

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Appendix A

2001 Study Realignment Results of Math Curriculum with State Standards

Scope and Sequence
AUSD Abbreviated Mathematics Standards

Grade 5
MATHEMATICAL REASONING
Students use a variety of methods (words, numbers, symbols, charts, graphs, tables, diagrams, models) to explain mathematical reasoning.
Students use estimation to verify reasonableness of calculated results.
Students analyze data in word problems.
Use the appropriate operation.
Put data in multi-step problems.
Identify relationships and distinguish relevant from irrelevant information.
Evaluate the meaning of the remainder as it applies to the problem.
NUMBER SENSE
Students understand the relationship between numbers, quantities, and place value: billions - thousandths.
Read and write numbers from billions to thousandths.
Estimate and round numbers through billions to a specified place.
Compare and order whole numbers and decimals.
Students estimate, calculate, and solve problems involving addition and subtraction: billions - thousandths.
Estimate sums and differences. reduce fractions to lowest terms.
Find and use equivalent fractions, decimals, and percents.
Compare fractions: <, >, =.
Write comparisons as fractions, ratios, decimals, and percents.
Compute with fractions, decimals, and percents.
Interpret percent as part of a hundred.
Solve equations involving equal ratios.
Students understand the concept of exponents.
Solve problems using exponents.
Use exponents with prime factorization.
Students identify and plot decimals, fractions, mixed numbers, and positive and negative integers on a number line.
Students can read, analyze, and create different types of graphs.
Compile and organize survey results.
Organize and categorize data.
Represent data as fractions and percents.
ALGEBRA & FUNCTIONS
Students interpret and solve algebraic expressions.
Solve simple algebraic expressions with a variable.

Use the commutative and associative properties to solve problems.
Identify and graph ordered pairs in four quadrants.
MEASUREMENT & GEOMETRY
Students understand and apply the concepts of measurement.
Know the relationships of basic measurements (inches to feet, minutes to hours, etc.).
Estimate and measure length, mass, and volume (metric and standard units of measure) using appropriate tools.
Measure and use temperatures using degrees Celsius and Fahrenheit.
Determine time using an analog clock to the nearest minute.
Students identify, analyze, and construct geometrical figures.
Understand and use vocabulary related to geometry.
Identify point, line, segment, and ray.
Identify parallel, perpendicular, and intersecting lines.
Identify and measure right, obtuse, and acute angles.
Identify and classify polygons according to the measure of their angles, length of their sides, and number of sides.
Identify and graph congruent, similar, and symmetric figures.
Measure, identify, and construct perpendicular and parallel lines, angles, and polygons using appropriate tools.
Find the perimeter, area, and volume of a given figure.
Know the sum of the angles of a triangle is 180 degrees.
Find the measurement of the third angle of a triangle when two angles are given.
Know the sum of the angles of a quadrilateral is 360 degrees.
Identify space figures and count their vertices, faces, and edges.
Visualize and draw two-dimensional views of three-dimensional objects made from rectangular solids.
STATISTICS & PROBABILITY
Students collect, record, organize, display, and interpret data.
Find the average of a list of numbers.
Interpret, compare, and compute mean, median and mode.
Write ordered pairs correctly.
Students analyze the probability of a given outcome.
Associate verbal descriptions of probability with numeric descriptions.
Predict how often an event will happen in a given number of trials.
Compare what is expected with what really happens.
Judge likelihood of data using features such as center, spread, shape and outliers.

Grade 6
THE LANGUAGE OF MATHEMATICS
The language of mathematics is critical to communication in all disciplines of mathematics.
Understand the language of math (algebra, geometry, statistics, data analysis and probability).
MATHEMATICAL REASONING

Mathematical reasoning is woven into all lessons and addressed continuously throughout the school year.
Analyze problems, formulate and justify mathematical conjectures and determine the most effective way to solve a problem.
Use a variety of strategies to solve problems including estimation, graphing, inductive and deductive reasoning and precise calculation.
Determine a solution is complete and move beyond a particular problem by generalizing to other situations.
NUMBER SENSE
Students master addition, subtraction, multiplication, and division of whole numbers, common and decimal fractions and positive and negative integers.
Students use estimation to solve problems and determine if an answer is reasonable.
Students demonstrate understanding of the relationship between fractions, decimals, percentages, ratios and proportions.
Convert fractions to decimals to percentages.
Solve problems with fractions, decimals, and percentages.
Solve problems with ratios and proportions.
Students demonstrate understanding of factoring and multiples.
Identify prime and composite numbers and use prime factorization to solve problems.
Use exponents to factor and illustrate scientific notation.
Determine the square root of perfect squares to solve problems.
Estimate square roots of whole numbers.
Students use the order of operations to solve complex problems (or simplify expressions).
Students use the Associative Property, Commutative Property, Distributive Property and Identity to solve problems.
ALGEBRA and FUNCTIONS
Students demonstrate understanding of the concept of equality by balancing equations.
Use reciprocals to solve equations.
Apply the rule of equality to solve equations.
Isolate the variable to solve equations.
Students solve equations with one variable.
Students represent and explain patterns in a variety of ways including writing equations, creating graphs or tables, and using manipulatives.
Students use a variety of strategies to solve problems.
Translate word problems into appropriate numerical expressions, equations and/or formulas (A = 1/2 bh).
Solve problems involving rates, average speed, distance and time.
MEASUREMENT and GEOMETRY
Students analyze characteristics and properties of geometric shapes.
Use geometric terminology to communicate (acute, right and obtuse angles; complementary/supplementary angles; isosceles, scalene, equilateral triangles; quadrilaterals, pentagons, etc.).
Determine the area and perimeter of triangles and quadrilaterals.
Use the common estimate of Pi to calculate circumference and the area of circles.

Use formulas to calculate the volume of triangular prisms and cylinders.
Students apply appropriate techniques, tools and formulas to determine measurement.
Use rulers, protractors and compasses appropriately.
Use standard measurement to solve problems.
Use metric measurement to solve problems.
Estimate relationships between standard and metric measures.
Students specify and plot locations using coordinate geometry (4 quadrants).
STATISTICS, DATA ANALYSIS and PROBABILITY
Students read/analyze and create a variety of graphs from data.
Formulate questions that can be addressed with data.
Collect, organize and display data to answer questions.
Explore a variety of graphs (e.g. stem and leaf; box and whiskers plots).
Students understand, explain and use the concept of Central Tendency.
Define range, mean, median and mode.
Determine a reasonable measure of center and spread to analyze data.
Students describe the characteristics and limitations of samples.
Students understand and apply basic concepts of probability.
Represent probabilities as ratios, proportions, decimals and percentages.

Grade 7
PRE-ALGEBRA
THE LANGUAGE OF MATHEMATICS
The language of mathematics is critical to communication in all disciplines of mathematics.
Understand the language of math (algebra, geometry, statistics and probability) and use it appropriately.
MATHEMATICAL REASONING
Mathematical reasoning is woven into all lessons and addressed continuously throughout the school year.
Analyze problems, formulate and justify mathematical conjectures and determine the most effective way to solve a problem.
Use a variety of strategies to solve problems including estimation, graphing, inductive and deductive reasoning and precise calculation.
Determine a solution is complete and move beyond a particular problem by generalizing to other situations.
NUMBER SENSE
Students recognize and use rational numbers in a variety of forms.
Order and compare rational numbers on a number line.
Add, subtract, multiply and divide rational numbers (integers).
Determine prime factorization.
Students convert fractions to decimals and percents; determine appropriate conversion and apply to problem-solving situations.
Students use exponents, powers, and roots and use exponents in working with fractions.
Multiply, divide, and simplify rational numbers by using exponent rules
Use the inverse relationship between raising to a power and extracting the root of a perfect

square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why
Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers
Students differentiate between rational and irrational numbers.
ALGEBRA and FUNCTIONS
Students use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description.
Students understand and apply the order of operations to evaluate algebraic expressions and solve equations using rational numbers.
Students simplify numerical expressions by applying properties of rational numbers (e.g. associative, commutative, distributive, identity and inverse properties) and justify the process used.
Students use appropriate algebraic terminology (including variable, equation, term, coefficient, inequality, expression and constant).
Students interpret and evaluate expressions involving monomials.
Interpret positive whole number powers as repeated multiplication and negative whole number powers as repeated division or multiplication by the multiplicative inverse.
Multiply and divide monomials.
Graph and interpret linear and some nonlinear functions.
Students solve simple linear equations and inequalities over the rational numbers.
Solve two-step linear equations and inequalities, interpret the solution or solutions in the context from which they arose and verify the reasonableness of the results.
Solve multi-step problems involving rate, average speed, distance and time.
MEASUREMENT and GEOMETRY
Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems.
Students compute the perimeter, area and volume of common geometric objects and use the results to find measures of less common objects. (Know how perimeter, area and volume are affected by changes of scale).
Students understand and use the Pythagorean Theorem and its converse.
Students deepen their understanding of plane and solid geometric shapes that meet given conditions and by identifying attributes of figures.
Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them and determine their image under translations and reflections.
STATISTICS, DATA ANALYSIS and PROBABILITY
Students collect, organize and represent data sets that have one or more variables and identify relationships among variables within a data set.
Know various forms for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to compare two sets of data.
Understand the meaning of and be able to compute the minimum, the lower quartile, the median, the upper quartile and the maximum of a data set.
Use an electronic spreadsheet software program (Excel) to collect, organize and represent data;

create a graph from data.

Grade 8
Algebra
Students identify and use the arithmetic properties of subsets of integers and rational, irrational, and real numbers, including closure properties for the four basic arithmetic operations where applicable:
Effectively apply the properties of operations, especially the distributive property and property of equality.
Use properties of numbers to demonstrate whether assertions are true or false.
Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.
Demonstrate understanding of negative exponents and zero as an exponent.
Students solve equations and inequalities involving absolute values.
Students simplify expressions and then solve first-degree equations and inequalities in one variable.
Demonstrate how to balance an equation.
Work with formulas, percents and ratios.
Solve compound inequalities.
Illustrate the intersection and union of sets graphically.
Students solve multi-step problems, including word problems, involving first-degree equations and inequalities and provide justification for each step.
Students analyze and graph a linear equation in the x-y Cartesian plane
Compute the x- and y-intercepts given an equation.
Find the slope given an equation or two points.
Draw a graph of a linear equation when given the equation, slope and point or two points.
Students find the equation of a line.
Write a linear equation given two points, one point and slope, or a graph.
Use slope-intercept form and point-slope form as appropriate to find the equation of a line.
Students understand the concepts of parallel lines and perpendicular lines and how the slopes of such lines are related.
Find the equation of a line perpendicular to a given line that passes through a given point.
Find the equation of a line parallel to a given line that passes through a given point.
Students solve a system of two linear equations in two variables algebraically and interpret the answer graphically.
Students will add, subtract, multiply, and divide monomials and polynomials.
Students solve multi-step problems, including word problems, by using these techniques.
Demonstrate understanding of powers of a monomial. (Continued on page 9)
Academic Content Standards - Grade 8
Multiply binomials mentally, including squaring a binomial.
Multiply a polynomial by a monomial or two polynomials.
Students apply basic factoring techniques to second- and simple third-degree polynomials, including finding a common factor for all terms in a polynomial, recognizing the difference of

two squares, and recognizing perfect squares of binomials.
Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.
Students add, subtract, multiply, and divide rational expressions. Students will solve both computationally and conceptually challenging problems
Define and explain rational numbers.
Reduce, add, subtract, multiply and divide algebraic fractions using factoring techniques.
Simplify complex fractions and/or algebraic fractions.
Demonstrate understanding of direct and inverse proportions.
Students add, subtract, multiply, and divide irrational expressions. Students solve both computationally and conceptually challenging problems.
Students apply algebraic techniques to set up and solve a variety of problems.
Students understand the concepts of a relation and a function and give pertinent information about given relations and functions.
Determine the domain of independent variables and the range of dependent variables defined by a graph, set of ordered pairs or a symbolic expression (including linear, radical, rational functions).
Determine whether a relation is a function and justify the conclusion.
Students analyze and solve quadratic equations in a variety of ways.
Graph quadratic functions and know the x- and y-intercepts, line of symmetry, maximum and minimum points.
Determine the number and type of roots of a quadratic equation by factoring or using the quadratic formula.
Students know and use simple aspects of a logical argument.
Students use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements.

Appendix B

Examples of Math Lessons and Quizzes

Connecting math to everyday experiences provides interrelatedness between student interests, the environment, and school (Bertalanffy, 1968; Gardner, 1999a; Senge, 2000). In the example below using skateboarding for a pop quiz in a math class as a warm up activity for middle school or high school levels reinforces the concepts introduced the previous day (Thornton, 2001).

Tony Hawk 900 Quiz

What is a "900?"

Do the Math and show your work.

How many degrees would two complete revolutions make?

What is a "1080?" Explain it mathematically. Draw a picture or diagram to show an example.

Professional Corner

An example lesson provides an explanation of how Gardner's Intelligences (1993) are used in high school mathematics. Verbal/Linguistic—a discussion of how to divide the graph, getting student responses for examples; Logical/Mathematical--solving the graph divisions by turning the day into fractions of a 24 hour period; Visual/Spacial--drawing a model graph on the board; Musical/Rhythmic—a discussion of how many hours a day students listen to music, while accomplishing other activities; Intrapersonal--each student graphed a personal routine during a typical school day; and lastly, Interpersonal--the students assisted each other in figuring out the graphing assignments.

The following scenario explains the demographics of the students targeted for the high school math lesson and the results of the step by step process for replication purposes:

In a 54 minute class period a graphing assignment was given where the students range in age from 14 to 18 years old, with levels of abilities as diverse as the ages. On the campus of Arcadia High School the students are enrolled in four different classes consisting of a Special Day Math Class: levels 4^{th} - 8^{th} (ages 13- 16), two Investigating Math Classes: levels 8^{th} - 11^{th} (ages 14- 17), and a Consumer Math Class: levels 10^{th} - 12^{th} (ages 15- 18). The lessons took place the first day back after Spring Break.

The first worksheet from the Professional Corner (Charles, Cooney, Dossey, O"Daffer, & Scheilack, 1998, p. 17) is introduced as a warm-up activity. Anticipate that the students will be slow to get started because they are returning after having a week vacation. Simply state the questions:

What comes to your mind when you see or hear the word Mathematics?

If a younger brother or sister asked you what mathematics is, what would you say?

As expected, the students started slowly, but after some encouragement and explanation for the assignment they began to take it seriously. Some were worried about spelling errors, so stress that spelling does not count and that it would easily be able to be understood. Many students expressed a fear of Math, causing them to dislike it because they did not understand it. The majority of the responses to siblings were related to negative comments. Expect the kinds of responses due to the fact that the students in the classes have had a difficult time in their math careers up to this point in studying mathematics.

The second worksheet taken from the Professional Corner (Charles, Cooney, Dossey, O"Daffer, & Scheilack, 1998, p. 423) was designed to incorporate several levels of Gardner's Multiple Intelligences. The activity, named: *What happens in a normal school day?,* asked the students to record the time spent on daily activities in a normal school day and then record the activities on a circle graph. The students were also asked to color or decorate their graphs in any way they chose, with the markers, colored pencils, or crayons that were provided. The answers and degree of decorations varied. Some students immediately wrote down anything as quickly as they could, just to get the assignment finished. Others worked diligently, taking time to figure out what fraction or percentage fit in each part of the circle.

Anticipate that the lesson will take longer than expected due to varied levels of the learners. After completing the warm up activity, writing thoughts about Mathematics and how to explain it to a younger sibling, the discussion opened about a typical school day. The discussion led into a sample graph on the board and how to divide each individual graph. Allowing enough time for the graphs to be decorated for the visual/spatial learners is important (Schubert, 2006).

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