

Transforming Education: Case Studies in Systems Thinking

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Systems Thinking: The Key to Educational Redesign

As we approach the next millennium, rapid societal change has dramatically altered our educational needs—which in turn is challenging us to transform the structure and processes of our schools. The simplest explanation for the current need of educational change, is that we, as a society, have outgrown our schools. That is, the predominant educational system of today was created for the industrial age needs of sorting students into future factory workers and leaders, towards disseminating core knowledge, and towards building basic skills (Reigeluth, 1994). While this model was appropriate earlier in this century, with the advent of the information age, and now the beginning of the communication age (Thornburg, 1995) we are finding that it no longer meets our societal needs. In fact, it is limiting the ability of teachers and students to adapt to the 21st century.

As the amount of information increases exponentially, our educational system can no longer focus primarily on memorizing a core body of knowledge. There is no way any single individual can master all of the information available. Rather, our schools must help children become skillful manipulators, synthesizers and creators of knowledge. And since we are now entering an era of global communication and collaboration, we need professionals who can work on teams to solve complex problems. Society no longer relies primarily on factory workers, but on life long learners who can think critically, solve problems and work collaboratively. These are the skills of tomorrow's "knowledge workers" (Drucker, 1994). Since, industrial age schools were not designed with this goal in mind, we need entirely new concepts in learning and teaching—rather than more efficient industrial age schools.

Just understanding this need for redesign, however, does not provide us with the necessary skills to successfully create alternative schools. All too often, reform efforts fail because we lack the abilities required for systemic design; we cannot analyze the existing school model holistically and recreate it from the ground up. Instead, we often remain entrenched in our current notions of education and only tinker at the edges of schools—making minimal changes. With the grandest of ideals, designers often aim towards creating a new school that looks totally different from traditional education, only to find that the resulting system is very similar to a traditional classroom!

To avoid this trap of piecemeal change, we need to develop expertise in systems thinking which can help us determine how our schools will be designed organizationally, how people will interact within the system, and how people and things will move in and out of the system. Unfortunately, systems thinking is a difficult skill to acquire; and it is not commonly taught. To remedy this deficiency, we will present SIGGS, a model that will enable readers to practice systems thinking while examining their current educational systems and while designing new schools and classrooms.

SIGGS, is an educational systems model created in 1966 by Maccia and Maccia through the synthesis of four different theories: Set, Information, di-Graph, and General Systems. Unfortunately, since SIGGS is written in highly complex mathematical language, it has received little attention since its creation. To make SIGGS more accessible, we will translate several SIGGS concepts into every day language by contrasting two alternative educational models—a modified Montessori classroom and the museum school—with our image of the traditional school model. As you follow along with our analysis of the different schools using SIGGS concepts, you will explore

how students learned, teachers taught, and how objects, materials and people flowed into and out of these systems. This process will give you ideas on how you might redesign your own school or classroom. We will continue with a brief introduction to SIGGS, and to the two case studies we conducted on The Smithville Montessori School (pseudonym), and four museum schools.

SIGGS: Relevant Literature and Supplemental Resources

In several publications, Elizabeth Steiner Maccia and George S. Maccia (1976, 1975, 1966) presented their SIGGS Theory Model which they created by combining four different theories. From this model, they then developed a theory of education, consisting of 201 hypotheses, which are presented, in the 1966 manuscript. These hypotheses describe relationships among properties of educational systems. For example, one of the hypotheses is: If centralization in an educational system increases, then active dependence decreases. In order to understand this and other hypotheses, readers must first master up to 60 properties of systems that Maccia and Maccia describe (such as active dependence and compatibility).

Perhaps the simplest place to start, is Steiner's (1988) description of an "educational system." According to her work, educational systems are comprised of four components: teachers, students, content, and context. A teacher is defined as someone who guides or leads the learning of others. While we typically think of direct instruction, this also includes indirect guidance—such as teacher-created or selected learning materials or discovery centers. A student is defined as someone who intends to learn through guidance from a teacher; whereas a learner is someone who attempts to learn on

his or her own. Content refers to what is actually learned; and context is the setting in which the content is mastered.

Using a systems approach, Frick (1993, 1991) has examined the kinds of relationships that can exist among these four components, such as, teacher-student relationships, student-content relationships, teacher-content relationships, etc. Through this exercise, Frick portrays our image of industrial age schooling. For example, in teacher-student relationships, teachers of the typical industrial age school generally present information, assign readings, grade assignments, supervise student seatwork and answer student questions. For student-content relationships, students often find the subject matter to be disconnected from their lives, have a passive interaction with the subject, lack the opportunity to choose their own content; and consequently, they are often bored with the subject matter. In teacher-content relationships of industrial age schools, teachers often have little control over what content is to be covered, and are usually required to use district-mandated learning materials, such as textbooks. From this exercise, we can not only begin to see what has often occurred in industrial educational systems, but we can also envision how we might change those relationships.

In order to understand the hypothesis presented above (centralization in an educational system increases, then active dependence decreases), let's look at how teachers, students, administrators and other stakeholders inter-react with content. Generally speaking, most industrial age schools have a high degree of centralization, with decision making lying more in the hands of administrators, than with teachers, students or parents. According to SIGGS, if centralization is high, active dependence is low. Active dependence relates to whether or not people within the system have the power to impact

influence others. Indeed, quite often, teachers, parents, students, and community members have little power to impact what content is taught, or the materials used to cover that content. Instead, they implement choices made by publishers, textbook adoption committees, administrators, and school boards. Therefore, it does follow that if centralization is high, active dependence is low.

Through using SIGGS concepts, educational designers can gain an understanding of how components of current schools systems are interacting with one another, and they can then re-design their systems. To explore more SIGGS concepts, point your browser to the Web site created by Frick and a group of researchers (1995-1999).

Methodology and Data Sources

The Smithville Montessori School

In 1993, a qualitative case study on the upper elementary classroom of the Smithville Montessori School (SMS) was conducted over a two-week period during which a team of researchers (Anelli, King, Lutz, Yi & Zhu, 1993) studied the classroom as a unique instructional system. Data collection methods included observation, interviews, and document analysis. All five researchers individually observed the classroom and studied class materials for a total of six visits. Interviews were conducted with the head teacher (Mr. Morrison), four graduates, one parent, and with the second author who was a former member of the Board of Directors with ten years of SMS involvement.

The Smithville Montessori School (SMS), was located in a small midwestern town, and was founded in 1968. It was accredited by the American Montessori Society in 1971, and was owned and operated by its students' parents. Since there was no

principal, most of the day-to-day running of the school was carried out by the teachers and the school's sole administrative staff member who performed secretarial and office management duties.

In order to understand Mr. Morrison's classroom, a brief review of Montessori education will be presented. Even though Dr. Maria Montessori developed her philosophy nearly 100 years ago, her approach was uniquely modern and foresighted. In fact, the major components of Montessori education have been echoed and re-discovered in the work of Dewey, and in the recent constructivist movement (Bednar, Cunningham, Duffy & Perry, 1991; Bonk & Cunningham, 1998; Duffy, Lowyck & Jonassen, 1993).

The Montessori classroom is a community of learners with the following characteristics: freedom, structure, authenticity, and student ownership. First, children manage their own time, choose their own activities, and move freely about the classroom. However, they also must develop the maturity and independence needed to manage their time productively. Second, while Montessori classrooms appear to be chaotic, there is an underlying structure supporting the bustling activity. Third, real-world objects from the local environment are brought into the classroom, and are used by the children in the same way they are used in society. And finally, the Montessori learning community gives students ownership over their environment. They are responsible for managing their own time, for teaching each other, and for organizing and cleaning their classroom (Lillard, 1972; Wolf, 1975).

Following this belief in active learning, the Montessori classroom is a place of independence and responsibility. Accordingly, very little time is devoted to whole class instruction. Instead, teachers carefully design learning environments that contain centers

of real-world activities that are uniquely suited to the children's interests and developmental abilities. Students are free to engage in work at the centers at will; however, they are required to finish the projects they start and to return all materials to their proper place afterwards. As the children develop, they become responsible for more tasks, such as completing assignments on time, leaving the room unsupervised and teaching their younger classmates. Thus, there is a dual emphasis on increasing levels of independence and responsibility.

The Museum School

During the past ten years, several museums and schools have collaboratively created a new educational system, the museum school. Since there is minimal research exploring their instructional practices and institutional design, the first author conducted a qualitative multi-case study on four museum schools (King, 1998). Each school was visited for approximately five days, and 32 participants were interviewed. Data collection methods consisted of interviews, observation, document analysis, and a follow-up survey. Based on findings from these four cases, the museum school concept can be described as a school that is collaboratively designed and implemented through a partnership between a school district and at least one museum in order to implement museum learning that engages students in creating their own objects, exhibits or museums.

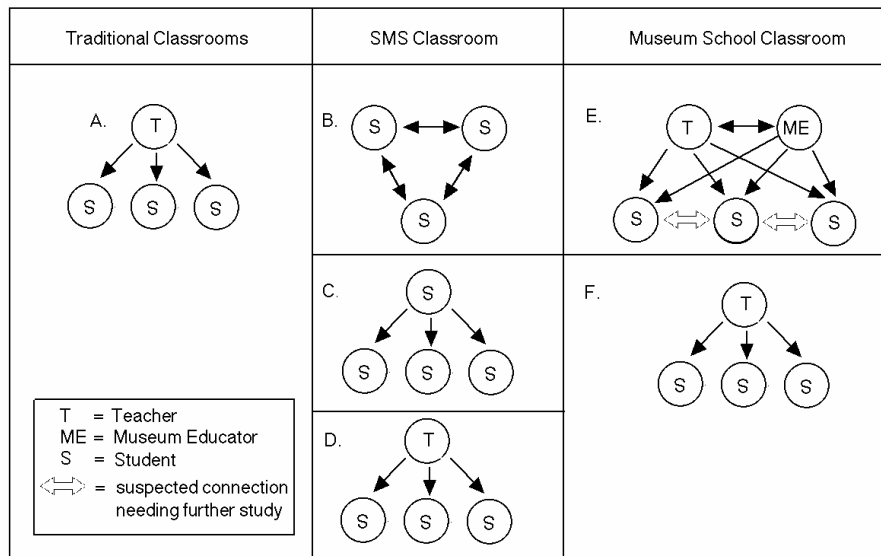
In these four schools, real-world objects and the exhibit development process were combined with constructivist and sociocultural curricula that embedded learning in long-term projects and apprenticeships. With the goal of situating learning in authentic contexts, children created their own knowledge through mentoring by museum

professionals, by conducting research, and by developing their own exhibits. Each school implemented museum themes in which district-mandated learning goals were pursued through projects requiring students to research and create artifacts and exhibits. Throughout these eight week themes, students and teachers worked with museum educators on a daily or weekly basis, learning how to learn in a similar way that museum professionals learn while building their collections and developing exhibits. For example, at The Museum Magnet School, in St. Paul, first graders learned about science, math, and language arts while working with museum educators and teachers to create an exhibit on worms and recycling. At the Stuart-Hobson Middle School, eighth graders worked with museum professionals from the Smithsonian Institution—learning math, English, fine arts, and science—as they created an exhibit on Native Americans. At The New York City Museum School, seventh graders worked on social studies and English with their classroom and museum teachers by researching colonial America in the period rooms and portrait galleries of the Brooklyn Museum of Art.

Exploring Three Classrooms through the SIGGS Lens

Patterns of Interaction

In order to understand the teaching and learning process within our three models, we will first examine connections between teachers, students, and parents by studying the “affect relation” of “guiding the learning of...” To do this, we must draw one diagram for each system, as illustrated in Figure 1.

Figure 1: "Guiding the Learning of . . ." Digraphs

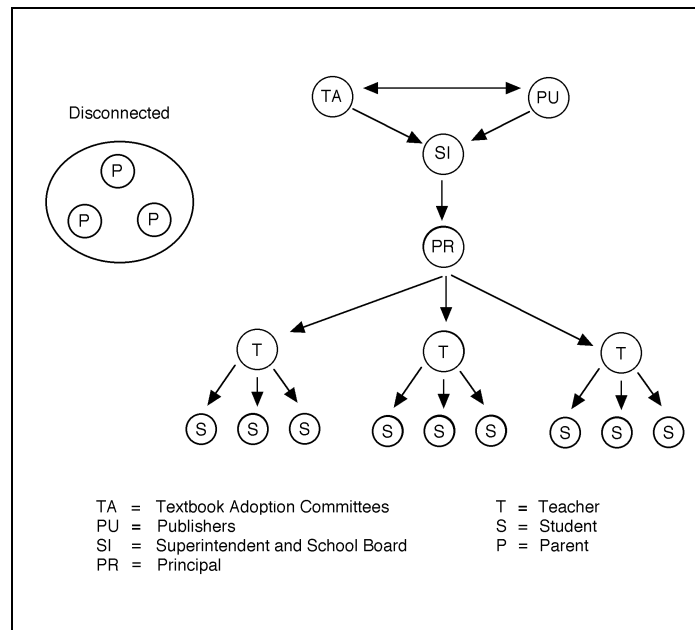
In traditional classrooms, connections tend to go from the teacher to the students; students seldom have connections to the teacher or between themselves with respect to "guiding the learning of." Thus, generally, the teacher is active in the instructional process, while students are passive recipients. The lack of arrows from students to teachers indicates their passive role, and the fact that we don't think of students guiding their teachers' learning. We say there is a high degree of passive dependence, and that much of the time students are dependent upon the teacher's direction.

In the SMS and museum school classrooms we observed, however, we saw a variety of configurations. In Digraphs B and E, we can see more active dependence, as arrows flow both ways between a variety of individuals. Interactions with double arrows portray situations where children were given more control over their learning by teaching each other, and where museum educators and classroom teachers were guiding each others' learning as they collaboratively designed and implemented museum themes. Since students in both classrooms were more active in their own learning, many were

motivated to pursue classroom activities even when teachers were not in the room. It is important to stress, however, that in all classrooms we observed times of whole class instruction, that resembled Digraph A.

Who Selects the Content?

Next, we will explore how content was selected in the three models, looking at levels of filtration controlling what materials were brought into the system. In industrial age schooling, our digraph (Figure 2) depicts a highly centralized process, demonstrating how little control many teachers have over the content, and how disconnected parents can be. Generally, it is publishers, textbook adoption committees, administrators, and school boards who determine which textbooks will be written and adopted; and it is usually the teacher's role to implement those decisions. Quite often, there is an indirect relationship between publishers and textbook adoption committees, where the publishers filter their content in order to receive acceptance by the textbook adoption committees to accept their books. Typically, the states of California and Texas wield the most influence in content selection (Norman Overly, personal communication, September 11, 1998). Administrators and teachers can then only choose from textbooks that have already been filtered by the textbook adoption committees; they have little say in what was written in those textbooks.

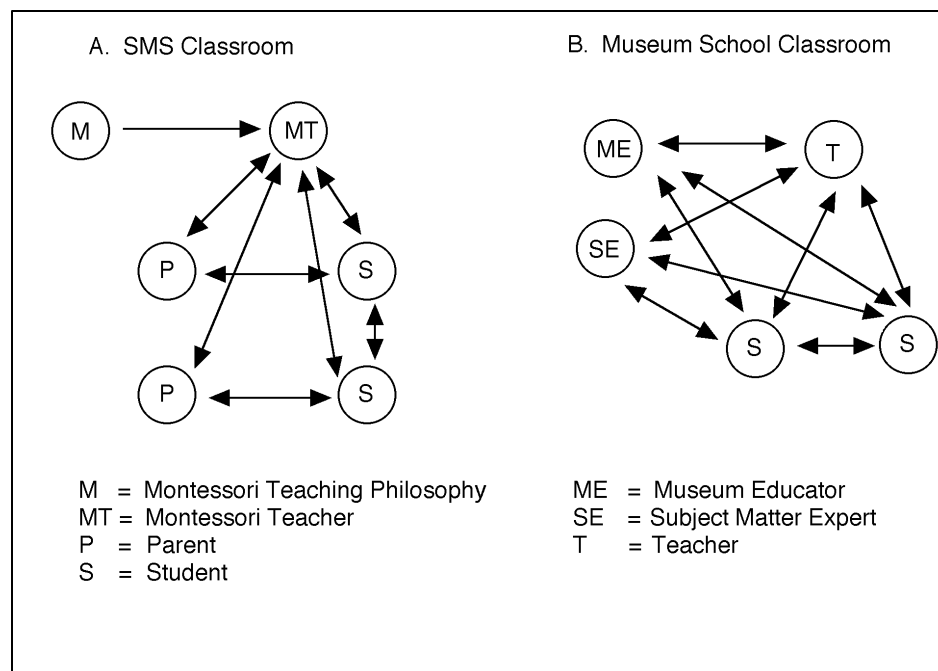
Figure 2: "Selecting the Content" in the Industrial Age School

In the SMS and museum school classrooms we observed (Figure 3), however, centralization and filtration were minimal, enabling teachers to choose from a diverse range of learning materials. Teachers empowered children and their parents to influence the content, giving students more control over their learning. For example, at SMS, content-decisions were made primarily by the teachers, not administrators. While Montessori teachers begin their careers with the standard set of Montessori teaching/learning materials, they are expected to continually design other materials based on their students' needs and interests. In the Montessori classroom we observed, each student was required to conduct twelve research projects every quarter. At the beginning of each new quarter, the head teacher sent a note home, asking parents to describe topic areas that would intrigue their children. He then designed projects around those interests within reasonable limits regarding time and scope. Throughout the year, each student used reference books for their individual assignments; these books either came from the

classroom library, the school library, or from the local public library which the entire class visited one day per week. Therefore, in this classroom, the teacher, parents, and students had significant influence over content selection.

In the four museum schools studied, teachers and partnering museum educators worked together with students and various subject matter experts (artists, builders, curators, exhibit developers) to create content and learning activities that interested the students, that met district-mandated learning goals, and that leveraged the museum's (and other informal learning centers') objects and exhibits. Once again, instead of focusing primarily on standard textbooks, content was now generated by teachers, students, and experts through a variety of resources, such as local informal learning institutions (museums, zoos, botanical gardens, history centers, etc.), traveling exhibits, the Internet, and local experts.

**Figure 3: "Creating the Content . . ." for the SMS and
Museum School Classrooms**

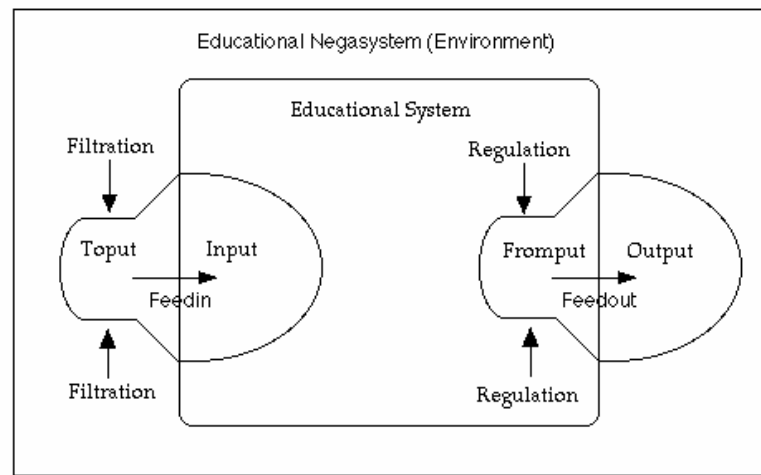


Now that we have a landscape view of the three different school systems, we will zoom in closer for an analysis of how people and things move in and out of the classrooms.

Bringing People and Things into the System: Feedin and Filtration

The process of feedin involves bringing people and things into the system in two steps: toput and input. First, when things are made available to the system they become toput. Second, some or all of this toput is then brought into the system and becomes input. We measure feedin, and its sub-components, through levels of uncertainty or variation: how certain is it that your child will be enrolled into the school—will become input? To answer this question, we must consider filtration, which determines what items are made available to the system—to become toput. In public schools, since there is minimal regulation regarding admission, nearly all children who apply become toput, are eligible for admission. This results in a higher degree of variation within the input—in many different types of students regarding socio-economic status, ethnicity, achievement, etc. It is important to realize that when we state there is a high level of input, we are saying there is diversity among the student body, not that there are many students entering the school.

The concepts of feedin and regulation can also be applied to the acquisition of learning materials. In many traditional schools, filtration limits learning and instructional materials to standard textbooks, workbooks, and manipulatives. Teachers often experience this when principals, school boards, or state departments of education dictate what material will be covered. When a principal denies a teacher's request to implement a new curriculum, this is an instance of filtration. When all students in a class have the same learning materials, there is low input—which means there is little diversity.

Figure 4: Moving People and Things In and Out of the System

In the SMS classroom we observed, there was higher input (greater diversity) than we typically see in traditional schools. This results from the fact that Mr. Morrison (the head teacher) was responsible for selecting learning materials and was not restricted to any district-mandated textbooks. Therefore, there was less filtration. The result was a greater diversity in learning materials—in higher levels of input. In fact, the only standard text he used was a math workbook.

Since the bulk of student work required the completion of research projects, most of the curriculum consisted of content specific reference books. Rather than using language arts textbooks, Mr. Morrison established an extensive classroom library of reference books. Additionally, the students used the school library; and weekly, the entire class visited the local library to select additional books for their research projects. Thus, there was weekly feedin (and feedout) of library books for each student.

In the museum schools observed, there also appeared to be higher levels of input, and greater diversity in learning materials. For example, museum educators were on-site on a weekly or daily basis, bringing new learning activities and resources—some even

established offices within the schools. Also, at the Museum Magnet School of St. Paul traveling exhibits were brought into the school on a regular basis, and objects from the Science Museum of Minnesota were installed in the school atrium.

Therefore, learning material input for both the SMS and museum school classrooms was greater than in the traditional school model. There was greater uncertainty of—or variation in—learning materials than is typically found in most industrial age classrooms.

Moving People and Things Out of the System: Feedout and Regulation

Feedout is the opposite process of feedin, representing the process of making components available to leave the system (fromput), and the subsequent release of these components (output). Each year, high school seniors become fromput, and then become output as they graduate.

Just as feedin is monitored through filtration, feedout is monitored through regulation (Figure 4). When there is a high degree of regulation, there is less uncertainty or variation in the output. For example, if a school only allows students with a minimum GPA of 3.7 to graduate, then there is a high degree of regulation with little variation of the student body with regard to GPA.

Besides occurring on an annual basis, regulation happens daily. In Mr. Morrison's class, student performance was regulated daily through the use of something he called the 9-12 Card System. While students were free to manage their own time throughout much of the day, they were responsible for completing three units of work each day—one major (a paper, a poster, fifteen fact cards) and two minors (five fact cards, a weekly

reader or a computer software program). When students were not engaged in small group or whole class activities, they were expected to work on their individual projects.

Upon entering the class in grade four, each student was given a tangerine punch card with rows of pluses and minuses. At the end of each day, students were eligible for dismissal only after having an exit interview with one of the teachers. If the child had completed the required major and two minors, the teacher punched three pluses; if not, she punched three minuses. At the end of each quarter, the punch cards were reviewed, children were moved up or down a color, and extra privileges were either awarded or rescinded. Privileges included the following: talking quietly with friends, visiting the library or outside deck unaccompanied, and conducting an independent field trip.

This system helped the teachers monitor each child's development of personal responsibility and time management. It reflected a type of regulation, where each day, students were only eligible for dismissal (can become fromput), after they had their exit interview. Afterwards, they become output—their parents took them home.

It also helped foster self-discipline. While researchers were observing Mr. Morrison's class, they did note off-task behavior. At times, children engaged in the quiet chatter of work: humming a song or talking to other students while working. At other times, this behavior escalated to such a level, that the students were not getting much work done. Teachers did not stop student chatter because children were free to manage their own time, even if it meant that they squandered time on off-task behavior. At the end of the day, however, the students were responsible for having done their work. If a child had not completed the one major and a minor, it was noted on the punch card. If the problem escalated, the student lost various privileges. For example, after failing to

complete sufficient work, several students were no longer allowed to place their desks next to their fellow students; instead, they had to sit by themselves alongside the walls until they had demonstrated the ability to manage their time effectively. Therefore, through the use of regulation, this classroom had a strong structure presenting children with real-world choices and consequences.

Feedout was also different for the museum school classrooms. Student-created exhibits and objects were leaving the school and being installed at local museums. Additionally, students and teachers left the school on a regular basis to visit museums as alternative learning sites. For example, at the New York City Museum School, students and their teachers spent several hours two to three days each week at one museum.

If We Take Different Pathways, Do We Still Reach the Same Mountain Top?

Using a metaphor of mountain climbing, we will explore three SIGGS concepts—homomorphism, equifinality, and compatibility—that focus on both the process and outcomes of student learning. In industrial age schools, stakeholders typically feel that all students must complete the same activities if they are to acquire the desired skills; that is, all students must follow the same pathway to arrive at the mountain top.

It is this belief that leads to high levels of “homomorphism.” Simply put, homomorphism analyzes the degree of similarity within an educational system, such as a classroom. For example, regarding the affect relation of “guiding the learning of (X),” homomorphism measures the degree to which students are all doing the same thing (X). In industrial age schools, homomorphism tends to be high; that is, quite often students are all working on the same activities with the same textbooks at the same time of day. For

example, guiding the learning of geometry typically involves a teacher lecturing to students who follow along in their textbooks.

In the SMS and museum school classrooms we observed, however, we saw lower levels of homomorphism, with greater diversity in learning activities. In Mr. Morrison's classroom, while there was some whole class instruction, much of the day consisted of unstructured time in which a variety of learning activities occurred: some students worked on their research papers individually, others consulted with a teacher, and a small group of students worked with the head teacher on a math lesson. Additionally, the instructional guidance by the teachers was often offered indirectly, through the learning materials they had acquired and developed for the students. At the Stuart-Hobson Middle Museum Magnet School, the first author saw low levels of homomorphism while students prepared their Native American exhibit opening. One third of the grade level was painting murals, another third was in the gymnasium building life-sized buildings (i.e., igloo, teepee, longhouse), and the remaining third was working—with little or no supervision—on exhibit artifacts, i.e. hand-drawn portraits of Native Americans, portraits frames, beaded works, etc.

Such low levels of homomorphism stem from a belief in "equifinality," which suggests that there are many different pathways leading to the same destination. Though students took different paths, they all climbed the same mountain top. For example, these museum school and SMS classrooms encouraged students to pursue unique avenues of research and inquiry. At SMS, each semester, students conducted 12 individual research papers covering different content. At the museum schools, students covered basic learning goals through a variety of different museum themes, such as a Worm Exhibit, a

Native American Unit, a Habitat Theme, a Colonial American Module. While the content changed, it was believed that children learned similar skills as they defined their research project, generated questions, gathered data and information, synthesized findings, and published their work through papers, exhibit openings, and presentations.

While not all children learned the same content; it was believed that they would all cover learning goals enabling them to pursue lifelong learning, critical thinking and problem solving. This approach is quite different from traditional elementary schools which generally require that all students complete the same or highly similar learning activities.

A final concept we will present, compatibility, deals with the mountain top destination you choose for your students. How compatible are the graduating students with the “negasystem?”—that which is not part of the system. When we examined the three educational models, we found that this issue was dependent upon how we defined the negasystem. For example, were we examining how compatible graduates were with the traditional school environments they typically entered? Or were we interested in how equipped these graduates were to be communication age lifelong learners? When pursuing the first question, our findings suggested mixed results. During interviews with participants from the SMS classroom, and from the four museum schools, we heard anecdotal evidence suggesting that the students performed well academically after graduation. However, four SMS graduates did express initial difficulty with their loss of control over their learning—when leaving the SMS elementary program and entering a traditional public middle school.

While graduates of these alternative educational models appeared to perform well in industrial age schooling, it is important to realize that the skills society wants are not those that are most typically required for academic excellence. As Honebin, Duffy and Fishman (1991) state, authentic activity for traditional schools tends to be test taking and paper writing, but authentic activity for the workplace involves thinking critically, solving problems, and working collaboratively. Therefore, we need to redesign our schools so that the primary focus is not on information acquisition, but on the process of learning, thinking and problem solving.

Both SMS and the museum school models we studied appeared to be highly compatible with the communication age workplace, by helping children become self sufficient learners capable of building their own knowledge. However, it is precisely these skills which appeared to cause SMS students initial difficulties upon acclimating to the public middle school. For example, the four graduates we interviewed found it most difficult to adjust to a learning environment in which they had little autonomy. After years of individual responsibility and control over their own learning, suddenly these students found themselves having to adapt to the "sage on the stage" model where the teachers were now primarily in control of the learning process. Why are we asking our children to give up the very skills we want them to acquire? Additionally, as existing museum schools seek to evaluate their success, and new museum schools are creating assessment systems, they are struggling with an outdated system that uses standardized testing as the primary means for measuring success. Since standardized tests do not measure the higher order thinking skills typically needed in the communication age workplace, they are not appropriate tools to be used as sole measures of a school's

compatibility with its negasystem. When considering compatibility, we are confronted with the necessity of redesigning every layer of our schools so that success in schools mirrors success in the workplace.

Educational Significance

Society is experiencing the most amount of change it has ever experienced in recorded history (Drucker, 1994). To navigate these choppy waters successfully, we must redesign many of our societal systems, not only to meet current needs, but also to shape the future we all envision. One of the most important systems we need to redesign is our schooling. While it is tempting to have others re-design our schools for us, this is not the optimal choice because only the stakeholders themselves can truly understand their own unique needs and goals.

However, we cannot effectively design our schools unless we have skills in systems thinking. SIGGS is a powerful conceptual model that enables designers to analyze existing schools and design alternative systems by exploring the way people and things interact. As you are designing your new school or classroom, begin by defining the learning mountain top. What types of learning goals are you setting for your students? How compatible will these graduates be with the schools they enter? How compatible will your graduates be with the future work place?

Next, picture the pathways your students will take up the mountain top. Will you have high levels of homomorphism? That is, will students be doing the same tasks to arrive at the desired skill levels? Or will your program espouse equifinality, encouraging students to chart unique learning pathways up the mountain top? Such an approach will encourage the development of distributed expertise—such as the Montessori system of

education (Lillard, 1972)—in which students acquire knowledge in different areas; yet, all students will also be building common skills in lifelong learning, problem solving, inquiry and collaboration.

Once you have your basic goals and philosophies articulated, continue your design by drawing a digraph depicting an affect relation, such as “Guiding the learning of...” Ask yourself, “Who is guiding each other’s learning?” Is the teacher in primary control? Or are you creating knowledge building communities where teachers, students, and experts are guiding each others’ learning, as appropriate?

Next, think about how you will select content for your students. Will administrators and text book adoption committees be in primary control? Or will teachers, students, parents, and subject matter experts be free to choose from a variety of materials? Also, determine how you want to manage the feedin/filtration and feedout/regulation processes. Who will influence how people and things move in and out of the system? Will parents, students and community members have access to the system?

Such disciplined inquiry of asking questions and drawing diagrams helps educational designers break out of their traditional notions of schooling and realize their dreams of creating something entirely new. Traditional industrial age school systems are no longer capable of preparing our children for the future. There is nothing more important than this goal of educating our children to become lifelong learners capable of working effectively in the communication age; and perhaps there is nothing more challenging, overwhelming, and exhilarating. Even though SIGGS is a difficult language

to understand, it is an invaluable systems thinking tool that supports us in the redesign process.

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