

### A Synergistic Collaborative Learning Model

With the millennial generation now in college, one must ask the question: does a more collaborative approach to instruction better raise student outcomes and increase student satisfaction? This action research paper explores the outcomes of four separate university undergraduate pedagogy classes at a mid-west university.

#### **A Brief Review of Relevant Literature**

As public education moves into the twenty-first century, it is critical that educators pay attention to the changing trends both inside and outside of the classroom. The evolving manner in which student's communicate and gather information is of critical importance. New models of learning with this "net" generation must be explored.

The Net Generation has grown up with information technology. The aptitudes, attitudes, expectations, and learning styles of Net Gen students reflect the environment in which they were raised—one that is decidedly different from that which existed when faculty and administrators were growing up (Oblinger & Oblinger, 2005).

The Net Generation refers to students under the age of 22. These students have grown up immersed in technology from cell phones to computers (Tapscott, 2009). In addition, these individuals have developed different communication and learning styles, which are largely collaborative in nature (Oblinger & Oblinger, 2005). These changes cause us to look for new models in human learning. One such collaborative model may be referred to as a Synergetic Collaborative Learning Model.

The implications of this inquiry leads this researcher to suggest a potentially new learning model, which will be referred to as The Synergetic Collaborative Learning Model (SCL), which

strives to provide an expanded view of how individuals communicate, but also how they process and make meaning out of those communications, thus leading to active learning. This communication process may exist at all developmental levels ranging from infant learners to mature adults. While there may be variances in the process at each stage, the mechanisms tend to remain constant.

Communication theory has generally viewed human communications as being concerned with the making of meaning and the exchange of ideas and understandings between individuals and groups. Harold Lasswell (1902-1998), a leading American political scientist and communications theorist, has been quoted as saying that communication is “who says what to whom in what channel with what effect” (Miller, Vandome, & McBrewster, 2009). While this represents a very pragmatic definition of communication, learning theorists such as Dewey (1938), Vygotsky (1978), and Bloom (1956) have striven to explain how individuals derive meaning from communication. The Synergetic Collaborative Learning Model is built upon four basic pillars, all of which proceed from the theoretical frameworks of Dewey, Vygotsky, and Bloom.

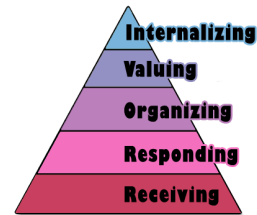
- Learning is filtered by the affective
- Learning is a social process
- Learning is an active process
- Learning must become cognitive

### **Learning is Affective**

Theorists traditionally have focused heavily on the cognitive processing that occurs during the learning process. One such theorist, Bloom (1956), pointed out that there are actually three domains for learning, which are as follows: affective, cognitive, and psychomotor. The

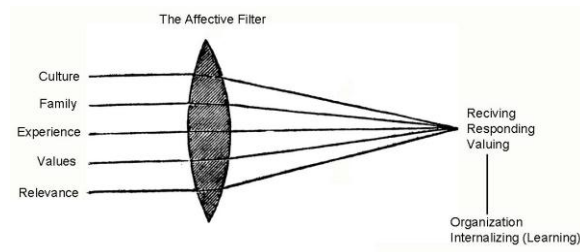
first of these was the cognitive and dealt with the mental processes involved in learning at various levels from basic facts to synthesis and analysis. SCL would contend that Bloom's Affective Domain plays an equally important role in the learning process. Bloom stated that the affective domain deals with both feelings and values (Bloom, 1956).

The first sub-level of this domain is receiving. Receiving refers to the act of listening and accepting something that is communicated. It is the base affective level of human interaction. When examining this interaction in a classroom the dynamics that



exist between the individual student and the teacher are keys to the model. If students perceive that the communication is contrary to their belief system, it will most likely be rejected and not received. The students must see value in what is being communicated otherwise it is seen as having no meaning. How many times have educators asked a question of the class only to receive the response; "what?"... "Could you repeat the question?" The student was clearly not receiving the question and most likely the information that preceded the question itself.

The student's affective filter had blocked the information, indicating that either his or her own thoughts or daydreams were determined to be more important than the



communication of the teacher. Had the students received the communication and thus were able to answer the questions, the process would have moved to Bloom's (1956) second affective level, responding. At this stage, the students have at least determined that being attentive in class is desirable and are willing to devote a small portion of their mental energy. They have heard the questions and have responded to them. So far, this response may give an indication that the

students are, in fact, learning, but without the third affective stage of Bloom, that learning may be very short-lived.

Valuing is the affective level in which the students begin to view the information as relevant and may begin processing means to retain the information (Bloom, 1956). The valuing stage can be very situational. The affective motivator for this stage may in fact be the fear of failure on the exam. In this case, if there are no other motivators beyond the exam, the information is often discarded and meaningful long-term learning is lost.

Long-term learning begins to show itself at the fourth stage of the affective domain, organization (Bloom, 1956). At this stage, the student begins to organize the information, building upon the schema established by previous relevant knowledge. These bonds tend to become more permanent in nature as they are integrated into the thought process of the individual. Not only do the new elements of information become bound to old knowledge, they also become the platform upon which information may be built in the future. It is at this stage that strong feelings of belief often appear. Even if these belief structures are faulty, they become very difficult to dislodge. As this organizational process proceeds, it will move to the final affective stage of Internalization where behavior is permanently changed. This is where the information is fully integrated into the thinking of the individual.

When affective dissonance occurs, a time when a learner is unable to bring value to incoming knowledge, there is cognitive dissonance. When students have feelings of cognitive dissonance in a classroom, feelings of confusion and anxiety can quickly lead to detachment and apathy for the content and material, rendering time in class to be a waste for the students and the educator. In today's educational environment of high stakes testing, this has enormous implications. One seventh grade student was once heard saying: "Mr. Smith, if we pass this

exam, will we still have school on Monday? If we fail this exam, will we still have school on Monday? Then, why should I care one way or another? Makes no difference to me” (personal communication, Student X). What the student has demonstrated is that the affective domain is blocking any perception of usefulness or relevance for the student. Under such circumstances, the student can expect to perform at a level that is less than optimal. However, when an affective (emotional) reaction and collaborative inquiry help to generate a series of synergies, understanding and analysis are expanded and developed by students.

### **The Big “So What”**

As an educator begins to develop the lesson objectives, it is critical that they ask themselves the steering question, so what? Not from the adult perspective, but rather, from the perspective of their students. When the question is reframed in this context, if the teacher cannot provide a reasonable answer, then they must ask themselves why the students will care. So that instruction may not only penetrate the students’ affective filter, the learners must see a direct reason for learning the information. Students must see value beyond the test at the end of the unit.

### **Learning is Social and Active**

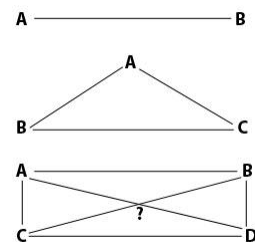
Vygotsky (1978) stated that learning is a social activity. Vygotsky indicated that very little learning could take place without social interactions. Modeling and imitation were key elements in how individuals learn and process information. Dewey (1938), on the other hand, insisted that learning must be relevant and active. Dewey believed that people learned best by doing. As such, the individuals created meaning or relevance from their activities. Finally, Bloom (1956) created his taxonomy of learning, which is broken down into the cognitive, affective, and psycho-motor domains. Each domain speaks of a series of processes, which are

often presented as separate from each other. The cognitive processes deal with thinking and analysis, while the affective with feelings and values, and the psycho-motor with learning activities that are tactile in nature. Elements that are often overlooked include the inter-relationships that may exist between each of these processes. Before the cognitive domain can be engaged, the learner must see value in what is to be learned. This relates to the affective domain. Dewey used the term relevance in relation to this affective process. Vygotsky would contend that the affective process is either enhanced or diminished (reinforced or extinguished) as a result of the perceived negative or positive nature of the interactions.

### Synergetic Communication

Now we come to the core of SCL. Each communication or interaction creates or extinguishes synergies (or channels of ideas and collaborative interactions). All synergies start out as potential synergies. The determination is that if a synergy becomes active, it falls within the affective perceptions of each of the participants. It is necessary to understand the potential synergies that may cause a phenomenon, called the multiplier effect.

Each line in the illustration to the left represents two potential synergies. In the top illustration, where there is an interaction between person A and person B, there are two potential synergies generated. Learning is dependent upon each individual's acceptance (receiving) of



the others synergy. In the second illustration, there is an interaction between persons A, B and C. You will notice that the synergies are not growing on a one to one basis; in fact, you will now observe six potential synergies. In the bottom illustration involving four individuals, twelve potential synergies are generated. Collaboration among four individuals produces our first synergistic intersection. Each intersection has the potential of generating new synergies from the

established known ones. Synergies are the building blocks of ideas, learning, cognitive, and emotional growth. Each new line represents two communication elements leading to a potential original idea or thought. Expand this model to a very large population.

Until recently, synergetic interactions were limited to direct personal points of contact. Even in published materials, the points of contact were often mono-directional and producing single synergetic strands. With the advent of interactive media, such as the World Wide Web (WWW) (appropriately named, as the Web is the network of synergies between participants) the world has seen a virtual explosion of new information. The WWW is what can be referred to as a synergistic engine. There have been synergistic engines in the past as well, and the development of each engine expanded the knowledge base of the population immeasurably.

- Spoken Language moved to cave drawings
- Cave Pictogram's moved to a written language (hand transcribed)
- Transcribed Language moved to Printed materials (printing press)
- Printed materials being enhanced with media (telegraph, telephone, recordings, cinema, radio and television)
- Printed materials and being enhanced by Internet 1.0 (pull/push technology)
- Internet 1.0 technology being enhanced by Internet 2.0 (interactive technology, intelligent systems)

Thus far, potential synergies have been presented. For a synergy to become active, it must be embraced, accepted and valued. Setting the proper tone for synergistic collaboration is important. Students who have been exposed to directions to sit and listen in classes for years, often need to receive permission to collaborate. Humans are social creatures by nature. However, when a meeting lets out, most people pair up or immediately form communication

groups. An observation of how these groups form is important. Generally, people will group with those individuals whom they have determined will most likely support their synergetic output. If a member of a group takes a highly offensive position, communication is often discontinued and active synergies close.

### **Test Anxiety Reinforced**

Individuals learn best when learning from mistakes. Students are terrified that mistakes will impact their grades. Students try to cover up mistakes or cheat to avoid the possibility of failure. Scoring perfectly is the ultimate goal for students at this time. The current education system is breeding individuals afraid to make mistakes or lucky enough not to make mistakes. Students that make many mistakes give up and believe they are unintelligent and leave education in the rear view mirror. Teachers are often those that have not made many mistakes. If educators have not experienced failure or struggle, how are educators going to empathize or understand struggle? The overly standardized educational systems in this nation are troubling, forcing all Type A personalities to exist and control. Individuals outside of the box are left behind.

### **Research Questions**

1. Does student performance increase with the use of a technologically assisted collaborative instructional methodology?
2. Does a technology assisted collaborative instructional style increase student satisfaction?

### **Population**

The population is composed of junior level undergraduate students in a secondary education teacher preparation program at a public university. Students were enrolled in instructional pedagogy classes offered in 2007, direct instructional lecture formats in 2008, and



collaborative instructional formats in 2009 and 2010. Participants ranged in age between 19 and 45.

Table 1.

*Sample Characteristics\**

Traditional Classroom (Teacher Centered)	Collaborative Classroom (Student Centered)
1. Main instructional format - lecture	1. Main instructional format - inquiry
2. Answers provided by instructor	2. Questions provided by instructor
3. Projects graded entirely by instructor	3. Projects peer reviewed with revisions
4. Student Personal reflections recorded weekly	4. Student Personal reflections recorded weekly
5. Final unit report rubric provided and individuals worked alone on personal reports	5. Final unit report rubric provided and student peer work teams established to provide ongoing feedback to members
6. Main Technologies utilized: <ul style="list-style-type: none"> <li>• PowerPoint</li> <li>• Blackboard (to submit assignments)</li> <li>• Paper Handouts</li> </ul>	6. Main Technologies utilized: <ul style="list-style-type: none"> <li>• Open Chat discussion board projected in front of room</li> <li>• Wiki's for collaborative work</li> <li>• Blogs for both private and public reflections</li> <li>• Blackboard to submit assignments, utilize discussion forum, use collaborative group assignment spaces.</li> </ul>

\* Note:  $N = 162$ . Classroom Format has categories: Traditional Format ( $n = 83$ ); Collaborative Format ( $n = 79$ ).

### **Method**

This action research utilized a mixed method approach when the method of instruction was determined to be the independent variable. Sample 1 consisted of four sections of students taught using a traditional lecture format, while sample 2 represented four sections of students taught using a technology assisted collaborative teaching model. Each class prepared a final work sample for class that was evaluated through a blind evaluation process by two independent examiners. This process is one that is consistent with the practice of assessment of final projects in this particular course. An extensive rubric was utilized in the evaluation of the process and independent scores were recorded. In no case were the examiners cognizant of delivery method. Historical data was used in this case spanning a period of eight consecutive semesters. The instructor of record for all class samples was the same individual utilizing the two different instructional approaches. As the data was analyzed, an independent t-test analysis was performed.

Following the quantitative analysis, a qualitative examination of student's attitudes was performed through the examination of both aggregate personal reflection samples, which were recorded by students as part of their weekly journaling about the class. In addition, a comparison of Student Instruction Report II (SIR-II), evaluating teacher effectiveness, data from two of the semesters was also analyzed. One other component that was examined was the comments from field supervisors regarding student performance during their Early Field Experience.

### **Data Sources**

1. Final Unit Report Work Sample

This report on the Early Field Teaching Experience is a detailed report prepared by each student. The report looks at the following aspects of both planning and execution of the

field teaching unit at a middle school setting. Sample reports were examined from each class in a blind evaluation. Components from the reports were scored by the two independent evaluators include:

- A five lesson instructional unit created in conjunction with the supervising host teacher.
- Profile of the Class (description and analysis of how classroom environment and composition impacts upon planning and teaching).
- Context of the Unit (description and analysis of how this instructional unit fits within the entire curriculum as well as examining instructional relevance).
- Goals of the Unit (description and analysis of how instructional goals and objectives relate to prescribed curricular standards based outcomes).
- Activities of the Unit (description and analysis of how each daily activity supports the stated learning objectives).
- Assessment in the Unit (description and analysis of how both formative and summative, assessment is used to evaluate student performance).
- Evaluation and Reflection on Unit Effectiveness (description and analysis of those elements of instruction and planning which were effective and those which were less than effective utilizing the tools of assessment, daily reflective logs and defined outcomes as related to objectives including a discussion of any instructional adjustments made).

## 2. Personal Student Reflective Entries

- Each week, each student records reflections and observations in a personal reflection blog. Following the conclusion of each semester, these comments are stripped of

identifying information and included in a data-base which is used for ongoing improvement for this class.

3. Feedback from Teaching Field Supervisors

- There were several anecdotal comments recorded by teachers and supervision regarding the effectiveness of students in the collaborative sample.

4. SIR-II Reports

- An aggregate look at the student evaluation scores were examined to provided corroborating evidence of student satisfaction.

### Results

Table 2.

*Raw Scores on Unit Report\**

Variable	Mean	Std. Dev.	Mode	Range
Traditional	400.35	55.69	365.00	215.00
Collaborative	466.20	47.64	500.00	131.00

\* Note:  $N = 162$ . Classroom Format has categories: Traditional Format ( $n = 83$ ); Collaborative Format ( $n = 79$ ). Total Points Possible = 500.

Table 3.

*Independent Groups t-test\**

Variable	$t$	$p$	$df$
Lecture to Collaborative Format	4.018	0.0003	160.000

\* Note:  $N = 162$ . Classroom Format has categories: Traditional Format ( $n = 83$ ); Collaborative Format ( $n = 79$ ).

The results of an Independent Groups t-test analysis of the aggregate scores as recorded on the Final Unit Report between the traditional lecture format as compared to the technology enhanced collaborative format found that they were significantly different at  $p < .001$  as seen in the table above.

Table 4.

*SIR-II Score Comparison\**

Spring 2009 – Traditional Group	Fall 2009 – Collaborative Group
3.92	4.81

\* Note:  $N = 162$ . Classroom Format has categories: Traditional Format ( $n = 83$ ); Collaborative Format ( $n = 79$ ). Based on 5 point scale.

In addition, an analysis of both the SIR-II scores as well as personal comments indicates an increase in overall student satisfaction with the collaborative mode of instruction. While there are specific limitations to this study including an inability to generalize due to a relatively small sample size, it does act as a pilot for future more detailed inquiry.

### **Significance**

Universities have traditionally been viewed as the centers of change in the field of education. At the same time, education remains as one of the most traditional of disciplines. As such, change, when it occurs in education, often comes very slowly. Meanwhile, students are becoming more socially connected due to the availability of the communication tools that can be found in the various technology-based infrastructures that occupies every waking moment of their lives.

Educators have known that people are social creatures for quite some time. The social learning theories of both Bandura (1977) and Vygotsky (1994) have both contended that learning is a social process (Wertsch, 1985). Young adults today are proving that they learn and

collaborate in a truly social manner when given the opportunity. This mode of learning is often underutilized in university classrooms. When used, social networking technologies can have a marked effect on what is often typically viewed as a very traditional setting.

### **Discussion**

With the rapid expansion of potential synergies, educators should question why much of education is still based on mono-directional, single-strand synergistic methods such as classroom lecture. Most students, from pre-K to about grade four or five seem to love school. School is fun (affective), social, a place where cognitive growth has a rapid pace, and learning is usually hands-on (active). By the time the fifth grade is reached, an entirely cognitive approach to instruction is guided, even dictated, by the appearance of the yearly test.

Once children enter fourth or fifth grade, they are reconditioned to work independently, without social interactions. Children learn to dislike group work. Group work is a rarity at this age and onwards. Social relationships and interactions are to be reinforced during lunch and recess. The type of pedagogy used within our formative years has misconstrued our perceptions of learning. People are quickly adopting theories that learning and real work cannot be done by more than one person.

Rows of desks often replace learning stations and the process becomes one of memorization, practice, and rote learning. Social interactions are deemed disruptive and discouraged. In few cases, hands-on learning becomes limited to numerous worksheets and irrelevant homework assignments. By grade seven, a large portion of these students, have begun to shut down. School is no longer a “fun” (affectively supported) place of learning. In fact, one affect that is internalized is the fact that learning is not fun. The results are failing schools and

students, escalating dropout rates and diminished levels of learning on both qualitative and quantitative levels.

The SCL (synergetic collaborative learning) theory is a successful tool that should be utilized more frequently within school systems. When students at a university and high school level are asked to work in groups, their first response is dismay and distress. They ask their instructors how they could possibly trust other people with their grades. Once moving into a career, individuals learn that group work is necessary for any successes in every field. In business, individuals need to work together for a focused interest for the company's bottom line. There was a general agreement that computer programmers were antisocial hermits that did not enjoy collaborative work. Then facebook.com and other social networks became more popular in mainstream information exchange. Even computer programmers must work with groups to accomplish goals in software and web design. Many individuals that found group or collaborative work difficult or annoying, before entering the work field, will have a hard time transitioning into a new style. Group work is required in this new transition and individuals are at a loss.

Instead of group activities as an occasional practice, they need to become part of the normal state of affairs. Teachers lecture occasionally in this new type of learning, in accordance with the SCL Model. The world is stuck in this paradigm in which students take notes while being lectured or talked at in a classroom. Being stuck in this paradigm will make a transition towards a synergistic collaborative learning design difficult.

### **Implications**

In the traditional lecture classroom, students receive information for a variety of reasons. These students happen to like the teacher, they are conditioned to attend to the lecture to perform

well on tests, and they do not want to be embarrassed by not knowing the answer to a question. In the traditional format category, locating the A students is an easy task. These A students have been conditioned to be active listeners. These students will also respond well to questions and often value the information simply because they value the status of the teacher. Through routines of study, these students have established a organization system to access the information, but often will end at this point as they traditionally have a very fixed set of internalized values, relying on external motivators. These A students may learn necessary content for a class, but may often quickly discard a large part of the gained content at the end of a semester. While these students tend to be very successful, they also tend to become formula thinkers and often lack critical analysis skills for information that falls too far from the accepted norm.

In the case of the C students, often times they express boredom. They have learned that most of what is presented in classroom lecture is transitory information at best and they will struggle to assimilate just enough information to perform at an average level on the test. These students usually have one area of interest in school, either in music, art or science, mainly because these subjects tend to be “hands on” in nature. While most of these students will perform adequately to successfully graduate, most of the information that has been learned is soon forgotten.

Some anecdotal evidence has caused some concerns that highlight this situation. In the above education pedagogy classes, there were a series of questions asked each semester. The students were college juniors and were preparing to be future teachers. In the first case, social studies and history majors were asked to refrain from answering or helping.



The first question was: Who is the vice president of the United States? The best response received in four years is 46%. The next question was: Please name the three branches of the United States government. In this case, only 5% of the students were able to answer correctly. After asking for the three branches of the United States government, students were informed of the answer and then asked: Which branch of the government is responsible for budgets and spending? In this case, only one student responded correctly in four years. Then math majors are asked to refrain from answering or helping. Students were asked to solve the following problems:  $\frac{3}{4} + \frac{5}{8}$ . In over four years, only nine students (four were science majors) have been able to solve the problem correctly. Another problem that students were asked to solve was:  $1\frac{2}{3} - \frac{5}{6}$ . Again, in over four years, only five students (four were science majors) solved the problem correctly. A third question asked of students in the classrooms involved math reasoning and presented as follows: you have been working for \$6.24 per hour for 40 hours a week; after taxes, your take home pay is \$197.00; you just received a raise to \$7.50; which means what will your approximate take home pay be, provided that your tax rate remains consistent? Over four years, three students (science students) have provided a correct answer to the process. Just two years earlier, these questions appeared on the PRAXIS exam, which was necessary for entry into teacher education. Because the information was no longer valued, nor was there a need to have it internalized, and it was forgotten.

In the collaborative learning model, we see that the generation of synergies tends to give a social value to the information. Instead of the process of learning being simply cognitively facts based, the social component provided an affective dimension. As a result, information learned collaboratively tends to rise quickly to the stage of internalization. One of the dangers of

this process, once understood, is that it can be utilized to energize mob thinking. The ethical considerations are profound.

### **Glossary of Terms**

**Synergy** – The interaction of two or more agents or forces so that their combined effect is greater than the sum of their individual effects. In terms of collaborative learning, a synergy represents a unit of resonance involving the flow of ideas being transmitted between individuals or groups. The progression of synergies has the potential to multiply geometrically with the number of individuals in the synergistic system. Two individuals generate two potential synergies, three individuals generate six, four individuals generate 12, and so forth. In the case of the World Wide Web, the number of resonating synergies is greater than  $1.9e+99$ .

**Potential Synergy** – In the exchange of ideas, the acceptance and internalization of those ideas (learning) depends upon the Affective Synergistic Determinant. Does the receiver of the idea find value in the idea and as a result internalize it? The strength of the synergistic determinant determines the overall power of the individual synergy to become active or kinetic.

**Kinetic Synergy** – Once an idea has been accepted as having value by an individual or group, it is internalized and more importantly is transmitted to others as a new potential synergy. At this point learning becomes active and dynamic.

**Cascading Synergies** – Kinetic synergies that find wide acceptance and are shared among an expanding group of individuals or groups. An example of these phenomena can be found on the Internet where an idea or element of communication such as a video goes viral. This kind of spontaneous, self-sustaining synergistic dynamic can be either positive or negative in nature. In the case of the media, the various ideologies can be used to illustrate this effect. With cascading synergies, individuals or groups tend to accept those elements that align with their personal

belief systems and reject those that do not. Cascading synergies can promote a specific learned behavior and can be used as a tool of indoctrination. However, when used cascading synergies properly can motivate students to expand the scope of their learning.

**Open Synergistic System** – A system in which there is an acceptance of new ideas and concepts. There is a free flow of ideas and the potential for synergistic exchange is optimized. In such a system, the flow of potential synergies is not obstructed or controlled by ideology or dogma.

**Closed Synergistic System** – A system in which the free flow of synergies is limited or constrained by a rigid set of values or dogma. Closed systems may even exist nested within open systems as sub-units of the whole. An example of a closed synergistic system would be the KKK. When there is a collision between two polar opposite closed systems, there is often the potential for conflict due to an extremely incomparable affective synergistic determinant.

**Affective Synergistic Determinant** - In any communication system, each component of that system (individuals or groups) filter potential synergies by comparing them with accepted norms or values. If the concept has been found to have value, does not conflict with strongly held beliefs, the potential synergy becomes kinetic or active. In the case of the classroom, if the material is seen by the student to have no relevance, it is therefore seen to have no value and is rejected. The potential synergy dies and learning does not occur. Bloom's affective domain plays a critical role in cognitive learning as it provides the filter as to what is received by the student.

**Mono-Directional Synergy** – Communication that is usually initiated from a top – down strategy. This is most commonly found in the lecture only classroom. There is only one potential synergy being transmitted at a time... the teachers. Acceptance of this synergy is

entirely dependent upon a positive affective response by the student. In a class of 30 students, only 30 potential synergies are generated. Mono-directional synergies tend to be answer based.

Omni-Directional Synergy - In this case, the students become the seekers of answers. A question is generated and the students become the center of learning. It tends to be a bottom – up strategy. The question becomes the main focus of learning, not the answer. In fact, the synergy continues until the answer is discovered. Questions activate synergies, while answers end them. On the other hand, sometimes answers could lead to more questions.

Social Learning Systems - Humans are social creatures. They learn best in a socially active atmosphere. Social systems best generate the greatest number of potential synergies. Various social learning systems include project based learning, cooperative learning and collaborative learning. The Internet has become a huge social learning system and information on the Internet is expanding at exponential rates as a result.

Collaboration Effect – The collaboration effect has a multiplier of learning possibilities. In this model, students find value and relevance in what they are learning. The number of ideas and potential synergies increases geometrically with the number of individuals actively engaged in the act of collaboration.

Synergistic Dissonance - In any synergistic system, there is the potential for disharmony or push back from elements within the system. This dissonance serves to either create new opportunities for discourse and discovery, or in the case of overly negative dissonance, inhibit the synergistic process.

Synergistic Harmony - In any synergistic system, there is an alignment of values and purposes for learning. This harmony can serve to either create new opportunities for discourse and discovery, or in the case of a closed synergistic system, inhibit the process.

Synergistic Resonance- In a synergistic system, there are certain ideas of potential synergies that “ring true” and are accepted by the participants. This is often the case where there are shared systems of value. When a teacher announces a field trip, there is usually a synergistic resonance within the class members. Teams and competitive organizations often build upon this principle.

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