



SYSTEMS THINKING PROJECT

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WHAT IS SYSTEMS THINKING?

First introduced by Peter Senge in 1990, systems thinking is the conceptual framework for an organization.

- It is a way of thinking about, describing, and understanding the powers and relationships that shape the behavior of an organization.
- Understanding of a system is achieved by contemplating the whole, not any individual part.
- It encourages teams to explore the underlying problems of an organization before greater problems emerge (Senge, 2006).
- It is the knowledge and practice for recognizing and managing complexity (Senge et al., 2012).

THE FIVE DISCIPLINES

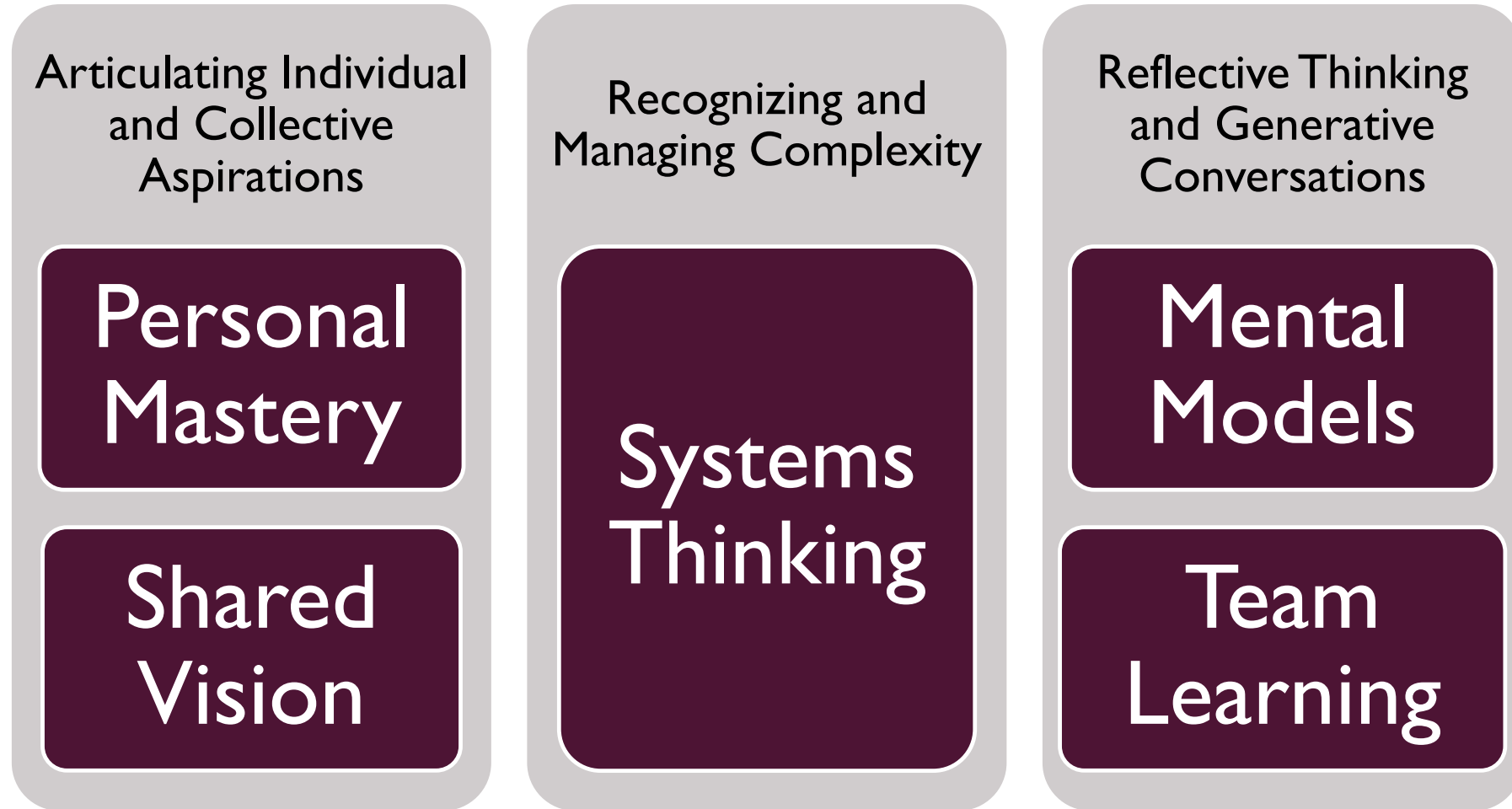


In order for any learning organization to achieve the three core learning capabilities of fostering aspiration, developing reflective conversation and understanding complexity, these five disciplines need to be followed as intended and not in isolation (Senge, 2006).

THREE CORE LEARNING CAPABILITIES

- Articulating Individual and Collective Aspiration
 - The ability to focus on goals and change behaviors based on those goals.
- Reflective Thinking and Generative Conversation
 - The ability to use in-depth contemplation, discussion and dialogue to raise awareness of individual assumptions and patterns of behavior.
 - Naturally leads people to reflect on their own and each other's thinking.
- Recognizing and Managing Complexity
 - The ability to see larger systems and forces and constructing ways of expressing their interrelationships.

(Senge et al., 2012)



As noted by teachers and administrators, these learning disciplines offer effective ways to deal with the dilemmas and pressures of educational institutions (Senge et al., 2012, p. 7).

PERSONAL MASTERY

- The practice of developing a coherent image of a personal vision.
- If individual learning cannot occur, then group learning cannot occur.
- Recognizing areas of needed growth.
- Grounded in competence and skill.
- It requires spiritual growth and approaching one's life as a creative work.
- It is a lifelong process and constant state of learning.

MENTAL MODELS

- The images, assumptions and stories that we carry with us about our surroundings.
- It includes effectively sharing our thinking with others and having our thinking open to the influence of others.
- They are active and shape how we act.
- Strengthening your mental model requires being open minded, reflective and inquisitive.
- To improve learning, mental models need to be acknowledged and challenged so they can be improved.

BUILDING SHARED VISION

- A set of tools and techniques for bringing everyone's individual goals and statements into alignment.
- It provides the focus and energy for learning.
- A vision grows in strength with increased enthusiasm, clarity and commitment.
- It requires commitment (a true buy-in to the vision) as opposed to compliance (seeing the vision as a requirement).
- “A vision is not shared unless it has staying power and a life force that lasts for years, propelling people through a continuous cycle of action, learning and reflection” (Senge et al., 2012, p. 87).

TEAM LEARNING

- A set of practices designed to aid teams in thinking and acting together.
- Members should have a shared vision, comparable purpose and compliment each others efforts.
- The process of aligning and developing the capacity of a team to create the results its members truly desire.
- Dialogue is an essential part of team learning and should lead to addressing/solving problems before they escalate.

SYSTEMS THINKING IN PRACTICE

The following three concepts will be used to correlate, extend or contradict Senge's five disciplines:

- Universal Design for Learning (UDL)
- Constructivism, Constructionism and Powerful Ideas
- Flipped Classrooms

UNIVERSAL DESIGN FOR LEARNING

Meeting the needs of every learner is important in today's 21st century classrooms. "Universal Design for Learning (UDL) helps educators meet this goal by providing a framework for understanding how to create curricula that meets the needs of all learners from the start (CAST, 2011, p. 4).

It gives learners multiple means of representation, expression and engagement.

How to implement:

- For Representation: Varied size of text and images, volume or rate of speech, speech-to-text, and written transcripts.
- For Action and Expression: Joysticks or alternate keyboards, physical manipulatives, concept maps, and web applications.
- For Engagement: Digital badges, tasks that allow active participation and exploration, activities that foster imagination.

UNIVERSAL DESIGN FOR LEARNING (cont'd)

Project I: A traditional Kindergarten worksheet focusing on letter recognition is transformed into a learning environment that represents the letters through sound, sight, movement and touch.

Correlation to Senge's 5 Disciplines:

Systems Thinking: A system is achieved by looking at the whole instead of an individual part. In UDL, modifications are made to benefit all learners as a whole and not individually. The classroom is viewed as a complete unit.

Personal Mastery: Universal design can be implemented to help students achieve personal mastery.

UNIVERSAL DESIGN FOR LEARNING (cont'd)

Mental Modes, Shared Vision & Team Learning: While mental modes may not be inherently present in UDL, the ability to discuss and raise awareness or a shared vision for UDL in the teaching and learning process can open a dialogue and to possibly change behaviors. When designing a school wide curriculum, a team learning approach could help institute the shared vision of UDL.

CONSTRUCTIONISM AND POWERFUL IDEAS

According to Bers (2008), “constructionism proposes that people learn better when provided with opportunities to design, create, and build projects that are personally and epistemologically meaningful” (p. 16). Paperts notion of “powerful ideas” leads learners to new ways of thinking, using knowledge and connecting that knowledge to other domains (Bers, 2008).

How to implement:

- Audio and Video editing.
- Green screens and digital photography
- Robotics and Legos

CONSTRUCTIONISM AND POWERFUL IDEAS (cont'd)

Project 2: A curriculum proposal to integrate the use of 3D printing into a middle school class where after learning the basics of 3D printing the students will design an adaptation for a product so that a student with a physical disability will be able to interact with the product in a way similar to his non-disabled peers.

Correlation to Senge's 5 Disciplines:

Systems Thinking: Systems thinking is not only present in the notion that powerful ideas connect knowledge to other domains but in looking at the systemic approach to integrating technology into a classroom.

Personal Mastery: Personal mastery for the student is achieved when they are motivated to learn, are engaged in the lesson and can express personal vision.

CONSTRUCTIONISM AND POWERFUL IDEAS (cont'd)

Mental Modes: One of the goals for this project was to extend the topic of 3D printing into the powerful idea of designing adaptations for students with disabilities. Essentially trying to raise awareness, open mindedness and challenging preconceived notions of disabilities.

Shared Vision: The underlying premise of constructionism suggests that students learn better when provided with opportunities to design, create, and build projects that are meaningful. Working collaboratively can help them share their vision.

Team Learning: Students working together to construct meaning and build on a shared vision for a solution to a problem.

THE FLIPPED CLASSROOM

The use of a flipped classroom approach to teaching provides a basis for personalized education customized to student's needs. Reversing the traditional classroom, lecture content is delivered via video, animation, screen casting and audio files at home while content is reinforced through activities and projects during class time. Using this model allows for more teacher interactions, differentiation of instruction, an increase of enrichment activities and support for struggling students (Bergmann & Sams, 2012).

How to implement:

- Teachers make videos of their lessons that students watch for homework.
- Students participate in engaging learning activities in class.
- Multiple versions of each assessment are created for students to demonstrate mastery.

THE FLIPPED CLASSROOM (cont'd)

Project 3: Using the principles of a flipped classroom design, students learned the basics and background of 3D printing through videos, online presentations and online quizzes and used actual class time for the hands-on design and printing phases of the lessons.

Correlation to Senge's 5 Disciplines:

Systems Thinking: This major component of the flipped classroom improves the interconnectivity of the classroom by engaging students outside of class and testing their skills in class through interaction. This model helps students gain a broader and deeper understanding of the subjects they study.

Personal Mastery: As the teacher makes the commitment to change their instructional delivery method, they have changed their personal vision to make a change that will benefit their students.

THE FLIPPED CLASSROOM (cont'd)

Mental Modes & Shared Vision: In embracing the flipped model, teachers can reflect on the required skills, and help others to abandon their preconceived notions and nourish a sense of commitment for implementation. Their shared vision provides the focus and energy for learning.

Team Learning: For students, the flipped classroom naturally encourages a team approach to learning as collaborative projects and hand-on activities are the focus of class time. For teachers, using a team approach to teaching and video production aids in the successful implementation of the flipped model.

References

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class everyday*. Eugene, OR: International Society for Technology in Education.

Bers, M. (2008). *Blocks to robots: Learning with technology in the early childhood classroom*. New York, NY: Teachers College Press.

CAST. (2011). [available online] Universal design for learning guidelines, Version 2. Retrieved July 5, 2016 from [http://www.udlcenter.org/sites/udlcenter.org/files/UDL_Guidelines_Version_2.0_\(Final\).doc](http://www.udlcenter.org/sites/udlcenter.org/files/UDL_Guidelines_Version_2.0_(Final).doc)

Senge, P.M. (2006). *The fifth discipline: The art & practice of the learning organization*. New York, NY: Doubleday.

Senge, P. M., Cambron-McCabe, N., Lucas, T., Smith, B., Dutton, J., & Kleiner, A. (2012). *Schools that learn: A fifth discipline fieldbook for educators, parents, and everyone who cares about education*. New York, NY: Crown Business.