

THE WATERS GRANT PROJECT - Orange Grove Middle School

Developing Productive Thinking and Problem Solving Skills

The 1992-93 school year marks the fifth year of middle school development at Orange Grove. The resulting program is a combination of components from the past thirty years of middle school study and components that were previously in place at Orange Grove Junior High and components based on research in other levels of education.

During the past five years, we have become more familiar with the concept and the use of System Dynamics as a tool for dealing with dynamic, complex problems. Because most problems in today's world are both dynamic and complex, increased skill in the use of this tool has been beneficial. It was our interest in the use of the tools of System Dynamics that led us to the Waters Grant Project. As the work to constantly improve our program has continued, we have expanded the project to include a great variety of strategies that have increased our ability to teach and to use productive problem solving skills. Although we have gradually expanded use of the System Dynamics tools in the classroom, the most rapid and evident implementation of increased systemic thinking has been in the organization. Having adults practice the types of communication, collaboration, problem solving and decision making skills that are desirable for students to learn has resulted in a greater sense of community and a greater effectiveness in dealing with challenging situations.

Citizen Champion

A unique aspect of our work in the past five years has been the efforts of Dr. Gordon Brown, professor emeritus and former dean of the engineering school at MIT. Dr. Brown is a resident of the Catalina Foothills School District. He brought the concept of System Dynamics to the attention of the Orange Grove staff. He has made a variety of resources available to district staff members to be used to increase our problem solving skills and teaching skills. In addition he has helped us to maintain an awareness of the realities of today's world that will face the students graduating from our schools. In the community, Dr. Brown has been a supporter of our school district and has influenced others to be supportive also.

In The Classroom

System Dynamics entered Orange Grove through the use of STELLA simulations in science. For many years research has shown and educators have realized that students must develop greater skills in the area of problem solving. Training in instructional strategies related to critical thinking, higher order thinking skills, decision making, problem solving, information literacy and creative thinking has been highly encouraged and is evident in successful schools. The Orange Grove science teachers recognized System Dynamics as a necessary element in the teaching of problem solving skills. Because students will be facing extremely complex problems in their future, it is necessary that we extend their learning through understanding dynamic complexity. Through the use of the System Dynamics tools, content knowledge can be applied in a "real world" context, interrelationships between the parts of the whole can be analyzed and long term consequences of actions can be studied.

STELLA simulations are a powerful tool for application of knowledge. Over the past five years, six 8th grade science simulations, four 7th grade science simulations, one 6th grade science simulation, one 7th grade social studies and one 8th grade literature simulation have been developed and implemented. Students demonstrate a high level of understanding of content and concepts following a STELLA simulation activity. The length of the simulations varies from 2-5 days.

Other System Dynamics tools can be used for the purpose of identifying causal relationship (causal loops) and studying both patterns of behavior and long term consequences of decisions (behavior over time graphs). Both of these concepts are essential to the development of productive thinking and problem solving skills. Traditional subject content can be analyzed, compared and synthesized through the use of these tools. Introduced to these concepts in the 6th grade, 8th grade students often use them to support conclusions or ideas during debates or presentations. Students also report using their newly acquired problem solving skills in daily, personal interactions.

In The Organization

Traditional school organizational structures have not been conducive to communication or collaboration between staff members. The lack of communication and collaboration has often resulted in omissions, overlaps and a general lack of connectivity between various aspects of instruction and other functions of schools. For these reasons, the concept of teaming is very desirable to educators. The challenge of designing the right combinations of groupings, developing the skills necessary for successful team decision making and planning and managing the new dynamics produced must be handled carefully. Other entities in the world outside of education are struggling with this same challenge. Stimulated by the major concepts of systems thinking, the Orange Grove staff has consistently sought and used resources that will increase the ability of the OG organization to function as an effective system.

The tools of System Dynamics have increased staff awareness of the interrelationships between the roles that they play and the actions that they take. They understand the importance of both attention to the parts and attention to the whole. When making decisions, they are now much more likely to consider effects of those decisions on other parts of the organization and to compare both short and long term effects. Graphs, causal loops and models are often used to discuss a problem. Although time does not allow the construction of a STELLA model for most problems, the awareness and understanding created by STELLA training has benefited many staff members.

Study and application of the disciplines of the "Learning Organization" have helped Orange Grove staff members to increase their dedication to continual personal growth and to continued improvement of the system. Other resources have been identified and utilized as needed. The entire staff has played a part in reinforcing the importance of personal responsibility, willingness to optimize the whole system rather than maximizing one's subsystem, seeking to understand and accept other mental models and many other systemic concepts. The evident enthusiasm for lifelong learning is a powerful model for students. Students and guests often comment on the amount of collaboration and mutual support among staff members as well as a sense of joy in the work to be done.

Summary

The Orange Grove program is not perfect. Blending the old with the new, combining the visions of students, staff, parents and community and utilizing available skills, facilities and other resources to the greatest extent possible is a never ending challenge. As one parent so aptly described the situation - "it's a system" - complex and ever changing. The good news is that by using the skills of collaboration and communication, of seeing both the details and the big picture, analyzing both short and long term consequences and examining a variety of mental models - we can continue to increase our capacity to produce the results we desire --- meeting the needs of today's students who will live in tomorrow's world.