

Education

Methodology Models

Reductionist, Wholistic or Sustainable Model

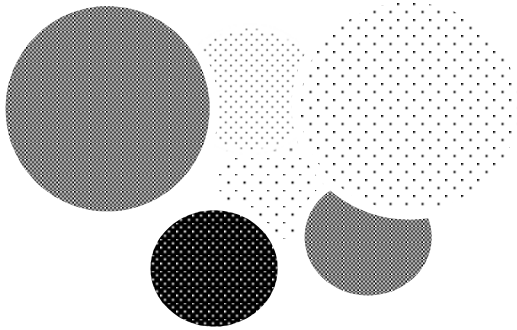


Gabriel Iqbal

Reductionist, Wholistic and Sustainable Model

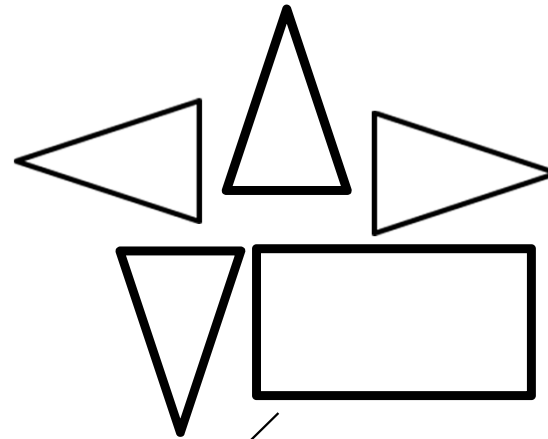
Wholistic Model

Everything is interconnected



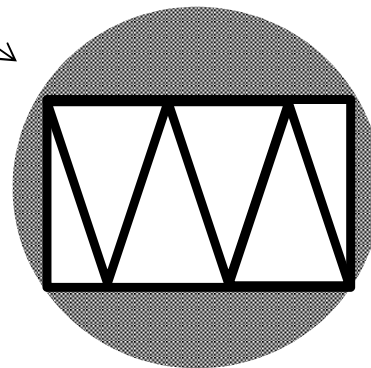
Reductionist Model

Everything is separate



Sustainable Model

Systems are operating within an interconnected whole and any change in one system has an overall effect on the whole hence in order for systems to be sustainable they need to operate in relationship with the whole.



Reductionist, Wholistic and Sustainable Model

Reductionist Model is a Cartesian idea that reduces the phenomena of nature into parts and focuses on the individual parts often ignoring the relationship of the processes involved that lead to the individual effect. It is the bedrock of Newtonian physics and has been set as a law in classical scientific thinking. It was proposed by Rene Descartes in the 17th Century. This concept understands the workings of the universe as a machine and has actually penetrated into all spheres of human life including education, science, economics and politics. The current failure of human beings to establish a sustainable balance with natural law and a resultant economic, social and environmental crisis is a direct resultant of reductionist thinking.

Classical physics as explained by Newtonian laws of gravity fails to explain many of the problems raised by Quantum Physics thus bringing us back full circle back to where we started from i.e. the Wholistic Model.

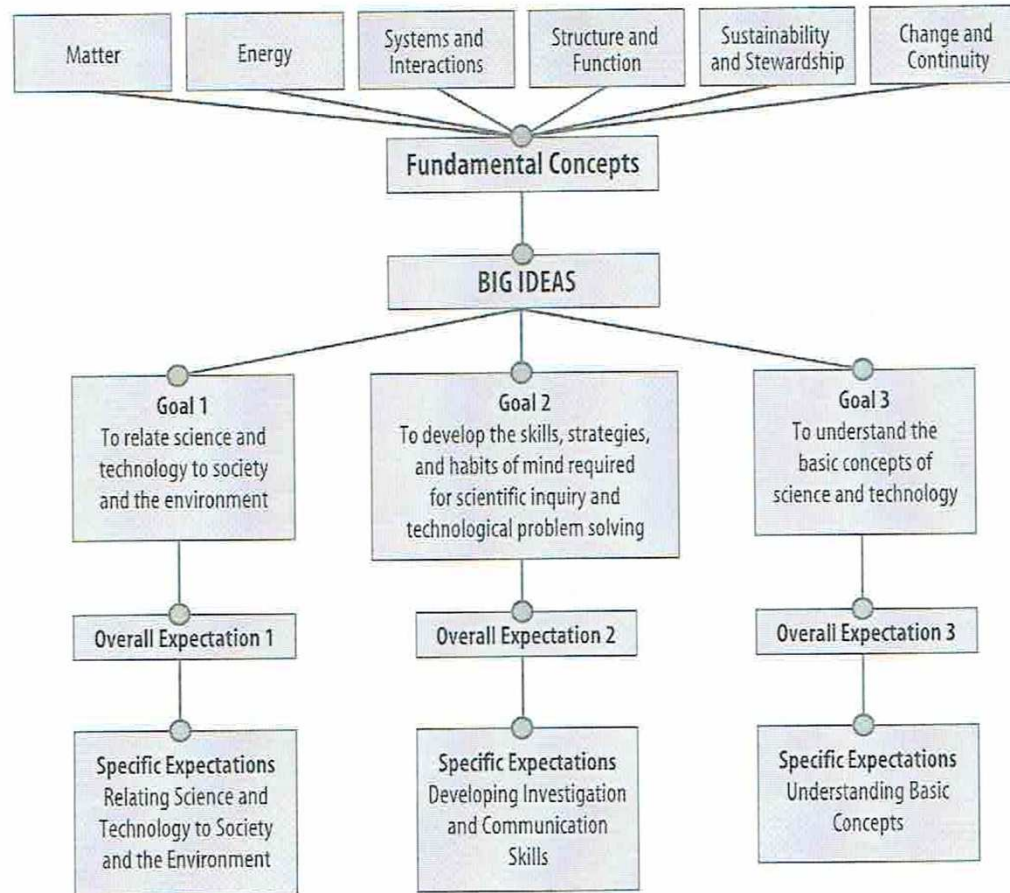
Quantum physics is therefore difficult to reconcile with reductionism, and requires a Wholistic view of natural phenomena. The subject-object debate and wave or particle nature of sub-atomic particles compels us to have a Wholistic view of the environment that actually influence the variables that we are so desperately failing to explain using classical physics.

Wholistic Model is an idea that the whole is foremost and often bigger than the sum of the parts and it is focused on relationship of processes not individual parts. Wholistic Model requires the study of phenomena of nature as an intrinsic web of multiple causes conferencing and complimenting each other from the micro to the macro.

The biggest challenge of our generation is now to have a balance between these two opposing viewpoints and that can only be consolidated by a realistic middle-path between the two. The Wholistic and the Reductionist principles can blend into one in the following manner: Reductionist approach can continue in our scientific understanding of the specifics however the consequences of the specifics must conform and lend themselves to the service of the Whole, example: all technological development must consider its effect on the environment and must mimic the balance in nature therefore focus on renewable energy systems and sustainable technologies.

The STSE (Science , Technology, Society and Education) component of the Ontario Ministry of Education has been specifically designed to address the above issue and STSE is supposed to merge across the curriculum in all disciplines. However most schools and teachers still subscribe to the classical reductionist model.

The relationships between the fundamental concepts, big ideas, goals of the science and technology program, and the overall and specific expectations are indicated in the chart that follows.



Fundamental Concepts : Ontario Science Curriculum

Matter

Matter is anything that has mass and occupies space. Matter has particular structural and behavioural characteristics.

Energy

Energy comes in many forms, and can change forms. It is required to make things happen (to do work). Work is done when a force causes movement.

Systems and Interactions

A system is a collection of living and/or non-living things and processes that interact to perform some function. A system includes inputs, outputs, and relationships among system components. Natural and human systems develop in response to, and are limited by, a variety of environmental factors.

Structure and Function

This concept focuses on the interrelationship between the function or use of a natural or human-made object and the form that the object takes.

Sustainability and Stewardship

Sustainability is the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs. Stewardship involves understanding that we need to use and care for the natural environment in a responsible way and making the effort to pass on to future generations no less than what we have access to ourselves. Values that are central to responsible stewardship are: using non-renewable resources with care; reusing and recycling what we can; switching to renewable resources where possible.

Change and Continuity

Change is the process of becoming different over time, and can be quantified. Continuity represents consistency and connectedness within and among systems over time. Interactions within and among systems result in change and variations in consistency.

Source: Ontario Science Curriculum



MINISTRY OF EDUCATION

The three goals of the science curriculum are as follows:

1. to relate science and technology to society and the environment
2. to develop the skills, strategies, and habits of mind required for scientific inquiry and technological problem solving
3. to understand the basic concepts of science and technology

Source: Ontario Science Curriculum



“Big Ideas”

Big ideas “go beyond discrete facts or skills to focus on larger concepts, principles, or processes.”

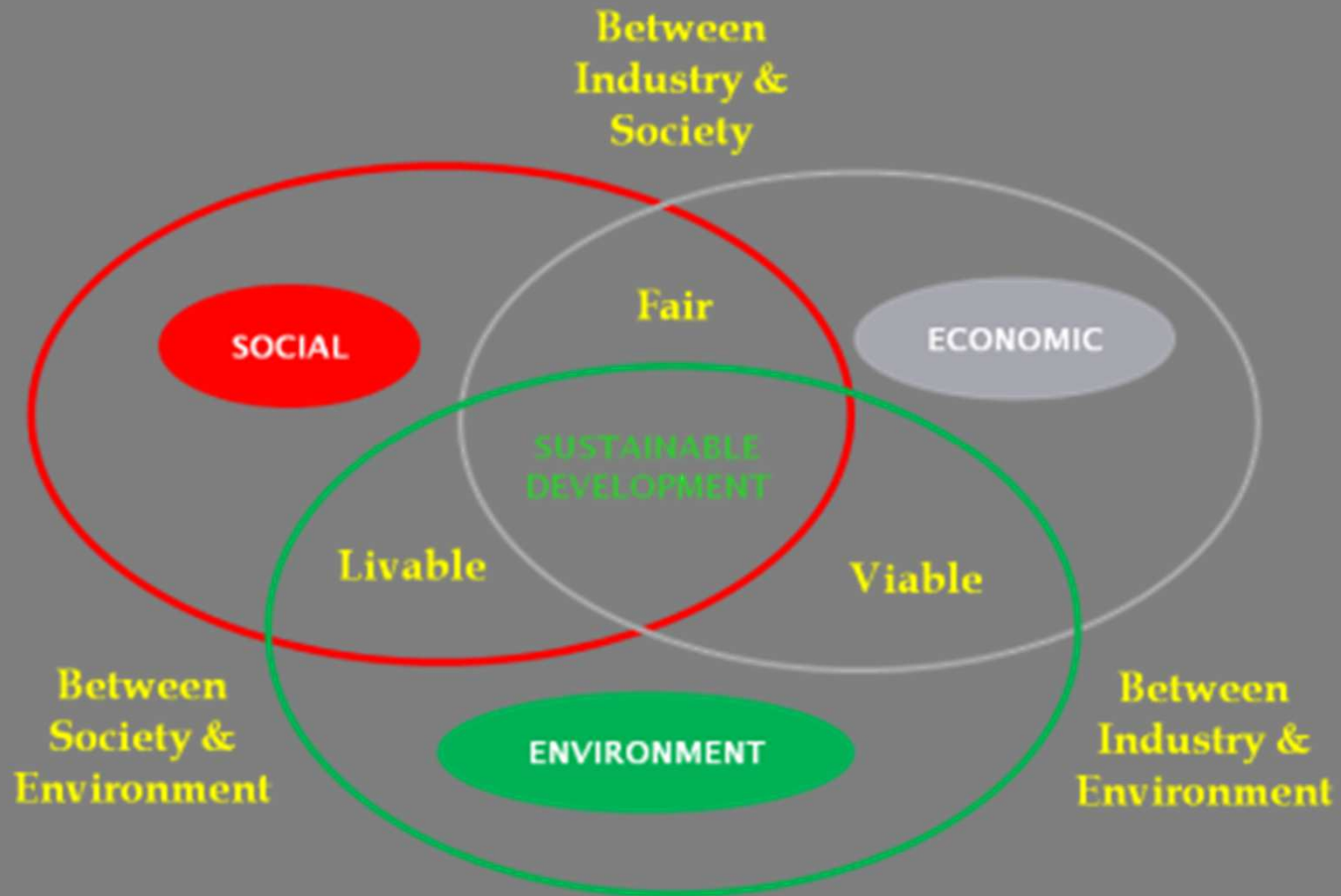
Grant Wiggins and Jay McTighe, *Understanding by Design* (1998), p. 10

Source: Ontario Science Curriculum



Reductionist, Wholistic and Sustainable Model

Dynamic Model for Creating Sustainable Relationship between Society, Economics and Environment



Reductionist, Wholistic and Sustainable Model

Workshop Exercise:

1. In your teams discuss how you can incorporate STSE learning models within your teaching methodology.
2. Share your results with other teams.

About the Author



Gabriel Iqbal was born in 1970 in the Himalayan valley of Kashmir. In 1990, he migrated to England to pursue his educational interests. After having secured a scholarship for distinguished performance in a Diploma in Health Sciences at Ealing, Hammersmith and West London College, UK, in the early 90's, he was privileged to work under the patronage of one of the world's eminent Biologist, Dr. Ray McNeil Alexander and earned a BSc. Honors in Biology from the University of Leeds, UK, with a key focus on Biomechanics, Fresh Water Ecology, Environmental Science, Evolution, Paleobiology, and Human Psychology. Later on he completed a Post Graduation in Science Education from the same university and taught Biology and Environmental Science for a few years.

Further, his career focused on Sustainable Development, Learning and Development, and Wellbeing. He has worked internationally for almost 20 years, with various fortune 500 companies, written extensively on Sustainable Development and implemented sustainable development programs at the grassroots level with practical success. Gabriel is a TÜV NORD Certified Internal Auditor for Environmental Health and Safety Management Systems that includes ISO 14001 (Quality Training) and OHSAS 18001 (Occupational Health and Safety Management Systems Training). He is also a TPS (Toyota Production System) certified professional especially in the areas of Lean Management, Kaizen (Continuous Improvement), 5S Methodology and Poka Yoke (Mistake Proofing). Gabriel has multiple certifications in Fitness, Diet and Wellbeing from Lifefitness Academy, USA.

Following his professional education his personal interests grew in the field of Behavioural Psychology, Human Motivation and Sustainable Development. Gabriel has provided Ethical Leadership, Management, Corporate and Social Responsibility, Human Motivation, Sustainable Development and Well Being Programs for over two decades via his training and development organization, the Eureka Academy in Oakville, Ontario.

To find out more go to: www.eurekamakingadifference.com

For his international works and services Gabriel has received the following awards:

- Outstanding Guest Speaker Award at International Leadership Congress 2010
- International e-learning Congress Award 2011

Gabriel is married to Tracy Liu and they have two daughters, Rumi and Roya and live in Oakville, Ontario, Canada.