对“问题解决”的再问题化：美国STEM教育改革中的“危机幻象术

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大纲

- 研究背景：美国**STEM**教育改革热潮和现存的对问题解决的文化批评
- 操演理论和课程史
- 如何发明问题解决的“情境”
- 如何发明“生存的危机”作为“问题”： 从明茨实验到 “ 地球飞船运动 ”
- 如何发明新千年的“问题解决者”
- 回到中国的语境：下一步的讨论

研究背景

- 美国**STEM** 教育改革中对问题解决的强调：

"By learning problem solving in mathematics, students should acquire ways of thinking, habits of persistence and curiosity, and confidence in unfamiliar situations (italic added) that will serve them well outside the mathematics classroom. In everyday life and in the workplace, being a good problem solver can lead to great advantages." (NCTM principles and standards for school mathematics 2000)

"Another positive sign is a recent increase in capital raised by venture funds, suggesting an improving attitude toward risk taking (italic added)." (Rising above the gathering storm)

- 现存的对问题解决的文化批评：

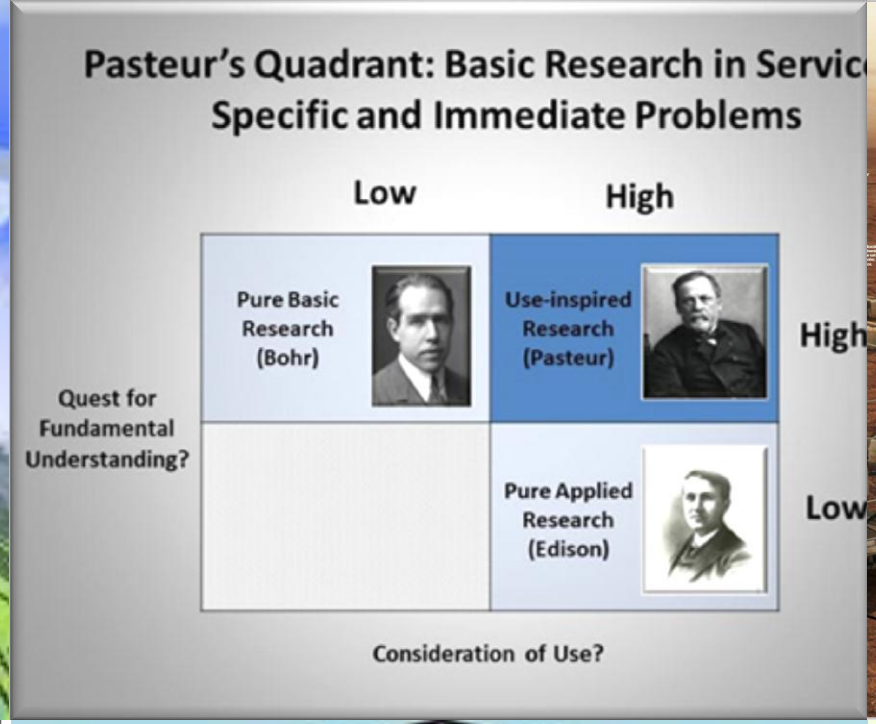
A given nature and structure of mathematic and scientific reasoning embedded in problem-solving renders students subject to the authority of scientific "expertise" and make them discipline and control their own minds in the language of entrepreneurs.

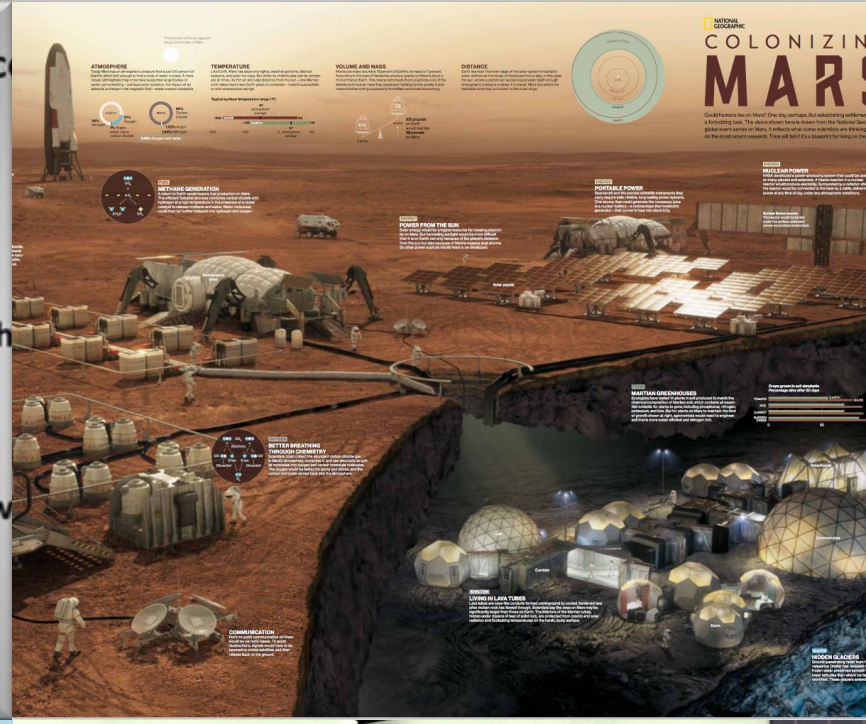
Flexibility in learning emphasized in problem-solving is to develop students' skills of self-control to be more accessible to the given order, which in another language is called "being adaptable to a wide range of jobs."

The rise of problem-solving in the us schooling in the 1980s was stemmed from military cognitive research that attempts to make human as component parts appropriate for optimal performance of weapon systems.

（Reference: Popkewitz, 2004; Noble, 1989）

- 现有的教育研究中对于"问题解决"的问题化主要集中在这个短语的第二部分，即"如何解决"，而较少关注第一部分，即什么"情境"和"问题"真正重要，它们会造成什么样的影响。本文认为，美国STEM教育改革的政策和研究文献将"问题解决"置于一个普遍的危机环境中，即学生随时会遇到冲突、风险和危险。为了将安全和革新结合在一起，这些改革文献中从认知和情感两个方面来处理"问题解决"教学法。





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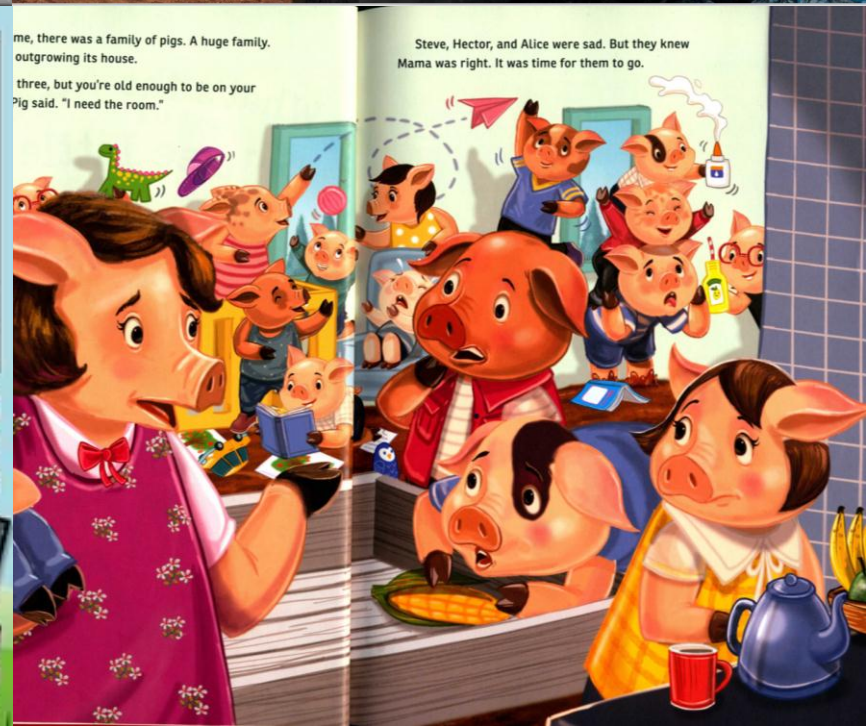


STEM 教育是如何通过想象“情境”（situation）和“问题”（problem）并将其具象化为未来生存危机（crisis of survival), 来产生一种特定的问题解决者的 。

研究问题

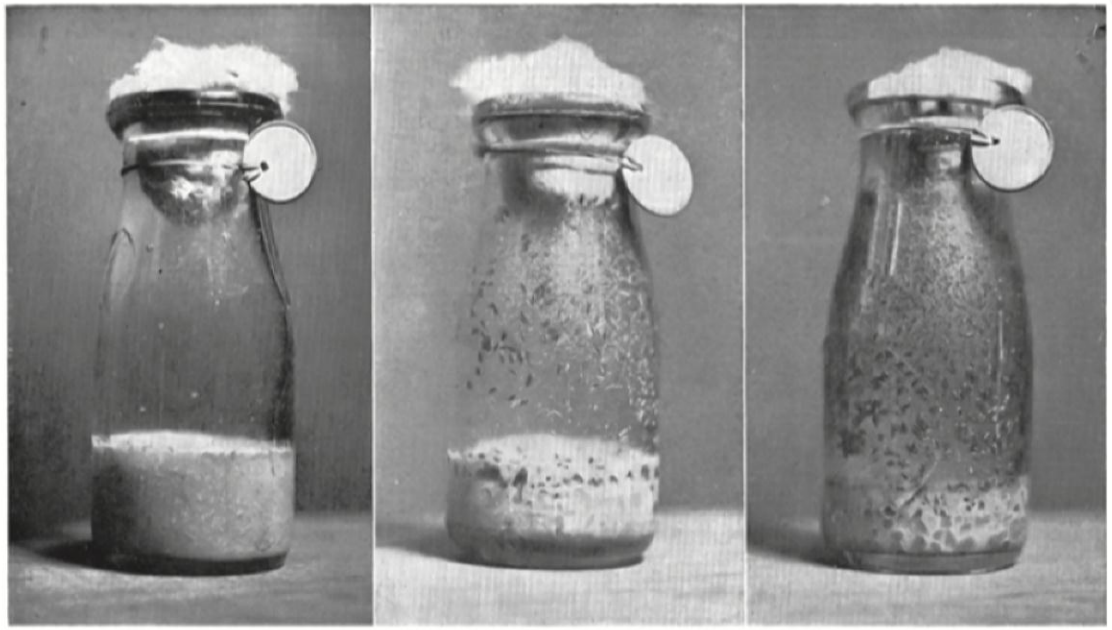
操演理论
PERFORMATIVITY

- 定义课程史：缠绕于知识组织方式之中的历史实践
- J.L.奥斯汀（语言学）、巴特勒（性别研究和女性主义社会理论）
- 巴拉德（量子物理和后人类主义科技哲学）,重新定义agency、知识、现实世界：

*现象不单单标志着“观察者”和“被观察者”在认识论意义上的不可分离性；相反，现象是内切互动（**agentially intra-acting**）“成分”在本体论意义上的不可分离性……特定的内切互动（包含“观察装置”的特定物质）实施了能动切割（**agential cut**）（与笛卡尔式切割--主体和客体存在固有区别--相反），以此来产生“主体”和“客体”的分离。*

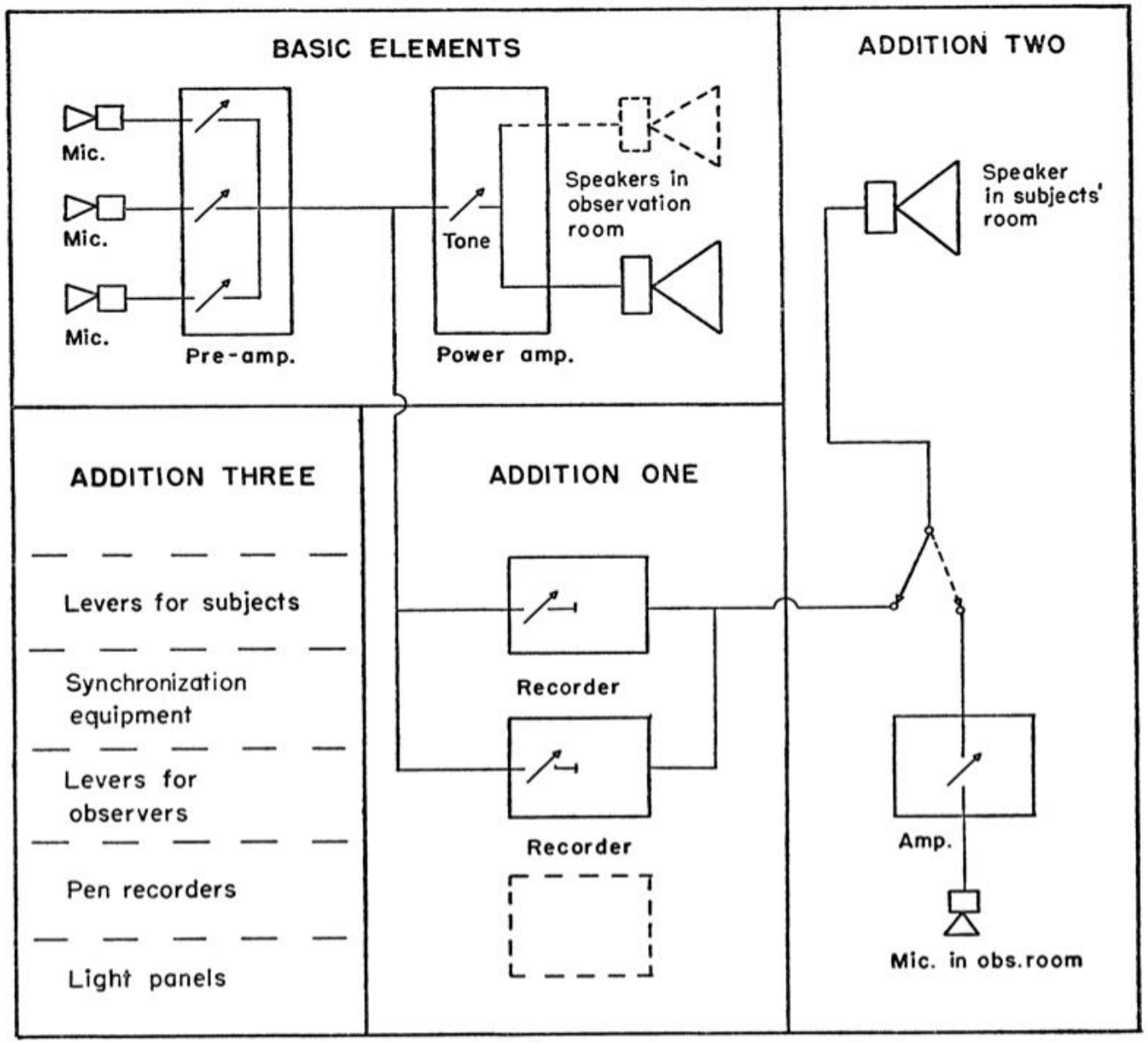
- 幻象术（phantasmagram）：墨菲（科技史）；既非完全存在也非完全不存在，它们造成了自身的物质化并需要我们去解释这个过程。科学实践的责任取决于如何解释这些实践的能动性。

Figure 4.1. "Baker Shot," part of Operation Crossroads, took place at Bikini Atoll in 1946. Nearby, in 1947, a group of thirty-one American social scientists began the Coordinated Investigation of Micronesian Anthropology, a thorough multi-atoll study of Micronesian psychology, culture, and physiognomy. The project never mentioned the escalating series of US nuclear tests in the area. (Reproduced courtesy of U.S. Department of Defense.)



INTRO.1 Raymond Pearl's bottle of *Drosophila* at three points in time. (Pearl, *The Biology of Population Growth*, 1930)

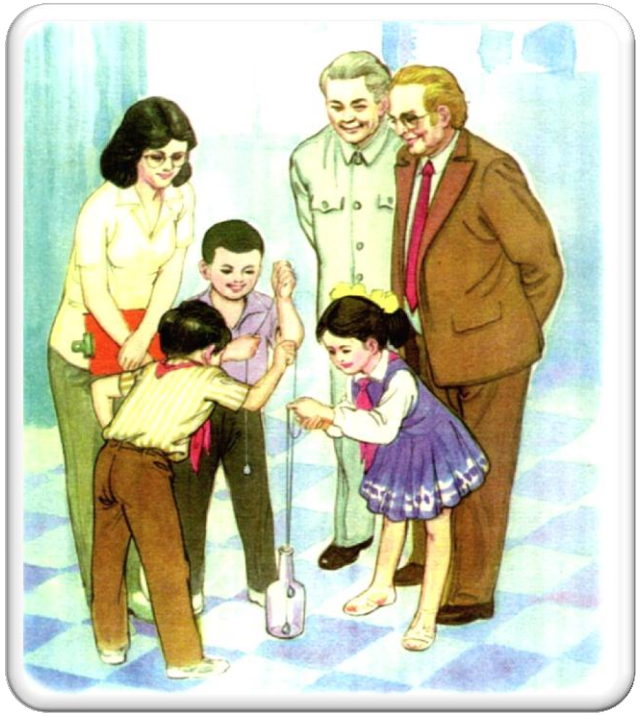
问题解决的“情境”：美国科学与军事实验中的一项发明



Bales' design of an observation room (Bales, 1954)

美国为主导的科学、技术、工程和数学在冷战期间如何制造了上述“危机幻象”

- 20世纪上半叶生物学和心理学通过控制实验对crowd与灭亡（extinction）建立因果关系（基于19世纪的道德哲学假设）；
- 1950-60年代社会科学田野研究和统计研究将城市危机归因为“穷人的文化”（实则为行为方式）；
- 1960-70年代生态学和系统理论结合以计算地球危机并将其归因为“第三世界”增长的人口（破坏平衡、引起冲突）；
- 1960年代起，美国科学和教育政策制定者及社会科学家借助系统理论重新定义教育为资源配置的社会工程（pipeline）和解决经济及安全问题的手段；
- UNESCO和OECD等国际组织基于上述假设和研究开发国际教育规划项目和评估项目。科学、技术、工程和数学不仅被作为普世的评估对象，也作为普世评估手段来控制国家内部和世界的预期的危机。



人教版三年级语文：一次成功的试验

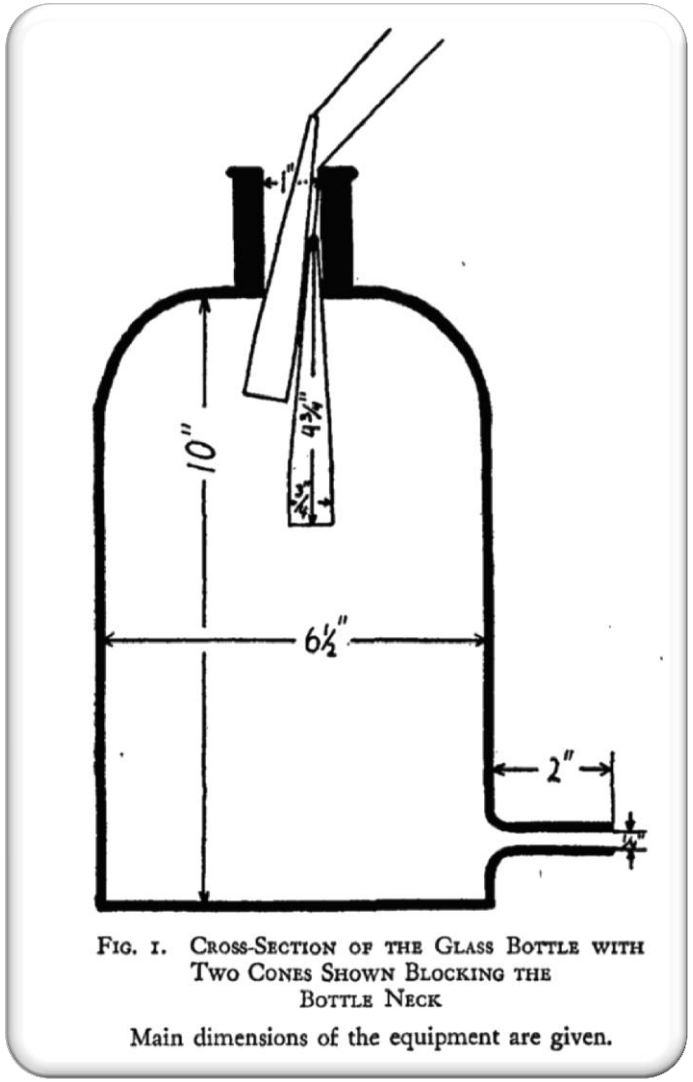


FIG. 1. CROSS-SECTION OF THE GLASS BOTTLE WITH TWO CONES SHOWN BLOCKING THE BOTTLE NECK

Main dimensions of the equipment are given.

Mintz’s Experimental Bottle,
“Non-adaptive Human Behavior” (1950)

SPACESHIP EARTH MOVMENT: How human can survive a finite planet (mid 1960s-1970s)

- BARBARA WARD. (1966). *SPACESHIP EARTH*
- KENNETH BOULDING. (1966). THE ECONOMICS OF THE COMING SPACESHIP EARTH
- R. BUCKMINSTER FULLER. (1969).*OPERATING MANUNAL FOR SPACESHIP EARTH*
- NASA. (1968). *APOLLO 8 MISSION IMAGE – EARTHRISE*
- MEADOWS. *(1972). THE LIMITS TO GROWTH*
- ISSAC ASIMOV. (1974). *EARTH: OUR CROWDED SPACESHIP*
- AMERICAN FRIENDS SERVICE COMMITTEE. (1975). *HUNGER ON SPACESHIP EARTH: SIMULATION GAME*.

- *SOCIAL EDUCATION* (NOV. 1968): INTERNATIONAL EDUCATION FOR THE TWENTY-FIRST CENTURY

KENNETH E. BOULDING, EDUCATION FOR THE SPACESHIP EARTH

HERBERT C. KELMAN: EDUCATION FOR THE CONCEPT OF A GLOBAL SOCIETY

DONALD N. MORRIS AND EDITH W. KING: BRINGING SPACESHIP EARTH INTO ELEMENTARY SCHOOL CLASSROOMS

- FOREIGN POLICY ASSOCIATION. (1969). *AN EXAMINATION OF OBJECTIVES, NEEDS AND PRIORITIES IN INTERNATIONAL EDUCATION IN U.S. SECONDARY AND ELEMENTARY SCHOOLS*.
- CENTER FOR CURRICULUM DESIGN. (1970). SPACESHIP EARTH CURRICULUM PROJECT.
- FOREIGN POLICY ASSOCIATION. (1971). *INTERNATIONAL EDUCATION FOR SPACESHIP EARTH*
- *TODAY'S EDUCATION* (JAN. 1973)

LAMONT COLE: HOW FARES SPACESHIP EARTH?

- HAWKHILL. (1973).*SPACESHIP EARTH* (TEACHING VIDEO)
- RODGER W. BYBEE. (1979). SCIENCE EDUCATION POLICIES FOR AN ECOLOGICAL SOCIETY: AIMS AND GOALS

Fear of Intimacy and Interdependence

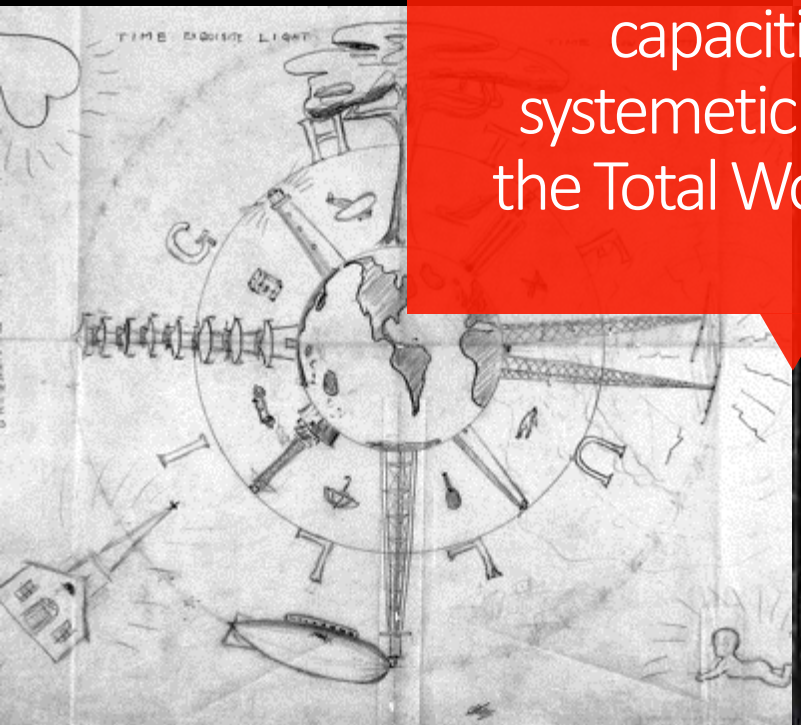
Barbara ward (1966)

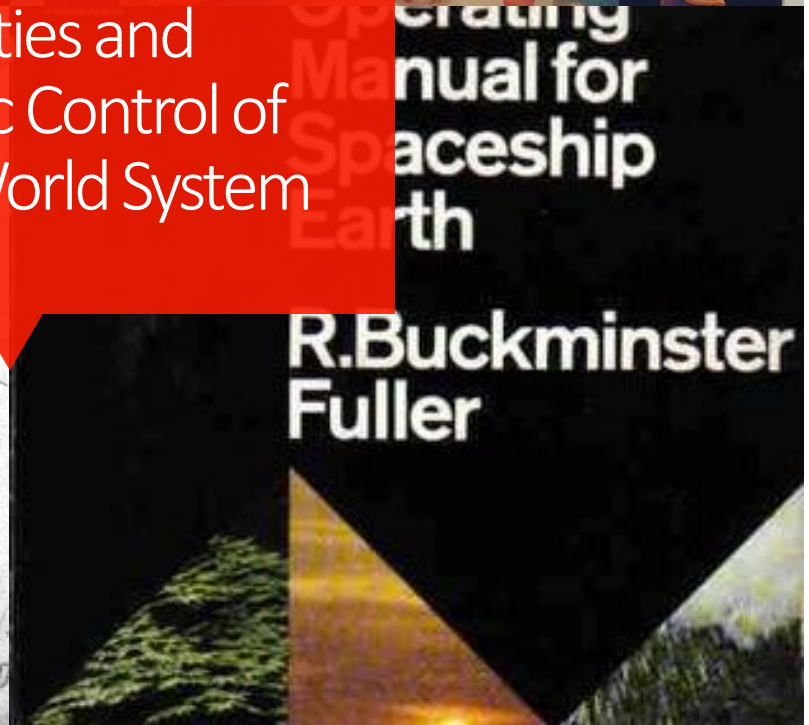
- Modern science and technology have created so close a network of communication, transport, economic interdependence—and potential nuclear destruction—that planet earth, on its journey through infinity has acquired the intimacy, the fellowship, and the vulnerability of a spaceship. In such a close community, there must be rules for survival.
- For the first time in human history, a nation can lob a little device over a neighbor's backyard and blow him up and everything else with it. If this fact does not create a "community," I do not know what can. If we can all be destroyed, together, in two or three act of grandiloquent incineration, then we are neighbors.
- This space voyage is totally precarious. We depend upon a little envelope of soil and a rather larger envelope of atmosphere for life itself. And both can be contaminated and destroyed. Think what could happen if somebody were to get mad or drunk in a submarine and run for the controls. If some member of human race gets dead drunk on board our spaceship, we are all in trouble….Rational behavior is the condition of survival.

Fear of Human Extinction and Conflicts for Survival

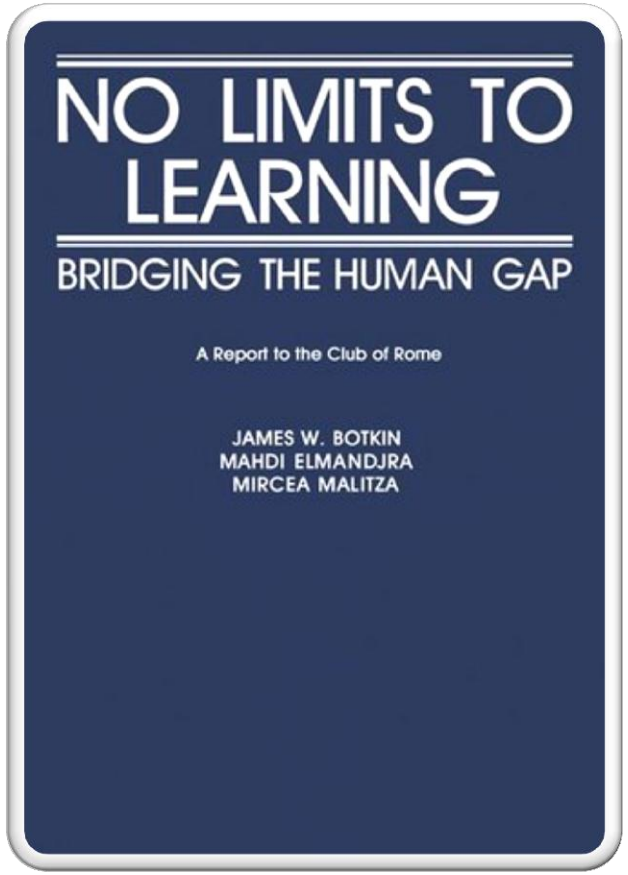
- 1969 summer, Elementary Laboratory School at Colorado State College (*International Education for Spaceship Earth, 1971*)
- "The children were the passengers and crew on board a spaceship. Through the use of an overhead transparency, which projected a drawing of the inside of the ship, and an audiotape, the environment was established. As the group traveled through space, the audiotape dramatized a sequence of events that limited the air, food, and water supply and created problems with overcrowded conditions, all understandable situations with which the youngsters could identify…. They talked about the complications that could develop in a limited environment, about the need for cooperative efforts among people in close proximity to each other or dependent on each other, about the kinds of internal conflict which arise when people are subject to discomfort, deprivation, danger, and other forms of stress.

Hope of Anticipatory Thinking, calculative capacities and systemetic Control of the Total World System





- Computers as the new Great Pirates (*Operating Manunal for Spaceship Earth, 1969)*
- "The most inclusive object of international understanding can be visualized as the world or earth system perceived as a totality." (*An Examination Of Objectives, Needs And Priorities In International Education In U. S. Secondary And Elementary Schools,* 1969)
- "Eco-tactics consist of environmental manipulation. Perhaps the best way to illustrate this distinction is to take a brief look at the problem of birth control. … Both the pill and the IUD represent the manipulation of a system to alter its functioning. … If she had this monitoring capability, this monitoring capability, it would not be necessary for her to tactically tamper with her physical processes or to tactically deny her emotional ones." (*Spaceship Earth Curriculum Project,* 1970)
- Hawkhill. (1973).*Spaceship Earth* (Teaching Video)



No Limits to Learning, 1979

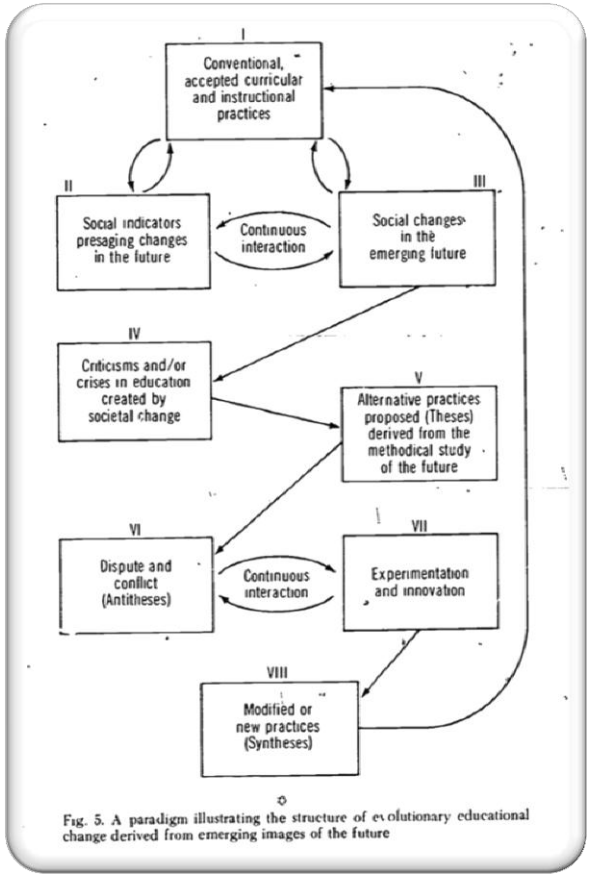
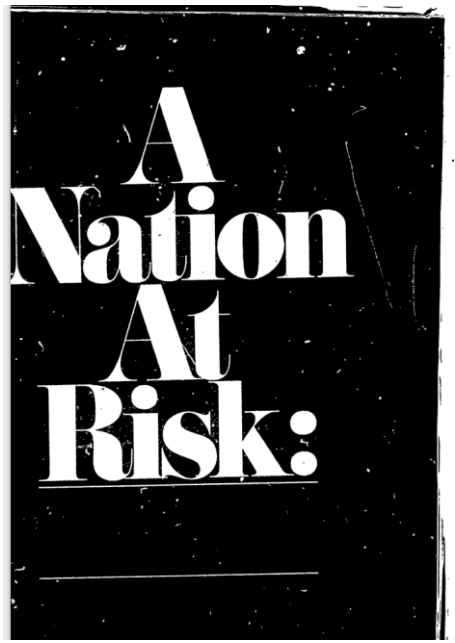


Fig. 5. A paradigm illustrating the structure of evolutionary educational change derived from emerging images of the future

Education for a New Millennium: Views, of 132 International Scholars, 1981



ANTICIPATORY LEARNING AND CURRICULUM

研究结论：

美国社会 / 科学在二战期间和战后所创造 、重组和流传的“ 危机幻象术 ”， 不仅制 约了国际教育 、 环境教育的早期发展 ， 还被重新组装成为当今“问题解决 ”的教学话语以及有关创新、全球素养和 **STEM** 素养的话语的组成部分。这些 幻象术 的反复操演使得通过生存危机来证明社会和教育改革的正当性变得常规化，而这些改革将生活和学习中的儿童定位为战士使他们不得不受困于一个有限的空间并与未知事物作斗争 。

对我国课程整合研究的启示：回到中国，寻找替代性

什么是问题：有哪些定义，怎么来的，我们怎么定义 （如果美国的是冲突和危机取向的）

什么是知识：知识和信息什么关系(40年代开始心理学和信息科学的发展，以唐诗，小学应用题为例）

整合的前提是分化：西（我和他辩证，二分思维）—中（中医，我和你辩证）—西（量子物理，缠绕）

“东方”文化提供的替代性思考：问题和解决是什么关系；理论和经验是什么关系；合与和

谢谢！

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