

Pacific Cognitive Styles and the Development Functions of Science Education

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Introduction

Benson's (1995) call for a greater awareness among educators of Pacific students' cognitive styles is a timely one, and our heeding it has, as he suggests, the potential to improve learning outcomes. This paper discusses Melanesian cognitive styles in relation to science education with a view to maximising the developmental benefits of modern science to Melanesian society.

Culture, Cognition and Development

Indigenous cognitive styles need to be approached within the global context of their background cultures and the functions of learning and cognition therein. The functions of education in traditional Melanesian society are to acquire essential life skills such as gardening, cooking and house-building and to inculcate conformity to norms and values conducive to social harmony (Coyne 1973, Kelly 1973). The validity of knowledge is dependent on its source, a cognitive paradigm that Lindstrom (1990: 6) referred to as "inspirational epistemology". This cognitive mode is transferred to the modern educational setting:

In a classroom, books and lectures are external, inspirational sources. The students' problem is to struggle to hear the message, not to actively interpret or generate new knowledge. Citation of external authority rather than internal intellect validates and strengthens a statement or position taken...

(Lindstrom 1990: 7)

More importantly, traditional reasoning involves

a closed logic system where the production of a solution does not lead to further development or the testing of the resultant proposition. Each problem and solution is discrete - therefore little transfer is possible and... testing of the proposition by deductive logic does not take place...

(Stevenson 1975: 33)

These cognitive styles are anathema to modern science, given its stress on empirical validation, the deduction of general principles, and linear logic. How can we modify science syllabi to accommodate such cognitive modes?

Perhaps a better question is: *should* we attempt to do so or should we try to wean students off certain cultural cognitive styles? At this point, we need to digress into exactly what we mean by 'culture'. Culture is not static; it is a human adaptation to the realities of life, which include change, and lead in turn to cultural change. Specifically, we need to recognise the parallel changes occurring in a society's socioeconomic development and in its culture, and attempt to keep the two in tandem; a mismatch often leads to development failures (Nottak, 1991).

Sustained socioeconomic development through the application of modern science requires two processes: the mastery of modern science through science education, and its application to local development problems. As was stated by Ogunniyi (1986: 119):

Although by nature science is universal, the needs of the different cultures and economies are not the same... Topics that relate to mechanised farming, control of malaria and many tropical diseases, ecological balance, provision of good drinkable water, production of food, development of good roads, drought, small agro-based industries, etc., are more relevant to the African setting than... many... topics that have featured in the science curricula of industrialised nations.

The mastery of modern science demands the adoption of a modern scientific epistemological approach. Quasi-Aristotelian physics may be 'cultural' (e.g. Boeha, 1988) but it does not launch the satellites that provide developmentally essential communications networks and remote sensing data. For science educators, this issue involves the systematic attempt to *change* thinking and reasoning styles, and hence cognitive modes. I regard it as a developmental function of science education to inculcate modern scientific reasoning modes with a view to empowering people through this potent intellectual technology. This approach is a far cry from any tendency towards cultural introversion in science education. A corollary of my argument is that to institutionalise traditional cognitive styles is to deny people a vital intellectual technology that is conducive to development through the application of modern science to local problems, and therefore keeps them in an underdevelopment rut.

It is an error to equate *scientific* reasoning with *western* reasoning. Europeans, like any other ethnic entity, exhibit scientifically irrational conceptual frameworks concerning the workings of the natural universe (Ogawa 1990). It was not until the Renaissance that some Europeans began to use what we have since recognised as 'scientific reasoning'. By no coincidence, the adoption of modern scientific reasoning was associated with the shift from an inward-looking, parochial, quasi-feudal

societal organisation to an outward-looking, global, entrepreneurial and meritocratic societal foundation. The global dissemination of modern science and technology as a concomitant of European mercantile and colonial expansion has sometimes led to the erroneous identification of the intellectual *modus operandi* of modern science as being inherently 'western'. The realities today for *all* societies are globalisation and modernisation, accompanied by the many tangible benefits that these bring. Cultures are changing as a result: rather than speaking of *traditional* Pacific cultures, a more realistic concept is that of *transitional* Pacific cultures.

While modernisation often means 'westernisation' in observable practice, it is my view that this is often so precisely because cultures have not been encouraged to develop their own endogenous mechanisms for coping with change. Caught in a no-man's-land between unyielding tradition and the western model of modernity, many young people merely mimic the latter. That this need to be so is exemplified by many 'second-wave' industrialised Asian societies. Japan is a pertinent example: the national modernisation plan adopted after the Meiji Restoration in 1868 included as an objective the mastery and adaptation of western science and technology alongside traditional values such as allegiance to the Imperial order (Cummings 1982). Japanese culture has changed immensely from the feudal agrarian society of the Tokugawa era to the present day, but it remains uniquely Japanese.

It is with regard to the process of application of scientific knowledge that cultural *values* associated with indigenous cognitive styles can be given their proper place in developmentally effective science education. In particular, the preoccupation with social implications of knowledge can be usefully directed towards local developmental issues. The failure to direct indigenous scientific skill towards local issues has been a problem with science education at the tertiary level (*cf* Bhalla & Fluitman 1985, Ukaegbu 1985). At the lower academic levels, I have argued elsewhere (Vlaardingerbroek 1997) that the adoption of the Science-Technology-Society

approach to school science education is a vital but underutilised key to optimising the development potential of science education (see also Vlaardingerbroek & Olney 1994).

Summary

Cultural cognitive styles should be approached within the context of the cultures in which they have arisen. Culture is a dynamic human adaptation to change. Today's world in which all societies are now interlinked is one of change through globalisation and modernisation. All cultures have responded and/or are responding to this new era, albeit at very different rates; few, if any, indigenous cultures remain 'traditional', the mode being 'transitional'. The erroneous equating of modernisation with westernisation manifests itself in science education through the equating of modern scientific reasoning processes with 'western' ones. But to 'return' to traditional conceptual frameworks in the guise of cultural-cognitively appropriate science education is to deny people a powerful intellectual technology that can and should be applied to socioeconomic development in their own societies.

Science education as an agent of development involves two aspects: the mastery of modern science and its application to local development-related issues. The first of these can not be achieved without inculcating modern scientific epistemological processes in the classroom and laboratory. There is no role to play for 'cultural', including indigenous European, cognitive paradigms. However, cultural values that are associated with indigenous cognitive modes can, and should, play major roles in the application of modern scientific knowledge and reasoning to local development issues. This aspect of cultural cognitive styles has been underutilised, and science education has not fulfilled its development potential as a consequence. It is suggested that the Science-Technology-Society approach can fruitfully accommodate both of the above aspects.

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