Vedic Science Based Education and Nonverbal Intelligence: 
A Preliminary Longitudinal Study in Cambodia

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ABSTRACT - This study surveys the current status of higher education in Cambodia, and examines the influence of a Vedic Science curriculum, which included the Transcendental Meditation program, on undergraduate nonverbal intelligence. The Culture Fair Intelligence Test was administered to 70 students from two institutions of higher learning: the Institute of Economic Science (n = 23) in Phnom Penh, and Maharishi Vedic University (n = 47) in Prey Veng province. Results suggest that the application of Vedic Science to the curriculum increases the problem solving ability of Cambodian college students.

INTRODUCTION AND CONTEXT

The history of Cambodian higher education is, to say the very least, an extremely sad one. Hansford (1991) points out, for example, that during the Pol Pot years: 80% of teachers and administrators (approximately 20,000 people) died or fled the country; Tuol Sleng, centre of the notorious "killing-fields", was formerly a secondary school; books and teaching materials, now a luxury, were burnt in the name of revolution; and many school buildings, monasteries, and other centres of learning like libraries and museums were destroyed or otherwise put to use as grain stores or animal pens. Indeed, the National Museum of Art, an impressive edifice in Phnom Penh and arguably the region's most important repository of Southeast Asian culture, was used during this time as a pig sty and is now home to a rare colony of bats.

However, as Wheeler and Miller (1990) report, significant progress has been made since the overthrow of the Khmer Rouge in 1979. Despite the fact that materials and trained personnel are still scarce and standards remain low, a medical school, an institute of technology, a fine arts university, an agricultural college, a law school, an economics institute, and a liberal arts university are now operating in Phnom Penh with the support of foreign faculty, aid, and educational resources, and other centres of learning are being revitalised (for example, see Chepesiuk's 1992 account of the National Library).

The Ministry of Education maintained that more than 10,000 students graduated from secondary school in 1989 (Jordens, 1991, p. 6) and approximately 15,000 students attended these seven institutions of higher learning during 1992, with the number still rising. This optimistic growth and increased educational diversity has nevertheless been tested by ongoing student unrest (Driver, 1992), political and social turmoil as reported extensively in the world media, and the continuing crippling effects of poverty, malnutrition, economic instability, and the well-documented side-effects of social trauma (Seanglim, 1991).
From January, 1979 to May, 1993, Cambodia was ruled by a severely-named Soviet-Vietnamese backed junta whose most recent manifestation was the Kampuchea People's Revolutionary Party (KPRP) headed by Hun Sen. The KPRP's strategy on education had been clearly delineated in such documents as the State of Cambodia's Vanyasa Oprum Noyobay, outlined by Jordens (1991). According to the Vanyasa, education was incorporated into Cambodian national development strategies since 1979, and had become a priority in later years with substantial support from the Soviet Union and Vietnam.

Jordens (1991, pp. 14-17) points out that the KPRP strategy called for research into new teaching programs and the revision of old programs, skills training for workers, cadres, and ethnic minorities, an expanded specialised education to serve economic and cultural demands, and the construction of new schools. Moreover, Cambodian education should, the Vanyasa claimed, aim to build cultural understanding, good health, multitalents and technical skills, a deep feeling for all people, internationalism, and an opposition to nationalism. This strategy has largely continued to the present day under the new multi-party government of 1993-1995, with educational development guided until recently by Ung Huot (now the Foreign Minister) who resided in Melbourne for twenty years until the early 1990s.

In this milieu, a recent joint effort initiated by Australian and Thai educators and undertaken by the Ministries of Education of both the KPRP and the multi-party government, Maharishi Vedic University International, a non-political, educational organisation based in the Netherlands, and the Australian Aid for Cambodia Fund, a non-government organisation based in Melbourne resulted in the 1993 establishment of Maharishi Vedic University (MVU) in Kamchay Mea, Prey Veng province, in Cambodia's eastern sector. MVU is one of three universities in Cambodia (Phnom Penh University and the University of Fine Arts being the other two), and the only institution of higher learning outside the capital.

The MVU curriculum and educational environment in Kamchay Mea was designed to address several of the aforementioned policies by: a) offering degree programs to undergraduates which develop technical skills and contemporary understanding in business and management (specialising in leadership, strategic planning, human resource development, and public administration), agriculture (specialising in self-sustainable, ecologically sensitive farming and management practices), architecture (specialising in natural materials and building/village design and construction in accord with Khmer tradition), and preventive medicine (specialising in Maharishi Ayur Veda, a traditional, cost-effective, prevention-oriented therapeutic approach); b) placing up to 1,000 high school graduates in higher education; c) developing cultural and international understanding through a variety of courses in Khmer culture and its links to ancient Vedic culture (for example, the history of Khmer civilisation and Sanskrit); d) incorporating health-related training strategies into the curriculum in order to promote the psychological and physiological health of students and to reduce stress; e) helping decentralise higher education, thereby making it more widely available to students from provinces other than Phnom Penh; and f) conducting research into these new strategies and programs.

The curriculum and educational philosophy of Maharishi Vedic University utilised the theoretical principles and practical programs of Vedic Science as developed by Maharishi
Mahesh Yogi. Maharishi's Vedic Science has been well documented (for example, see Chalmers, Clements, Schenklun, & Weintless, 1989; Chandler, 1987; Wallace, Orme-Johnson, & M. C. Dillbeck, 1990). The Vedic Science curriculum employed at MVU supplemented the technical and academic orientation of contemporary study in the four specialised fields listed above by incorporating three unique pedagogical features of Vedic Science: a) practice of the Transcendental Meditation and TM-Sidhi program to develop the intelligence, creativity, learning ability, and overall mental potential of students, and to reduce stress; b) study and application of natural health practices from the Vedic tradition designed to enhance student health and well-being; and c) study of the foundational principles of Vedic Science and how they inform, guide or otherwise bear upon the student's major discipline of study. Detailed descriptions of the Transcendental Meditation and TM-Sidhi program, and of Vedic Science and its relation to modern science, have been provided by Chandler (1987), Gelderloos and van den Berg (1989), and Hagelin (1987).

It was the impact of a Vedic Science curriculum on nonverbal intelligence that this study sought to investigate. S. L. Dillbeck and M. C. Dillbeck (1987) and Jones (1989) have examined the foundational principles and research outcomes of Vedic Science based education, and summarised their applicability to higher education; they have shown that when these three features of Vedic Science are incorporated into the standard curriculum, student health and behaviour improve, learning ability and concentration increase, and self-actualising qualities such as self-esteem, ego-strength and psychological autonomy have been observed to develop in college students (research findings also summarised in Chalmers, et al., 1989; Wallace, et al., 1990).

As a result of the Transcendental Meditation program alone, changes in intelligence and field independence (M. C. Dillbeck, Assimaklis, Raimondi, Orme-Johnson, & Rowe, 1986) and creativity (Travis, 1979) have been observed in college students in North America. Kember (1985) also noted improved academic performance in British graduate students, and Tjoa (1975) found increased intelligence in Dutch undergraduates after they learned the Transcendental Meditation program. Jedrczak, Beresford, and Clements (1985) have found a relationship between clarity of experiences in and number of months practicing the more advanced TM-Sidhi program and creativity and intelligence.

Nonverbal intelligence has been found to increase five standard IQ points over two years (Cranston, Orme-Johnson, Ackkchenbach, Dillbeck, Jones, & Alexander, 1991) and eight points (Aron, Orme-Johnson, & Brubaker, 1981) or nine points (M. C. Dillbeck, et al., 1986) over four years as a result of a Vedic Science curriculum. These findings contrast norms and controls from matched schools.

Research has also shown that the Transcendental Meditation program is associated with factors identified as relevant to higher education in Cambodia, and that students find the practice both easy and useful in promoting psychological well-being and cognitive ability (Fergusson, Bonshek, & M. Boudigues, 1994). Furthermore, research conducted by these authors has indicated that a Vedic Science curriculum lessens the secondary symptoms of post-traumatic stress disorder and develops the personality and health of Cambodian undergraduates (Fergusson, Bonshek, & J-M. Boudigues, in press).
Based on these findings, which suggest that a Vedic Science curriculum incorporating the Transcendental Meditation and TM-Sidhi program and other Vedic practices enhances cognition, the present study asked whether a Vedic Science curriculum would significantly increase the nonverbal intelligence scores of Cambodian undergraduates when compared to matched controls.

**METHOD**

Subjects. Seventy Khmer undergraduate students participated in this study. At the time of testing, all students were enrolled in a preparatory-year curriculum at either the Institute of Economic Science (IES) in Phnom Penh or Maharishi Vedic University; selection was random for MVU students but dependent upon availability and scheduling for those at IES. All groups were similar for age, gender, and educational level, although students at IES came from slightly more privileged families than those at MVU. Excluding the Vedic Science curriculum features listed above, students participated in essentially the same preparatory-year curriculum.

Group one consisted of 23 students enrolled at IES (seven females and 16 males; Mean age = 19.0, SD = 1.62); group one was pre-tested in January and post-tested in April, 1993 and served as a control. Group two consisted of 21 students enrolled at MVU (two females and 19 males; Mean age = 18.6, SD = 1.68); group two was pre-tested in January and post-tested in April, 1993. Group three consisted of 26 students enrolled at MVU (four females and 22 males; Mean age = 19.42, SD = 1.70); group three was post-tested only in April. These descriptive statistics suggest that students in this sample reflected the national average for age and gender ratio in higher education. Group two served as an experimental group, with group three as a post-test only comparison; groups two and three participated in the Vedic Science curriculum in identical ways and for the same period of time.

Obstacles to Research and Development. Keyes (1979) has shown that a general paucity of research tools faces the educator in Southeast Asia. He cites a total of only 271 works of any kind on Cambodia, with no dissertation bibliographies, no guide to statistics (excluding retrospective compilations of the colonial period), no periodicals, and no publications on libraries or a book trade. Certainly this lack was more severe immediately after the Khmer Rouge years when Keyes' survey was made, but our experience indicates that little has changed since 1979. Indeed, our review uncovered not a single contemporary study on education, and we were unable to locate within Cambodia any test instruments or research tools.

Elsewhere in the region and consistent with findings in the West, Lee (1973) has confirmed that a nonverbal test of intelligence can be used to uncover potentials in students that are not revealed by a verbal test. However, we were unable to determine if any research in Cambodia had ever been conducted on cognitive development, or indeed on any aspect of postsecondary education, making modification of the following standard instrument necessary.
Instrument. The Culture Fair Intelligence Test, Scale 3, Form A was used to measure nonverbal intelligence. According to its authors, the CFIT measures "individual intelligence in a manner designed to reduce, as much as possible, the influence of verbal fluency, cultural climate, and educational level. The test... is nonverbal and require[s] only that examinees be able to perceive relationships in shapes and figures" (Institute for Personality and Ability Testing, 1973a, p. 5).

The CFIT was chosen for several reasons. First, evidence suggests that the test is valid for non-English-speaking populations; second, little or no difference has been found between the scores of Chinese and American students, thereby supporting its claim to cultural "fairness"; third, because the test is constructed of nonverbal images, only the most minimal translation is needed to communicate test instructions; fourth, little or no difference between female and male CFIT scores has been observed; fifth, moderate to strong reliability and validity data support the instrument (for example, the test-retest reliability of the CFIT is approximately .70, IPAT, 1973a, pp. 9-11; IPAT, 1973b, pp. 9-20); and sixth, the CFIT has been used elsewhere to measure the impact of a Vedic Science curriculum (Aron, et al., 1981; Cramson, et al., 1991; and M. C. Dillbeck, et al., 1986), making comparisons possible.

Procedure. The CFIT is a standardised, group-administered, pencil-and-paper test consisting of four sections with a total testing time of 30 minutes; the test was administered, timed, and scored according to instructions in the test manual (IPAT, 1973a, pp. 12-18). In compliance with suggestions in the manual, each group was administered the CFIT with the help of local-language Khmer faculty who were blind to the study's hypothesis.

Participants had no prior knowledge or experience of the CFIT, and no special teaching styles or curriculum components were introduced at either school to familiarise students with the test or its conception before or during the testing period. A 45% attrition rate was observed in group one; according to school officials, this was due to social upheaval caused by the forthcoming UN-sponsored elections in May, 1993 during which many students acted as interpreters to UN personnel or departed Phnom Penh for their home provinces.

RESULTS

Table 1 presents the means and standard deviations for each group. Group one scored 14.3 at pre-test and 12.9 at post-test, group two 11.5 at pre-test and 15.7 at post-test, and group three 15.0 at post-test. A test of difference computed at the two-tailed level showed that there was a significant difference between the changed CFIT scores of groups one and two (t = 3.81, p = .001).

Analyses of covariance using pretest scores as the dependent variable also suggested that both gender (F = .31, p = .55) and age (F = 3.71, p = .06) were not factors in this observed difference; the latter finding being consistent with those reported by the authors of the CFIT (IPAT, 1973a, p. 9). Moreover, a test of difference between groups two and three indicated no statistically-significant difference between MVU groups at post-test (t = .64, p = .53).
Table 1:  Culture Fair Intelligence Test: Means and Standard Deviations by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Pre-Test Mean</th>
<th>SD</th>
<th>Post-Test Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>One (IES)</td>
<td>23</td>
<td>14.3</td>
<td>4.51</td>
<td>12.9</td>
<td>5.72</td>
</tr>
<tr>
<td>Two (MVU)</td>
<td>21</td>
<td>11.3</td>
<td>4.40</td>
<td>15.7</td>
<td>3.54</td>
</tr>
<tr>
<td>Three (MVU)</td>
<td>26</td>
<td>†</td>
<td>†</td>
<td>15.0</td>
<td>4.08</td>
</tr>
</tbody>
</table>

† Not applicable

When converted to normalised standard IQ scores, the IES mean decreased from 76 to 72 (no significant difference), while group two's mean increased from 67 to 81; at post-test, group three scored 78. These CFIT scores are, however, consistently lower than those derived from school children in mainland China ($N = 525$, CFIT = 22.8), Taiwan ($N = 765$, CFIT = 21.9), and the United States ($N = 1,100$, CFIT = 24.0) as reported by IPAT (1973b, p. 9).

DISCUSSION

This study was conducted in an atmosphere of tension and uncertainty. With a large foreign military presence throughout the country (the most ambitious of all UN missions to that time with a budget of US$1.9 billion and more than 22,000 personnel, see United Nations, 1992), continued fighting between royalists, forces loyal to the KPRP, and the Khmer Rouge, the first election campaign in more than 20 years, and crippling currency fluctuations, student life was anything but stable or normal. However, the present study is, we believe, important enough to make several observations which may prove useful for future educational research in Cambodia and Southeast Asia.

The students at MVU showed a significant increase in nonverbal intelligence over a three-month period when compared to controls. It is of interest to note that the present findings largely confirm the work in North America of Aron, et al. (1981), Cranson, et al. (1991), and M. C. Dillbeck, et al. (1986), namely that a Vedic Science based curriculum, which includes the Transcendental Meditation and TM-Sidhi program and other Vedic principles and practices, may influence the intelligence scores of undergraduates, although gains were apparently accelerated in Cambodian students.

Where earlier research found increases on the CFIT of eight or nine standard IQ points over four years, this study found an increase of 14 points over three months; the observed increase was apparently not due to a testing effect as evidenced by the post-test only mean of
group three, nor can self-selection or history explain the observed difference. Similarly, maturaion cannot account for the increase, as 18-year olds and up normally register small, but consistent, decreases on the CFTT (Barton, 1973).

Further research is needed, however, to determine: a) whether all three of the added Vedic Science curriculum features are needed to impact nonverbal intelligence scores; b) whether, or to what degree, each feature can operate independently in the curriculum and still be effective as an educational strategy in influencing cognition; and c) whether combinations of these curriculum components prove more or less effective in Cambodia. The present design only demonstrates that when all three features—Transcendental Meditation and TM-Sidhi program, health and health-related strategies, and study of foundational Vedic principles and their relation to modern disciplines—are present in the curriculum, nonverbal intelligence scores increase significantly over a three-month period.

The question of attrition is clearly troubling. Without a more reliable post-test score for group one and a larger sample generally, it might be proposed that the statistically-significant difference observed here between IES and MVU nonverbal intelligence scores was due to attrition in the control group and not due to the Vedic Science curriculum. However, the decrease in cognitive ability observed in the IES group is generally consistent with the aforementioned decreases observed in normal college-age adults, and the increase in MVU scores is consistent with the findings of earlier research on the impact of Vedic Science curricula. Thus, while future research must correct the problem of attrition, it is reasonable to conclude that the difference in intelligence scores found here was likely not due to a reduction in the number of post-test control students.

The question of "fairness" using a timed CFTT is also relevant. As Barton (1973, p. 13) has pointed out, "within any given culture there may be a wide range of responses to the timed condition. Some individuals may do better when they are under pressure, whereas others may become very anxious and therefore not perform at their highest level. Thus, an untimed version of the test may control for some of the motivational and personality differences that can distort test performance". Because the CFTT was administered here as a timed test, it is possible that students were unfairly pressured, and that collective scores do not properly reflect actual nonverbal intelligence. However, if this were the case, students were affected equally in all three groups, and the observed difference, regardless of what aspect of cognitive functioning or motivational and personality difference a timed CFTT might measure in Cambodia, suggests that the Vedic Science curriculum increased the MVU group score.

Of interest are the observations of these authors and others within each institution that suggested students did not generally appear troubled by the timed experience; students seemed to grasp the concept of pattern recognition easily, although a comparison of these means with those of children from China and Taiwan, for example, does indicate that either Cambodian students have lower levels of nonverbal intelligence when measured by the CFTT or that they were collectively disadvantaged by time. Based upon the above observations, the former appears to be most likely.

The recent work of Locurto (1991) suggests that gains in intelligence scores soon disappear and that IQ is not easily altered; he makes a strong case for the contextualisation of
cognition, taking account of the class, race, and socio-economics of intelligence. In order to test these propositions, a follow-up study is being designed which may support or refute Locurto's thesis when applied to Cambodia. Nevertheless, the observed increase in nonverbal intelligence scores of Cambodian undergraduates participating in a Vedic Science curriculum certainly warrants further investigation, preferably under conditions more favorable to the balanced and natural development of college student experience.

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