

To be published in the Proceedings of the International Conference on Cognitive Science,
Allahabad University, Dec. 16-18, 2004.

Spatial Encoding: A comparison of Sanskrit- and Hindi-medium Schools

A. Vajpayee (aparnavajpayee@aibhas.amity.edu)
Amity University, New Delhi

P. R. Dasen (pierre.dasen@pse.unige.ch)
FPSE, University of Geneva
CH-1211 Geneva 4, Switzerland

R.C. Mishra (rcmishra_2000@yahoo.com)
Banaras Hindu University

Abstract

In this part of the larger study, we compare 155 students attending Sanskrit schools (125 boys and 30 girls) with 221 pupils (172 girls and 49 boys) of a Hindi-medium school. It was expected that the socialization into Sanskrit cosmology would foster a better knowledge of the spatial orientation system, the use of geocentric spatial language, and geocentric spatial encoding. This hypothesis is fully confirmed. In addition, the Sanskrit school children were also more correct in their knowledge of right, left, front and back (RLFB) and they were more field-independent. Some gender differences occurred, but were not very important; for example, Sanskrit school boys use slightly more geocentric encoding than girls.

Introduction

This study examines spatial frames of encoding, spatial language use, and knowledge of the spatial orientation system in students attending either Sanskrit schools or a Hindi-medium school. While the former are bilingual (in Hindi and Sanskrit), this is not our main issue, rather we focus on the different socialization patterns that go with these two types of school systems (see Broyon, 2004; Mishra & Vajpayee, 2004).

Anthropologists and linguists, such as Levinson (2003) attribute a fundamental role to language in the construction of human culture. According to Levinson:

"We are a species lacking many wonderful modular endowments like echo-location or innate fixed-bearing dead reckoning systems, but with one spectacular specialization, namely language, which has come to play a dominant role in our psyche. Language has an interstitial status -- it is a public, shared, cultural representation system at the same time that it is a private, internal representation system. And some choices made at the cultural, external, variable level come to ramify right through our inner representational systems. [...] We normally do not have a choice between the systems -- the linguistic traditions in our local communities have long ago opted for one system or the other." (Levinson, 2003, pp.290-291)

While language has without any doubt played a major role in hominization, the word 'language' in the above quote could easily be replaced by 'religion'. The purpose of this paper is to examine the role a particular cultural feature, such as religious education, can play in

influencing the complex structure of spatial orientation system, spatial language, and spatial encoding. We take advantage of the existence in Varanasi of Sanskrit schools for both girls and boys to compare 155 students of these schools to 221 pupils following the more common Hindi-medium stream of schooling. Even though the latter are also of Hindu faith, Sanskrit education entails both a cosmology and practices that are expected to be relevant for geocentric spatial orientation.

The history and current status of Sanskrit schooling in India have been described by Mishra and Vajpayee (2004) while Broyon (2004) provides a case study of the particular schools used in this research.

Sanskrit Spatial Cosmology

The most ancient description of spatial language in Sanskrit literature is found in Rig Veda that is the oldest religious scripture in India. The hymns of the Rig Veda are composed in praise of the deities that were originally conceived as presiding over natural phenomena. These include such deities as fire, wind, water, rain, sun, and moon, etc. Among these, the sun (*surya*) is regarded as the soul of all living beings whether they are a part of the moving or stationary world. The rising and setting of the sun provide us with a measure of time, the day and night, which together form a day. There are approximately 30 days in a month, 12 months in a year with 360 days. In the Rig Veda hymns, the time frame is described as “the wheel of the sun with its 360 spokes”.

According to the hymns of the Rig Veda, the gods also produce an order in space. The sun is the lord of heavens; its movement from northern to the southern corner gives us a year. Thus, in the Indian setting, all divisions of time and space are completely based on the position of the sun. Anchored by the Sun other gods are also manifested in different directions (*mandals*). Sanskrit literature presents us with a description of ten directions: *uttar* (north), *dakshin* (south), *purva* (east), *pashchim* (west),

ishan, (northeast), *agneya* (southeast), *vayavya* (northwest), *nairitya* (southwest), *urdhava* (up) and *adhar* (down). Each direction is identified with a particular god. Mental representations or cognitive maps of the space guided by this particular picture constitute the viewer’s perspective to understand the surrounding world.

The concept of space and the person’s relative position in it is also guided by the philosophical questions of ‘who am I?’, and ‘where do I stand?’. Order in the perception of the world starts from ‘*omkara*’, that represents all gods together, or the highest God, (the *brahman*), or the divine soul in man. This orients persons towards more ‘global cues’, and allows to place themselves in the world wherever they go.

Space can be perceived as surrounding or engulfing people with objects such as buildings or furniture, or space can be perceived as separate from the individual with reference to the outside space such as the sun, or scenic views of mountains and rivers, etc. These notions imbibe the concept of cosmos in any given culture. Thus, the viewers’ perspective to resolve the spatial world can represent the same world in different manners with multiple modalities and frames. The experience with different sets of mind or expertise in philosophy can affect the meaning and the ways to understand the world. Thus, a child can experience space in various ways, and the environment can be viewed from different perspectives depending on the child’s experiences in a particular culture.

Knowledge about space can be obtained directly through actual navigation (e.g., walking, running, driving) or indirectly through depictions and descriptions. Indirect experiences also include the speech of caretakers (parents, teachers) in the form of specific social and communicative practices and artifacts.

To what extent does spatial language depend on paralinguistic spatial schematization (Mandler, 1996)? Do children learning languages with widely differing spatial semantic systems display different patterns of acquisition

(Bowerman, 1996)? What role as a spatial 'source domain' does the representation of the human body (as a person engulfed in nearby surroundings or as a person using more global cues) play in the acquisition of spatial concepts and language? These are some questions that lead us to the present study involving samples of Hindi- and Sanskrit-school children.

The ability to acquire and use spatial knowledge varies over the life span, and studies show a definite trend in spatial abilities in relation to age and gender. It has been shown that women have better memory for object names and locations, landmarks on navigational routes, and memory for details in drawings. Males in contrast have better mental rotation ability and better memory for overall spatial layouts in route navigation (Humphrey, 1997). There is evidence in other studies that females tend to use cognitive strategies paying attention to local detail while males demonstrate cognitive strategies towards the overall spatial structure (Humphrey, 1997).

If we observe the life of both Hindi and Sanskrit medium girls, a clear difference in socialization is obvious. Boys of both schools are allowed to go out frequently as compared to girls. Sanskrit schoolboys are allowed to go out to buy things and to take baths in the river Ganges. They go to temples on Mondays, Tuesdays and Saturdays. On the other hand, the girls in Sanskrit school are not allowed to go out. Interaction with males is also generally prohibited. They depend entirely on teachers for the necessities of everyday life. This is true for girls of Hindi medium schools as well. By the age of 11-12 they are also not allowed to go out freely. After grade 5 the schools generally make separate arrangements for teaching of boys and girls.

Methods

The background of this particular study, its general theoretical framework, and a description of the tasks and tests that have been used in this cross-cultural, collaborative project have been presented earlier. The sample characteristics are

presented in Table 1 (see also Mishra & Dasen, this symposium).

Table 1: Sample characteristics

	Age	Gender		Total	
		Boys	Girls	Total	
Hindi-medium schools	11	9	30	39	
	12	26	59	85	
	13	9	46	55	
	14	5	31	36	
	15	0	6	6	
	Total	49	172	221	
Sanskrit schools	10	2	0	2	
	11	6	3	9	
	12	35	5	40	
	13	49	6	55	
	14	30	7	37	
	15	3	9	12	
	Total	125	30	155	376

The present study was carried out in one Hindi-medium school and three Sanskrit medium schools. These two types of schools widely differ with respect to the philosophy and pedagogy of education. A brief descriptions of these schools is given below.

Sanskrit medium schools for boys

The basic philosophy of Sanskrit education is simultaneous development of physical, mental, psychic and spiritual capacities of children. This can be achieved by knowledge not only of subjects like history, geography and mathematics, but also by physical and mental exercises, practice of rituals, meditation and yoga. *Satsang* (contact with noble people) is also considered as an important means of attainment of knowledge and development of mind, to distinguish not only between good and bad or desirable and undesirable education, but also between truth and nontruth, as well as learn what to accept or reject in life. Thus, the aim of these institutions is to provide children with an ideal education of *Gurukul* (an ancient institution of education) that allows them to fulfill various responsibilities of living the life

of a true Brahmin. The message is that worldly duties are not bondages that must be severed; the world is the best teacher, and one should not renounce the world in search of a supernatural life or the realization of the supreme God. Several virtues of life such as respect for teachers and parents, mercy, love, generosity, patience, tolerance, purity, prudence, and right judgment are deliberately transmitted.

On the other hand, if someone has an orientation towards renunciation, he can opt for that life with the permission of teachers and parents. Thus, one can find in these schools students who study together but some live a life detached from worldly affairs. They learn Sanskrit to study Vedas, religious scriptures, and other books for self analysis and self correction. By observing *sadachara* (moral behavior), and self imposed restrictions on physical, mental and verbal behaviors they divert their energies to the attainment of an eternal state of bliss, called *sachchidanand*.

Most of the parents today want their children to attend modern kinds of school, because they provide several options for livelihood. Those who cannot afford the cost of education in modern schools send children to Sanskrit schools, in which the attainment of knowledge is now a less valued goal than the search for employment (see Mishra & Vajpayee, 2004).

1. Mumukshu Bhawan: This school is run by Kashi Mumukshu Bhawan Sabha, which was established in 1920. Spread over five acres of land, it comprises Veda Vedang Mahavidyalaya (for higher level education) and Prathama Vidyalaya (primary school for younger boys) besides a *math* (residence for aged saints). The school premise also houses charitable Ayurvedic and homeopathic dispensaries, a guesthouse and a couple of temples. The primary school enrolls 50 boys as students whose board and lodging is fully taken care of by the trust. The boys live in a hostel in care of the family of a school teacher. The students generally come from lower middle class Brahmin families living in rural areas near Varanasi. The school imparts education in subjects like history, geography, literature,

philosophy, religion, including a variety of rituals, meditation and yoga.

2. Nand lal Bajoria Sanskrit Mahavidyalaya:

This school was established by a lady in memory of her husband, Late Nand Lal Bajoria and is operated by a trust. The trust includes a Sanskrit school, a school for blind, a hospital for the poor, and houses for teachers. The trust fully supports the board and lodging of 80 Brahmin children for the learning of Sanskrit for two years. Children mostly come from village areas of eastern Uttar Pradesh and Bihar. The school teaches not only Sanskrit language and a variety of rituals and religious practices, but also subjects like history, geography and literature. In comparison to Mumukshu Bhawan, children of this school live in physically and economically less privileged conditions.

Sanskrit medium schools for girls

These schools are meant exclusively for the education of girls. They are different from boys schools with respect to the degree of freedom allowed to students for outside movement.

Panini Kanya Mahavidyalaya : This school was founded by late Prajna Devi with the help of the king of Varanasi. It was started as a small school, which got expanded during the last three decades. The school campus includes school building, a library, a hostel, residence of teachers, a guesthouse, a *Yagyashala* (place for worship), an armoury, a cow yard, and some fields for Ayurvedic plants and kitchen garden. The school admits students from all parts of India regardless of caste, class or social background. The students are adopted as a child of Gurukul family, and are renamed there. The school comprises 70 students and 5 full time teachers.

Education in this school is based on Vedas, with great emphasis on learning of grammar (developed by an ancient scholar, Panini), which includes 4000 formulae of Sanskrit grammar. The curriculum includes Sanskrit language, Sanskrit grammar, Vedas, Ayurveda, history,

geography, english, marshal arts, physical education, yoga, classical music and dance, cooking, a bit of animal husbandry, agriculture and horticulture along with rituals of different ceremonies of life (e.g., birth ceremony, sacred thread ceremony, etc.). The primary aim of this school is to save the cultural heritage of Sanskrit language and make women aware of their strengths. While the school combines job oriented with self oriented education, the ultimate aim is to help a student discover her inner spirit so that the hidden mystery of the eternal soul could be revealed.

Hindi medium school : Malaviya Shiksha Niketan

This imparts education through the medium of Hindi language; it is a semi government co-educational school. Established some 15 years ago the school provides education to about 2000 day scholars. Since the school is a profit making organization, the student pay a good amount of money as fee. Syllabi of the school are according to the norms prescribed by the state government. Hence, all subjects including the subjects of science are taught in the school. The school has got no choice in this respect.

The philosophy of education is to make student independent members of the society so that as adults they are able to manage life on their own. The focus is on the overall personality development of children and ensure their success in life. Unlike the Sanskrit school, the education does not focus on the development of hidden potentials

Results

On the Animals task (7 items), the Sanskrit school group produces an average of 4.7 geocentric encoding items compared to only about 3 in the Hindi-medium school. The contrast is much the same, or possibly even more striking, for Chips (7 items, including 2 with a 90 degree rotation) where the respective averages are 5.6 and 4. (Figs. 1 and 2). There is not much of an age trend, and indeed, for this

study, we are not focusing particularly on developmental aspects. There is the now commonly found effect of task specificity, namely a predominantly egocentric encoding on Steve's Maze produced by the more iconic nature of the task, and less difference between the schools (Fig. 3), although the means are statistically significant for all three tasks (see Table 2).

Sanskrit school children have, as expected from their training, a much better knowledge of the NSEW orientation system, both outside and inside a room. In fact, their performance is almost at ceiling level, and no doubt we could also have asked for the specifically named intermediate spatial directions. However they are also more correct in their knowledge of right, left, front and back (RLFB).

On the three language elicitation tasks, Sanskrit school children spontaneously use more (correct) geocentric language and less egocentric language. In fact, on the Route display, more than half of the Hindi-medium pupils do not use geocentric language at all but use RLFB (as expected from our previous results in Varanasi city, see Mishra & Dasen, in press). This task being close to the practice of moving about in city streets is expected to elicit more egocentric descriptions. However, only 10% of Sanskrit pupils use egocentric language for the Route.

On the Perspective display, which is much more static, and on the six items of the encoding tasks for which language was recorded, all Sanskrit pupils except five use geocentric language systematically, and it is also more common with the Hindi-medium children, 66 of whom nevertheless use egocentric language at least occasionally. Note that on these tasks, virtually no other spatial references (such as intrinsic, or landmarks) are used.

Figure 1: Animals

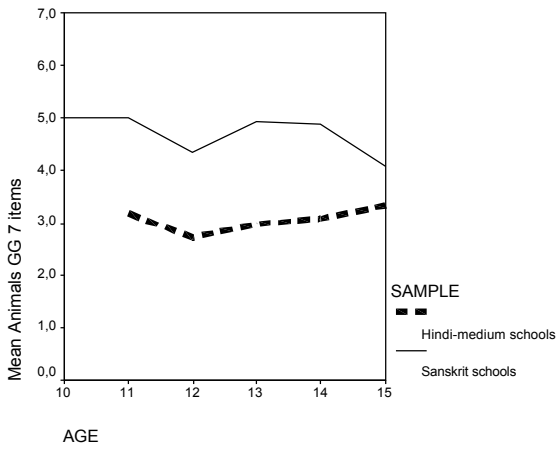


Figure 2: Chips

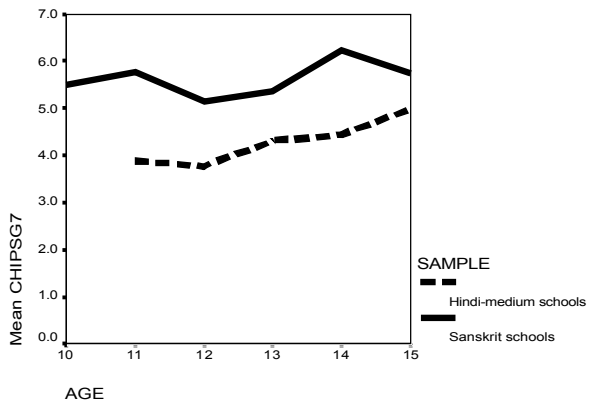


Figure 3: Steve's Maze

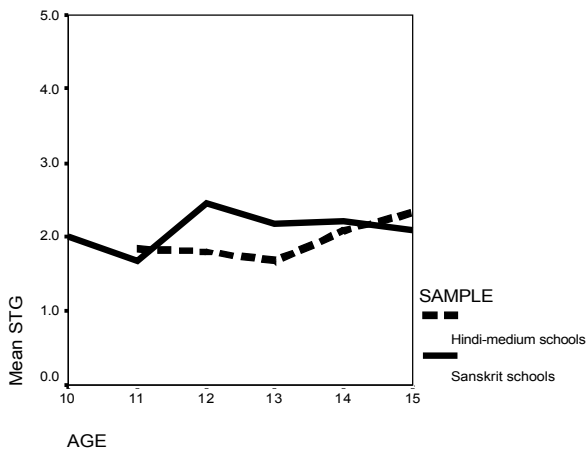


Table 2: One-way ANOVA comparing Hindi-medium (H) and Sanskrit schools (S)

	School type	Mean	SD	F	Sig.
Animals GG 7 items	H	2.94	1.80		
	S	4.71	1.83	86.401	.000
Chips	H	4.07	2.06		
	S	5.57	1.73	55.148	.000
Steve's Maze	H	1.84	1.16		
	S	2.22	1.25	9.311	.002
Knowledge of NSEW	H	4.30	3.44		
	S	7.26	2.02	92.200	.000
Knowledge of RLF B	H	6.93	1.71		
	S	7.65	1.21	19.970	.000
G+ language on Route	H	1.43	2.50		
	S	5.50	2.59	234.446	.000
E+ language on Route	H	2.19	2.21		
	S	.72	1.91	44.998	.000
G+ language on Perspectives	H	3.54	3.73		
	S	7.94	2.49	164.621	.000
E+ language on Perspectives	H	1.34	2.58		
	S	.22	1.26	25.221	.000
G+ language on encoding tasks	H	1.49	1.73		
	S	2.22	1.88	14.949	.000
E+ language on encoding tasks	H	.59	1.08		
	S	.005	.26	37.467	.000

N = 221 Hindi medium schools, N = 155 S

Gender

Since we were able to include girls and boys in both types of schools, gender is one variable that can be studied in more detail; however, because of gender bias in the sampling in the two schools, analyses have to be carried out separately for each school type. In our previous research with children aged 4 to about 12 years (sometimes 14), in Bali, India, Nepal and Switzerland, we never found any significant gender effect. Here, on the other hand, gender does show up as an effect, although only slight. This could be expected, since we are now dealing with adolescents, for whom gender introduces markedly different socialization practices (as well as, of course, biological sex differences). On spatial performance tests, it is well known that gender becomes a significant factor only with age.

In the Sanskrit school, a significant correlation is found between gender and encoding (boys produce more geocentric encoding). That boys use more geocentric encoding than girls could be due to the fact that, although the curriculum is the same in the S, the boys' experience of the outside world is quite different. Most of them have come from rural areas, where they have attended regular government schools, while the girls have joined their school at an early age, and are then separated from their families. The girls are also not allowed to leave the compound of the school, while the boys can move about more freely, at least to visit temples. In the Hindi-medium school, boys use more (correct) egocentric language. Generally speaking, we conclude from these findings that gender effects are in fact not very important compared to the effects of school type, for which our hypothesis is entirely confirmed.

Discussion and Conclusions

Sanskrit school children get more training with geocentric cues to orient themselves in their environment, but all Indian children also get training of egocentric cues. From the very

beginning they are asked to use the right hand for auspicious activities (such as eating, writing, rituals, etc) and they get training not to use the left hand. The use of the left hand is considered as a bad habit for this kind of tasks. In the same way they are asked to use the left hand for inauspicious activities (eg. use only the left hand in the toilet). While they perform rituals, Sanskrit school children change their left and right hands several times according to instructions or the principles of a particular ritual.

In our day-to-day life, we go out and find ourselves in previously visited places of interest. For that, we need to maintain a mental map and the skill to navigate. This requires spatial comprehension with an ability to perceive, understand, remember and recall spatial features for future use. In our route task, as in real life situations, one has to use many salient cues to follow the path. Cues might be a landmark, left and right turns, or can be geocentric. How people relate themselves to the physical world depends upon their previous experience and understanding of the environment. They are likely to use spatial information most useful in navigation in a particular context and are likely to avoid irrelevant or less important information. All the children of Sanskrit schools have come from village surroundings, where geocentric cues are more useful. In cities there are rules to follow for pedestrians based on the left and right sides of roads. Thus to execute a route task one can extract information according to one's preference and previous experience.

When we compare the performance of Hindi and Sanskrit schoolchildren then we need to focus not only on what is encoded but also how it is encoded. Knowledge about space can be obtained directly through actual navigation, which includes locomotion through the environment (eg. walking, running, driving etc.) or through viewing stationary scenic views. There are also indirect ways to acquire spatial information through depictions and descriptions (eg. maps, pictures, photographs and written descriptions). We presume that the Sanskrit school children acquired geocentric knowledge

through their village background and with direct use in their daily life in school, while the children in the Hindi-medium school may have acquired this information more from depiction or description.

Spatial language and conceptualization has been claimed to be of fundamental importance in the developments of cognition. According to Levinson (2003), linguistic variation gives rise to differences in non-linguistic cognitive processes of people speaking different languages. If we compare Hindi and Sanskrit School children, this is illustrated by the fact that Sanskrit school children are more geocentric in linguistic as well as non-linguistic cognitive tasks.

References:

- Bowerman, M. (1996). Learning how to structure space for language: A cross-linguistic perspective. In P. Bloom, M. Peterson, L. Nadel & M. Garrett (Eds.), *Language and space* (pp. 385-436). Cambridge, MA: MIT Press.
- Broyon, M.-A. (2004). L'éducation sanskrite à Bénarès, enjeu d'une société qui oscille entre tradition et transition. In A. Akkari & P. R. Dasen (Eds.), *Pédagogues et pédagogies du Sud* (pp. 231-250). Paris: L'Harmattan.
- Humphrey, D. (1997). Preferences in symmetries and asymmetries in drawings: asymmetries between ages and sexes. *Empirical Studies of the Arts*, 15, 41-60.
- Levinson, S. (1996). Frames of reference and Molyneux's question: cross-linguistic evidence. In P. Bloom, M. Peterson, L. Nadel & M. Garrett (Eds.), *Language and space* (pp. 109-169). Cambridge, MA: MIT Press.
- Levinson, S. (2003). *Space in language and cognition : Explorations in cognitive diversity*. Cambridge: Cambridge University Press.
- Mandler, J. (1996). Preverbal presentation and language. In P. Bloom, M. Peterson, L. Nadel & M. Garrett (Eds.), *Language and space* (pp. 365-383). Cambridge, MA: MIT Press.
- Mishra, R. C., & Vajpayee, A. (2004). Les écoles sanskrites en Inde [Sanskrit schools in India]. In A. Akkari & P. R. Dasen (Eds.), *Pédagogies et pédagogues du Sud* (pp. 207-230). Paris: L'Harmattan.
- Mishra, R. C., Dasen, P. R., & Niraula, S. (2003). Ecology, language, and performance on spatial cognitive tasks. *International Journal of Psychology*, 38(6), 366-383.