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एन सी ई आर टी  
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राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्  
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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The purpose is to provide a forum for teachers, teacher-educators, educational administrators and research workers; to encourage original and critical thinking in education through presentation of novel ideas, critical appraisals of contemporary educational problems and views and experiences on improved educational practices. The contents include thought-provoking articles by distinguished educationists, challenging discussions, analysis of educational issues and problems, book reviews and other features.

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## EDITOR'S NOTE

At the time of independence our country inherited a system of education which was struggling with the problems of equity, equality and quality. We have made substantial progress and have created a large system of education over the years to address these issues and challenges. However, quality is still a major challenge and we are still not able to provide education of equitable quality to all children. The present issue of JIE includes articles and research papers related to systemic and curricular issues and reforms in the area of school education and teacher education.

The issue begins with the written text of a memorial lecture delivered by Madhav Chavan. He strongly feels that we cannot improve the educational system simply by expanding it. Instead, we have to create a new system gradually, which not only meets the demands of the present society, but has a futuristic vision as well.

Articles contributed by M. Sen Gupta, Rachna Jain and R.K Parua reflect the systemic issue of teacher education. The research-based paper of Tulika Dey and Manab Deka analysed some of the educational issues of children of a tribal community of Assam.

As recommended by National Policy on Education (NPE-86), community participation is made an essential condition for effective management of elementary education at grass root level. The *Sarva Shiksha Abhiyan* (SSA) and Right to Education (RTE) Act, 2009 calls for community ownership of school based intervention through effective decentralisation which has to be augmented by active involvement of Village Education Committees (VEC) members, women's group and members of Panchayati Raj institutions. Krishna Kant Tripathi and Anjali Bajpai's paper reveals that the participation of VEC members in primary schools of some of the sampled villages of Uttar Pradesh is not satisfactory.

A large number of school children still have a sense of fear and failure regarding Mathematics. Mathematics teachers have lack of confidence, preparation and support for its effective transaction. Mbuthia Ngunjiri and P.N Singh in their research study found that self efficacy of students in mathematics motivated them to learn mathematics and mathematics teachers should make an attempt to enhance the level of motivation of students, especially girls.

The National Curriculum Framework-2005 advocates that during the process of learning, learners actively construct their own knowledge by connecting new ideas to existing ideas. This process requires a shift in the existing environment of our classrooms. Anil Kumar Jain and Shweta Bhardwaj in their paper elaborate the use of 5E model in Science classroom which is based on constructivist approach.

Environmental education is an integral component of the entire educational system right from the beginning of schooling. In primary classes environmental concerns are addressed using integrated approach in teaching learning process. Kavita Sharma and Leisangthem Binita Devi in their paper conclude that the primary school teachers still lack awareness and skills about using integrated approach in transacting curriculum of Environmental Studies, Language and Mathematics. Bilques Shair and Rukhsana Akhtar compared the level of awareness and use of environmental knowledge to solve environmental problems, among adolescent and higher education learners.

The issue concludes with a study conducted by Saurav Shome and Chitra Natarajan which involves developing a course on Energy and Environment for middle school students using a variety of activities specifically designed to highlight and resolve conceptual conflicts between students' existing understandings.

*Academic Editor*

# Changing Times Demand Change\*

MADHAV CHAVAN\*\*

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## Abstract

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*A country has to grapple with problems inherited from the past, issues that it needs to address in the present and those that are important to shape the future. In the developing world, as in India, the accumulated burden of the past is a major hindrance in the shaping of the future. This burden is visible in indicators such as poverty, illiteracy or lack of education, or malnutrition, or lack of infrastructure. But the thoughts and systems that we inherit can be an unseen burden that constantly creates bottlenecks. The phrase 'thinking outside the box' is used very often, but when it comes to actual implementation, we are slaves to our past which pushes us back inside the box. The word 'past' used to refer to centuries at one time. Now, with rapidly changing communication technologies, often five years seems to be a long time ago. In India too, the pace of change has quickened perceptibly, whether we like it or not. There was a time when the Indian mind was used to status quo. Today, there is impatience for change of one kind or another, and in one direction or another. How can we address challenges of education in this quick-paced change? What kind of systems do we need to ensure that we are not trapped in the burden of the past?*

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Shri Kapil Sibal, Hon'ble Minister for Human Resource Development, declared that inclusion, expansion and excellence were going to be the principles of his ministry direction in addressing the problems of education in India. Broadly speaking, the tasks are early childhood education, elementary

education, secondary education, vocational skilling, college education, research and knowledge development. Total number of children and people to be covered in this is roughly 65 crore, or two-thirds of India's population, including the 20 crore adult illiterates, about 12 crore children in the

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\* Written text of Zakir Hussain Third Memorial Lecture delivered on 28 January 2011 at RIE, Mysore by Professor Madhav Chavan.

\*\* CEO and President of Pratham Education Foundation

0-6 age category, 20 crore children in the elementary school age group, about 6 crore in the 14-16 age group, and another 6 crore in the 16-20 age group. Out of these, at least half fall in the category of under-privileged, who need active help.

While the numbers are massive and larger than most countries in the world, let us understand that we have also created an equally massive system over the years to meet the challenge. *Aanganwadis* in every habitation, primary school within one km of every habitation, and an upper primary school within two kms of most habitations. There are institutions created to support all this work till cluster level. But, we have a major problem in being able to impart quality learning at all levels. Also, there are big access gaps in secondary education, vocational education and tertiary education.

There too, we have structures such as open schools, boards of examination, school departments, colleges, open universities, universities, and so on.

So, is it a question of simply expanding these services and improving them?

Let me suggest that, perhaps, all these old structures will not serve the needs of the future, and we need to create something new. There is a need to dismantle old structures and create new mechanisms. Perhaps not immediately, but we must start looking for solutions so that we do not say after five years that we must live with the structures we have. The relatively open territory of vocational skilling has been opened up to completely new

initiatives that have taken a departure from the former 'ITI only' approach. We are learning in this field and these learnings should become applicable in other sectors too.

I share some stray thoughts here. I recently met a young man who has started helping farmers understand best agricultural practices by watching videos of what other farmers in the nearby area are doing, and discussing the lessons. This work does not use textbooks, but it spreads knowledge. It does not use highly educated university professors. Expert farmers share their knowledge with others, giving rise to more experimentation and learning. Here there are no film institute graduates to make the videos. A small video camera is used by local youths who have a two-month on-the-job training. The videos are shown in villages on a small handheld projector, which is the size of a cell phone. The farmers are learning from one another. A new structure is evolving for learning because the formal structures have failed or have not reached them. The project operated by young Rikin Gandhi started as a pilot project in Karnataka, and has spread to over 400 villages in eight states in a short span of three years.

There are about five crore young people in our country who want to complete secondary school certification, since without it they cannot access higher levels of learning. They cannot get secondary education because there is no access to a school. Why should they wait for a school to be opened in the vicinity? Do they need to go to a day school? There is

a National Open School and it can certainly be promoted. However, most young people who have been deprived of secondary school certification would like to have what they consider a proper certification that the market respects at least to some extent. Perhaps, the government should start a programme to assist these large number of youth who are deprived or are certain to be deprived for lack of secondary schools. Like what was done in Madhya Pradesh to start primary schools, why not let these students identify a teacher who will be paid on a per student basis, as the student clears assessments in stages of say, three months. This mechanism of payment upon passing the course has already been introduced in the vocational training sphere. Why wait to build schools and train teachers when we know that we need a huge workforce and urgently? We know that there is a large number of young people engaged in tutoring children. Many of them can become knowledge providers. I am deliberately avoiding the noun 'teacher'. Is this not possible? Or, is it just not acceptable to the establishment including education experts?

I am not saying that we do not need proper schools. But, is a 'school' needed to pass the secondary school certification examination?

We have passed a law for free and compulsory education that now prevents government-run or aided schools from charging any kind of fees. Suppose, if parents feel that they should contribute what they can to the school, would that be against the law? Do we want free and compulsory education?

Or, do we want compulsorily free education. True, no child should be deprived of schooling and discriminated against if his parents cannot or do not pay fees. But why should people not be encouraged to pay in cash or kind even if not as a regular payment? Most people in India are of the opinion that services given free lose their value and quality. This also includes the poor. In fact, even a token contribution is more empowering to the parent than many other measures. Our surveys indicate that large number of parents who send their children to government schools also send their children for private tuitions. Is this not an obvious contradiction?

There is a huge difference between something being given free and something being freely available. The government is 'giving' free education in schools. But, it is available in a structured fashion within structures and not freely available. What about learning that is freely available in the society outside the school? A person can choose what he wants and possibly according to his convenience. It is not what is prescribed by the structures and may not be free of cost, but it could be more useful. We need to be aware that times are moving from the era of education being given free to it becoming freely available as the number of educated people in the society is increasing, and modern technology is making practically free access to knowledge possible.

I want to suggest that the structures of education we have created, or transplanted, from other societies have become ineffective. On the

other hand, there is a new energy in India, and there is a great demand for education. People are finding their own ways to learn and move forward. The government and those with resources should create and support more open mechanisms for learning rather than extending old structures, especially beyond the elementary stage of learning, so that the structures do not become a hindrance. The Knowledge Commission has already suggested setting up libraries. But the idea has not found serious support. Why? Creating good public libraries is one important step in making knowledge freely available.

My organisation, *Pratham*, is working on adult literacy pilots at some NREGA projects. We recognised that although a large majority of the workers, especially women, at these sites in Rajasthan are illiterate, there are also a large number of young men and women who are educated up to high school or secondary school. Some are even college students. So, we have made computer trainers out of the educated NREGA workers, who teach computer to the secondary school educated workers, who, in turn, teach five adult illiterates each in their village. We find that the literacy acquisition rate is very good with over 40 per cent of women having learned to read reasonably well in about three months. Besides, everyone involved in the project is learning something new. What if this learning time was compensated at the normal NREGA rates as a part of the programme? This is not allowed in the scheme. Why not use NREGA as an opportunity to

train people in maintaining the public properties in their villages? Why not skill them in construction and handling machines rather than giving them just unskilled manual work? We extended a scheme that was created in Maharashtra during 1973-75, thanks to an extended statewide famine and a strong movement to demand work. So much has changed since then, but many of the people who were young then, and worked on famine relief works breaking stones and digging ditches are still doing the same work even in their old age in some parts of the state.

I am aware that many will not agree with me. My intention is to challenge your imagination today. Einstein is quoted as saying, "We cannot solve problems by using the same kind of thinking we used when we created them." Of course, we can argue with Einstein.

### **Are You a Slave?**

There is a simple quotation from Dr Babasaheb Ambedkar that has intrigued me for many years. The English translation of the Marathi quote goes something like this: "Make a slave aware of his slavery and he will rise in rebellion." Simple enough?

In my training programmes in the nineties with a group of adult literacy workers and some neoliterate women in Mumbai, I began asking the young activists a simple follow up question. Does a slave not know that he is a slave? I mean, he does know that someone owns him or he is bonded to, and not a man of free will. Does he not? The answer from the audience, as I am

sure from some of the readers would be, yes. The slave does know that he is a slave and someone is his owner.

Then there was another follow up question. Well, in that case, what does Dr Ambedkar mean by 'make him aware of his slavery'. Should we sit down with him and tell him that he is a slave? But, he knows, he is a slave. Does he not? At this point I would start talking to the neoliterate women about their day. They said they woke up early to fetch water. Then they got busy preparing to cook. The children had to be readied for school. Eventually, the husband woke up and he had to be given his tea and *nashta*. "Your husband does not help you?", I would ask. The answer came quickly, "How can he? He is a man, after all." At this time, with a small pause, the class would burst out laughing and applauding.

The fact is that a slave does not know he is a slave. He has accepted a belief system based on what he has experienced, heard and seen. A different life possible is not something that occurs to the slave. Making the slave aware of his slavery, I think, means making him see that life can be different. Every social reformer and political revolutionary essentially showed us that a different life was possible, which the relevant society had not even thought of.

Once you agree that a slave does not *know* he is a slave. I must ask, are you a slave? If your answer is an emphatic 'No!', I shall ask you to think again. After all, a slave does not know he is a slave. I think it is important for us to acknowledge that we are bound

by our own existence and often do not see beyond it. We know through history how man changed his perception of the earth from flat to a sphere. Now we are asking ourselves questions about the shape and size of the universe, and will not take one fixed notion as yet. Humanity, although not necessarily large numbers of human beings, has learned that we need to rise above the day-to-day perceptions to understand reality, so that we can act upon it. Some call it thinking outside the box.

#### **A Box Called 'School'**

We know it is neither easy nor common to think outside the box. The young ones can easily do so because they are not burdened with experience, which is another name for bias. As we get older and more experienced, we get more biased and our minds get blocked to new possibilities. Also, it is important to realise that there is not just one box to think out of. A person may think out of box in one context and yet in another he may be comfortable with his existence inside another. Our mind seems to be split into various boxes relating to our various experiences. Great thinkers, scientists, revolutionaries and reformers have been guilty of being conservative in one aspect of their life while breaking barriers in another. We may think outside one box and feel good, but we may be still inside another box. So, in thinking about the nature of things or in changing reality, it is important to consider various points of view, the evidence in support of each, and arrive at working hypotheses that help us to act. When studying nature, since

the basic reality remains the same, the study is relatively simpler, and allows building upon old hypotheses or theories, unless some new facts come to light that demand abandoning of old theories in favour of new. This has happened a few times over the last half of the last millennium. But when studying a society or nature's interface with a society, one has to be mindful of the changing social contexts, which create new facts quite frequently, and it is necessary to act on these facts for which we may have to create new hypotheses. When this context is changing rapidly, as in today's India, it is even more important to be sensitive to changing realities. Relying on existing models, theories and ideas can be ineffective, wasteful and sometimes even counterproductive.

An educationist in the United States, now in his late eighties, observed some years ago in a conversation that our world has changed so much over the recent centuries, but the basic model of what a school should be has not undergone a change. This is a simple yet fascinating observation. There have been different ways of transferring knowledge from one generation to the next over millennia, but the current model of a school where several children are taught by one teacher in a classroom, where they meet daily, has not changed fundamentally since it came into being about three hundred years ago. The scalable, replicable mass nature of the school model, its economics and the simple logistical convenience it offers for knowledge transfer is still what allows it to continue without change.

Such a school was once seen as a necessity and a need. Today, it is a habit and habits are difficult to change. Once upon a time, when there were no schools, what did the children do all day? While the school is a place where children are taught, it also keeps children engaged away from home, and away from streets, in safety. It is a place where children socialise in relatively large groups. They learn to negotiate with peers. It gives free time to parents, especially mothers. A school is believed to help keep children largely out of trouble, and disciplining — even regimenting them so that they submit to the general norms of the society while contributing to it.

Clearly, the school has many benefits beyond its role of educating children. This helps in maintaining the habit, generation after generation.

We are slaves to this model of schools, and cannot think of another that can take its place. In fact, we think of one school being better than another, but we still need it to be a 'school'. In the West, conscientious objectors to the system of education have created home-schooling models. In many countries such as Australia, where providing access to sparsely populated hamlets or even individual homes separated by long distances is a problem, distance education models are in place, where parents or neighbours play a central role. These are seen as exceptions. But could they hold the elements of future education facilities?

The possibilities created by information and communication technology are unique to this century

and millennium as never before in the history of mankind. Policy-makers in most countries, including India, have recognised this. The result is that everyone wants to put computers and other related equipment in schools. But, there is no evidence that any of the policy-makers or the business interests, have stopped to think of the true revolutionary potential of the new and still evolving technology, in reforming the whole sector of education. There is enough happenings in the society that points at what is possible. But, there is no challenging the basic school model. If resources allow, we would like to put modern technology in an old model, and expect it to perform better. The idea of student-centred teaching has been taking roots but the central theme is that children learn in the classroom a curriculum and a syllabus that is decided somewhere far away from the school. It is widely acknowledged outside the policy and in academic debates that children learn a lot more outside the classroom these days, than inside the classroom. In fact there is so much they need to learn today that a linear, graded, syllabus-controlled approach to teaching may be a waste of time already.

Notice that we have started talking of reducing the burden of studies, which usually means reduce the pages of textbook to be learned and make examinations easy or simply abolish them. The amount of knowledge available has increased a thousand fold today. The need for higher level skills is more than ever today. Should we cut down the amount to be studied early on? Should we dilute the

standards of certification? Or, should we create processes of learning that are more efficient? Should we stop testing? Or create testing that is less stressful and yet more useful? Perhaps not every individual needs to study everything at school? Clearly, a child should be enabled early in his life to access knowledge and learn anything as and when possible, and as and when required. The idea of a learning society has been talked about for quite some time. Today, as never before, it is possible to create mechanisms for learning that go beyond childhood and youth.

There is no doubt that every child has a right to education. But, let us ask ourselves if that means the child should be compelled to go to a place called school for a certain number of hours to learn what is prescribed from only a specific person, or group of persons the society recognises as teachers? I believe open education, which is an alternative system today, should and will become the norm of tomorrow.

### **Technology Revolution Leads to Change in Structures**

I cannot claim a great deal of knowledge of history or economics, but it seems to me that we need to understand the period of the Industrial Revolution, in order to guide ourselves as we undergo change similar in nature, but in a completely different era.

The Industrial Revolution created tools that forced the individual and the fragmented local processes into integrated socialised processes. The composite factories broke down

the total process of manufacture of goods into pieces, and re-integrated it under one roof for commodity production. The scattered villages where the artisans lived depleted or disappeared in favour of larger and complex industrial centres. The railways, the composite factories, and the assembly lines are representatives of the Industrial Revolution in many ways. While it democratised certain societies and revolutionised their production, the political and economic history of domination, exploitation and colonisation continued. It became stronger until a whole wave of freedom movements, social reform movements and socialist revolutions started challenging domination at all levels around the world. It is easy to criticise the failed revolutions, but their historical role in pushing the cause of greater freedom for mankind just cannot be ignored. It is a historical fact that mighty empires were defeated around the world.

Until the Industrial Revolution, knowledge transfer was largely individualised, decentralised, local and scattered just like the production process. Yet, knowledge of powerful economic tools beginning in ancient times with fire, animal husbandry, the plow, fibres, metals and alloys, weapons, fuels and currency transferred from society to society separated by thousands of miles. Knowledge that disappeared in one declining society suddenly appeared in another after centuries and flourished.

The process of education too became more organised into systems over a period of time. The changes

mirrored all other changes that were happening in the society. With systematisation came standardisation. Variety and diversity lost out to uniform education because the new model was clearly more suitable to educate the masses to be able to participate in the changing economic and social life. The education system also carried the mass-production stamp of the era.

Before the printing press, transfer of knowledge and ideas required transportation of people from one place to another, or at least a person to person contact. The press not only made mass transfer of knowledge possible, but it also limited the requirement of knowledge seekers moving from one place to another for the first time. It also made access to knowledge possible for anyone who could afford and read books. Later, public libraries were created in large numbers to open doors of knowledge further. Knowledge could now be available at a person's doorstep, but availability of those who can deliver knowledge effectively was limiting. The new era created a need for a professional teacher and the need for teacher training. A specialist was born for school education. Interestingly, for tertiary education, a similar need for training how to teach was apparently never felt.

Until the technology to make paper and print affordably was created, the true potential of printing was not realised. New printing abilities made literacy and education on large scale possible in Europe, and growing literacy helped printing more books. Libraries, learning societies and other forms supportive of learning arose

outside schools and universities. This, in turn, along with widespread need for skilled and knowledgeable people, led to transformation of Europe from illiterate to educated societies over a century.

The role played by supporting structures cannot be ignored in India where we seem to concentrate on opening schools and appointing teachers. It is said that it takes a whole village to educate a child. But, the school shuts out all the village resources which can help. Teachers and textbooks make education. Why should we not systematically have village artisans, farmers, poets, musicians come to school as guest teachers for a payment? It will cause less than a monthly salary of one teacher.

Children working alongside their parents in farms had been going on for ages. But, some of the new industries used this old tradition for inhuman exploitation of children. For a long period, this was also justified as apprenticeship. *Zari* sweatshop owners in India, and possibly other urban child labour users, routinely use the term *hunar sikhana and shagirdi* to justify child labour. Many middle-class homes feel good that they bring an underprivileged child from the village to look after their own children, or to do odd jobs while they attend night schools or nothing at all. Of course, the children of upper and middle classes are not subjected to this. The European society too had dual norms for the poor and the rich. It took almost a century to create a new social norm of keeping all children away from

exploitative labour. The example of Sunday schools shows that initially the need to educate the children of the poor was felt by philanthropists, but they continued working during the week. Later, as setting up of regular schools became possible, the idea of banning child labour grew and became universally acceptable. In fact, children working for wages gradually became socially unacceptable. A whole new concept of the child and childhood took shape.

Creation and evolution of schools happened along with the changes in the society but not without conscious intervention of social and political thinkers all over Europe. The social movements for education developed the thinking about education that shaped policies.

We need to recognise that social movements are necessary to improve education.

In Indian history too we find that every social reformer and political thinker promoted widespread education. In fact, under Gandhiji's leadership, people dedicated to the education of the masses started schools in whatever way they could during freedom movement. Many of these contributed to the development of education sector in a big way in post-independence India.

However, as governments took charge of school education, it became bureaucratized. This is true not only in India but almost in every country including the developed ones. Central controls became dominant over the core of education that has to do with the individual interaction of the

educator and the learner. Today, there are attempts being made to bring constructivist pedagogy in our schools. But, if the model itself is that of mass production with central controls that undermine the autonomy of the school and the teacher, how can we expect it to become sensitive to the creative aspects of education? On the other hand, given that there is a shortage of trained teachers capable of being good and responsible educators, the tendency of not giving freedom and autonomy seems justified.

It seems to me that there is recognition that decentralised autonomous schools that allow creative freedom to teachers are necessary for good education. At the same time we are slaves to the habit of centralisation. The justification of centralisation and controlling is that if the schools are not controlled, many things can go wrong. It is a justification that cannot be ignored.

The habit of concentration and centralisation was born in a period when there were few educated people. Education must necessarily need greater democratisation and decentralisation of power.

This is why reform is necessary. Simply expanding the system and then attempting to improve it will not do. Vested interests are not always of the exploitative villains. Sometimes, these are interests of old ways of thinking justified by prevailing circumstances.

As the American educationist I referred to said, our basic model of schools has not changed, and it is time that it undergoes change to reflect the social and economic transformation

that is underway, thanks to the new technology.

### **The New Technology**

Mass production in big manufacturing units and mass transport on rails or in steamships symbolise the Industrial Revolution. I like to think that this was largely the era of centralisation of everything, and mechanisation and socialisation of human activities that were largely individual or were at the most conducted in small units until then. It was also an era of order and organisation. The order helped, but it was in direct conflict with individual freedom and spontaneity. Various authoritarian ideologies and societies arose which openly curbed individual freedom and justified their actions as being good for the society. I think this was also a product and reflection of the change in the economy. This era created democratic nations in place of kingdoms in Europe, but the strength and the hunger for concentrated power and exploitation continued. The tendency to enslave and dominate colonies grew worse in direct conflict with the new nations' internal governance philosophies. By the end of the nineteenth century, a revolt against empires and colonial rules began to brew world over. As the empires fought to share the colonies, the colonies saw revolutions and freedom movements. In early twentieth century the Ford assembly line was born in which the domination of the machine over man was complete, but it was also a great landmark on how to improve productivity of human endeavour so that many more people experience greater freedom.

It seems to me that the model of a school was perfected in keeping with the mass approach and centralisation principles. It spread to the colonies too. It was effective for its purpose.

Automobiles, aeroplanes, telegraph and telephones followed by radio and television created a new world altogether in the post-World War II era. There are good technological reasons, I suppose, why automobiles and aeroplanes could not become commercially viable before the railways. But these developments also represent greater individual freedom, which began to spread. New nations were born out of the former colonies and began to find their feet. For the first time, a major power called the socialist countries stood in opposition to the colonisers. Man's quest of unlimited energy led us to weapons of mass destruction that threatened the destruction of humanity if used. This in a way was the expression of extreme concentration of power and what it can do.

The concentration of power came directly in conflict with humanity and every individual in it.

The post-World War II era gave birth to the era of satellites. Rocketry had been growing for armies. It became applicable in the commercial domain. Since we are meeting in Mysore, it is appropriate to recall that Haider Ali and Tipu Sultan, both rulers of Mysore are credited with the development of solid fuel rocketry, which the British took to England after Tipu's death in 1799, and developed it further. It took us another hundred and fifty years to set up our own rocketry programme.

The idea of using mechanical devices to calculate is over 2,000 years old. Programming machines to compute or to perform pre-determined tasks began in the nineteenth century. But, in the 1970s when personal computers made their appearance and computers got linked with satellites for communication, a total new era began to explode and it is still exploding.

We have seen a single channel black and white television, being replaced by colour television. Now we have direct-to-home devices for a price. Those who control the satellites control the waves and the costs. Although you can have many channels for a price, the content comes in a chronological order. You can flip channels but the programming is decided by the channel owners supposedly based on what viewers like.

The personal computer and now the internet have broken the bottlenecks and linearity of access rules.

The difference between the school and the library is that one provides free but structured and controlled learning while the other provides free access to knowledge that is stored. The computer, and its extension, the internet are nothing but an unlimited library. The possibilities of access to knowledge are only limited by how much content is uploaded on the internet and the speed of your internet connection. Efforts to set a price for the general content have never succeeded. A huge body of knowledge is available for free, and it is growing.

I do not want to go into a long discussion on the virtues of the internet, but it is interesting to note that while the desire to make a profit

out of knowledge is strong, there is another growing tendency to pass on knowledge at no cost. We have already seen two massively rich people, Bill Gates and Warren Buffet, declaring that all their wealth will be given away to not-for-profit work to improve life on earth. They are appealing to others like them to do the same. New models have come up led by Google, where content is available for free but the revenue to Google comes from advertising. In many ways, your newspaper also does the same thing. The token one rupee you pay is not where the profit comes from, it is the advertising.

There are two major examples of knowledge and content becoming available for free. One through cooperative efforts and one through individual efforts. Wikipedia is the cooperative effort example where someone uploads some content and a host of others add, edit and comment. The readers are also warned that the content is not authenticated but it is available if you want to edit it. There were about 1.2 million contributors to this free encyclopaedia worldwide in September 2010. These are people who have written or edited at least ten times since they joined the cooperative effort. Out of these half are in English language. The Indian language contributors are in Hindi, Tamil, Marathi, Bengali and are under five hundred in a descending order.

Why can we not create our own language Wikipedia? Or, should we finally decide that all knowledge will be and should be available freely only in English. This is an obstacle that we can overcome.

The second and most recent example is the Khan Academy, which is directly related to what possibilities are opened by the internet for learning. A young man called Salman Khan, born in the US in 1977 of Bengali parents from Bangladesh and India, started teaching his cousin over the internet and soon made his lessons available on the internet, on You Tube, free of cost. Today, his Khan Academy, which is a freely available library of lessons in math, science and history, is accessed around the world free of cost. The website says over 13 million lessons have been delivered so far. Now a project to translate the courses in a variety of languages has been undertaken. It is expected that the Khan Academy will keep on growing.

There are some obvious limitations to this access today, but let us not forget that when Rajiv Gandhi spoke of a computer revolution in mid-80s, many laughed at him. Let us not forget that we thought cell phones were expensive ten years ago and today more than 60 per cent Indian households have them. The services provided over cell phone now include short lessons, examinations and so on.

The interesting thing is that this huge body of knowledge is available freely and free of cost. Anyone who has an understanding of basic reading and math can start anywhere and end up wherever his quest takes him. It is copyright to those who want to give it free of cost. That means no one can restrict this knowledge flow by using it for profit or revenues. If you want to give it to others, you must give it free.

Who would have thought that in the middle of a world full of greed and scams this would become possible? But, I learnt from Karl Marx that the world progresses in dialectical ways. Every process has internal contradictions that lead to the end of the old and the birth of the new and although history seems to repeat itself, the motion is not just circular, it is helical as human society goes to higher levels with every turn.

Learning has come a full circle from being individual, diverse, varied and dispersed in small units for a few. It went to a mass and organised model in keeping with the times. Now, in the era of personal freedom, is mass education not possible in individual, diverse, creative and dispersed mode?

Why do we need centrally structured syllabi? Why schools and colleges in their current form? This is not a rhetorical question. It is a serious question.

The question perhaps should be what sort of institutions of learning do we need? It is time to redefine our institutions of education, at least after a child has learned to read and write. The world is going to change. Let us not doubt that. The question is how we are going to change with it.

### **Let us Imagine**

I imagine that about 5-10 per cent educated and skilled people who have occupations other than teaching will decide to set aside time to teach children. Some will do it daily, others weekly; some will find a couple of months a year — and their employers will give them leave — to teach

children and youth. Teaching others what we know will become a common social activity. This will provide the key resource for teaching in future. In some countries people are required to do a military duty, in ours it will be considered an important social obligation to teach children. Some youth who are pursuing higher studies will be required to do this voluntary work.

I have seen a government school in Bihar, where educated people of the village take turns to teach the children. This is not as difficult as it sounds.

The school will be more like a library where in one area the tiny tots will play and learn to read, write, estimate, learn about shapes, and build little things with their own hands. They will have a teacher who cares and knows their lives individually. By the time they are eight, they will all learn to read, understand and ask questions. They will have plenty of books with nice pictures all in their mother tongue but they will also learn a bit of English. There will be no standards, and it will all be one continuum and children will leave this continuum after they have learned basics of reading and writing. They will have audio-visual devices on which they can play whatever videos they want but there will be a full time teacher and a local volunteer who will help them make different choices and show them what is available.

There are multi-year, multi-grade, multi-level classes today in our schools. All we need is breaking away from the textbooks and grades, and focus on basic reading, writing, thinking, speaking, working with hands, and

understanding of quantities, shapes and patterns. They will learn to use the computer and the internet, with adequate safety measures.

The cost of equipment required will be less than the salary of a teacher within the next five years. But, it will be important to appoint only teachers who know how to do the job, and the volunteers will help.

The children in the 8-12 age groups will be mentored by a group of local volunteer teachers who will show them how things work, and help them work with their hands. They will come for a few hours to the school—a library with multi-media access to junior Khan Academy—like content and the net under the guidance of a learning manager. They will design projects and execute them. They will read books, either on the computers or in hard copies and learn to discuss what they have read.

They will go to educated men and women in their community to learn about poetry, math, science, history or whatever they choose, and supplement their interaction with what they have in the library. Perhaps some will prefer to spend time with the local potter or the carpenter. Remember, educated and skilled people will have volunteered time to teach. They will also be prepared to teach.

There will be sports, athletics and arts clubs which will be mandatory to attend for children. They may choose what they want to learn but teachers of athletics, sports and arts including fine arts and performing arts will be available on a per pupil payment. A village drummer can be a teacher and

so can village painters, or a kabaddi player or a wrestler. They will spot talent and recommend them to higher skill trainers.

In urban India today, there are many projects working where educated young people give time to teach children. As the level of education rises, this trend will grow but it needs to be harnessed with viable mechanisms. The society — not the government alone — needs to accept this. There is an upsurge of interest in arts, athletics and sports. The number of people skilled in these is growing.

For children above 12, there will be recognised master educators or master skill trainers who will be licensed to teach children in subjects. Lessons will be available in video and audio archives for children to see. The children will work on subjects or topics of their interest and go in depth in subjects or topics of their choice with the help of these master educators who themselves will be well-versed in the subjects. They may have other jobs, but an accountant could certainly teach history if he gets a master educator qualification to teach history.

Children will be able to appear for any examination any time of the year. Different organisations will offer examinations on different specialised subjects. For example, a Science Society, or a Geography Society can conduct certificate examinations on any topics of science.

Online examinations with broadband facilities are already available. It is possible for a student to sit face to face with the examiner on camera and be interviewed. There

will be no monopoly of a single Board. Schools will not be affiliated to any Boards. A village student will be able to appear for elite examinations if he wishes to. Anyone above 14 will be able to join a tertiary education programme. Background is no barrier.

I recently met a renowned French architect who was a carpenter. In the course of his work he was mentored by an architect. Without going through a university, he is now an established architect who loves to design and make furniture with his own hands.

Some years ago an auto-rickshaw driver who had barely completed 4th Standard joined a computer training centre of *Pratham*. Something clicked inside him and he accelerated to complete his 10th Standard and B.A. through open schooling. Today, he is a supervisor on a project of the municipal corporation, and a distance education student of MSW.

Colleges will be improved socialisation, cultural and sports centres. That is what they are today anyway minus the sports. They will have plenty of taped lectures and demonstrations by expert professors. Students who want to access tertiary education will plan their

work, submit their work plan, and apply to appear for various examinations. They will be appointed apprentices in an area connected with their study as they learn.

Professors will give time to meet students in groups and individually to be paid for these consultations. Class attendance will not be compulsory. When a Professor is lecturing, his lectures will be telecast live on the internet and also made available in archives for students to access.

I have let my imagination go. But, obviously it has not gone wild enough because I am a product of my times trying to get outside my box.

The economic aspects of this whole idea cannot be worked out now. I am just relying on the fact that more and more knowledge is becoming freely available free of cost. Of course, funds will be needed. But why let mundane matters come in way of some healthy dreaming? Once these processes are set in motion, if they are useful, the society finds the resources. History gives us enough evidence of this.

It may take a century, it may happen in decades. I believe it will happen.

# Experiments in Teacher Education

M. SEN GUPTA\*

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## Abstract

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*Experiments and innovations become worthwhile exercises when these are properly documented so that lessons can be drawn to make the system more effective and responsive to meet the emerging needs. With this in view, an effort has been made in this article to enlist the experimental teacher education programmes undertaken in India such that a long term and informed viewpoint can be developed. This perspective will be useful in professionalising and diversifying the teacher education programme to produce reflective practitioners in the years to come. In the Knowledge Age, the system requires efficient facilitators who can help create intellectually strong, creatively inclined and quality-conscious workforce. The present day teacher training system is the weakest link, mainly because of quantitative expansion and its predominantly theoretical orientation, combined with insufficient duration for value formation. The author has, therefore, presented some innovative ideas worth experimenting based on his experience to make the system rigorous, professional and responsive to the new demands of Knowledge society.*

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## Introduction

The history of Indian education has never before witnessed such an overwhelming enthusiasm for expansion, qualitative improvement and readiness for experimentation and innovation to produce reflective teachers who can help shape the destiny of the country in accordance with the constitutional goals and

the aspirations of the people. Many of these experiments done earlier have been forgotten because of lack of documentation. As a matter of fact, many worthwhile lessons can be drawn from the past experiences, thereby consolidating the gains and avoiding any pitfalls in future. These experiences need to be analysed on

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several dimensions like the duration of teacher education programme, general as well as specialised teacher education models, pedagogy-based or content cum pedagogy-based courses and preparation of teachers for academic as well as vocational spectrum of studies. While evolution of teacher education programme for the Knowledge Age will require extensive inputs from technological and digital world, the basic structures suitable in Indian context will have to be worked out keeping in view the experiences gained from the experimentations done so far.

As explained in the Report of National Knowledge Commission, there is a dramatic change in the nature of the world of work. Globalisation, privatisation and liberalisation have laid new foundations for products and processes of teacher education. In the knowledge age manual and mechanical jobs will give way to thinking and knowledge jobs. Youngsters, therefore, have to be trained for new types of opportunities available especially in the booming service sector. These include jobs like medical transcription, call centre jobs, jobs related to cyber world viz. e-learning, e-business, multimedia packaging, computerised photography, video conferencing, mobile technology; event management, resorts, spa and parlour management, jobs in entertainment industry, music industry, sports industry, health and fashion industry, food and nutrition industry, hospitality industry, telecommunication industry, institutional housekeeping, interior decoration, nursery growing, floriculture,

tissue culture, education and training services and in many other emerging areas. We require competent teachers who can inculcate in students the necessary values, ethics and personality traits. They should also be able to provide employable skills to students. Skill development and skill upgradation as well as multi-skilling perspectives are essential to keep a competitive edge in the global market. In today's perspective, general and vocational education paradigms have to come closer to develop a productive but enlightened and humane personality. Creation of a global workforce which is trainable, flexible and quality conscious rests with the teachers. Future teacher education programmes have to gear up to meet the emerging needs on the one hand and remain contextual, cost effective and continuously transform based on indigenous experiences, on the other.

### **Earlier Experimentations**

In independent India, experimentation in teacher education started as early as in 1961 with the emergence of NCERT at the national level as an apex research and development organisation in the areas of school education and teacher education. In pursuance of the recommendations of the Secondary Education Commission, the then Ministry of Education, Government of India in collaboration with the Ohio State University, USA, established four Regional Colleges of Education in four regions of the country. These colleges were envisaged as pace-setting teacher education institutions. Initially, the colleges were meant to

prepare teachers for the Multipurpose Scheme recommended by the Mudaliar Commission. The Regional Colleges started with a four-year integrated teacher education programme leading to the degree of Bachelor of Technical Education (B.Tech.Ed.). Later, however, three more highly acclaimed four-year programmes followed in Regional colleges and elsewhere namely B.Sc.B.Ed, a four-year integrated programme to prepare Science teachers, B.A.B.Ed., a four-year integrated programme to prepare Social Science and Humanities teachers and recently, a four-year integrated programme of B.El.Ed (Bachelor of Elementary Education) has been started in some selected Delhi University and Maharshi Dayanand University, Rohtak, colleges to prepare elementary teachers for the system.

The erstwhile Regional Colleges (now Regional Institutes) also experimented with many other innovative teacher education programmes like the three-year teacher education programme of Diploma in Industrial Arts and Crafts and two-year M.Sc.Ed. course in Physical and Biological sciences for producing teachers for the Higher secondary classes. Other experiments in innovative teacher education programmes include one-year specialised B.Ed. programmes namely B.Ed. (Agriculture), B.Ed. (Home Science), B.Ed. (Languages), B.Ed. (Science), B.Ed. (Vocational), etc. The products of these courses have been well received by the mainstream education system. Recently few more experiments have been launched to suit the systemic needs, for example,

the B.Ed. (Vocational) programme of Ruhelkhand University, an integrated teacher education programme in Regional Institute of Education, Mysore and pre-service teacher education programmes in DIETs and SCERTs.

### **Need for a Change**

Although four-year teacher education programmes have demonstrated a significant model over more than four decades, these have not yet caught the imagination of education managements, in general in India. The success achieved by the students of four-year courses and their versatility have amply proved that teacher preparation requires early initiation, longer duration, tailor-made curriculum, suitable environment, up-to-date human and material resources along with a farsighted and enlightened management. Young students who enter the four-year teacher education programme just after their higher secondary or intermediate and gradually imbibe the qualities and characteristics of a teacher through content cum pedagogy training, ultimately get shaped into committed, competent and conscientious teachers. It is also an open secret that present day teacher training system is the weakest link mainly because of quantitative expansion and its predominantly theoretical orientation combined with insufficient duration. The worst affected is the secondary teacher education programme popularly known as B.Ed. programme. With the mushrooming of B.Ed. colleges, it is being treated as the hen that lays golden eggs.

Fortunately, a significant innovation in teacher education was suggested by the NCTE in its Teacher Education Framework. They conceptualised an enhanced duration B.Ed. Course of two years. It suggested an enriched curriculum framework for teacher education with a view to produce teachers who will have character, competence, confidence and compassion. The Regional Institutes of NCERT again took the lead and introduced the innovation after making due preparations. The two-year B.Ed. programme is running successfully in these Institutes since 1997-1998. Researches done by Sen Gupta, Kakaria and Chugtai (2002) and Yadav (2010) on the status and efficacy of two-year B.Ed. programme have indicated empirically the positive difference the two-year programme has made in the attitude and competence of students due to intensive training and extensive school exposure. But the fact remains that except NCERT's Regional Institutes no other institution or University in the country has replicated the well thought out reform. The present one year B.Ed. programme, though looks quite robust on paper, turns out to be dismal at the field level because in effect the course turns out to be of eight-nine months duration in which stress is on pedagogical principles largely in a theoretical framework. Practice teaching in schools has degenerated into a routine affair. Can such a written examination-oriented course produce competent, committed and a reflective teacher is a question that needs to be debated upon. Further, attitude formation is a long drawn process.

### **Further Ideas for Experimentations**

It is time that some innovative ideas are considered and experiments are conducted to make the system more effective and efficient. For example, the ongoing B.Ed. one-year course being popular among students and managements, that is evident from the number of teacher education colleges in each State and pressure from students for admission, the possible suggestion is that let it continue with certain systemic modifications. But, the degree awarded for one-year course may be renamed as B.Ed. (Pass). Simultaneously, let there be another attractive option made available to students, parents and the managements. This would be in the form of a two-year B.Ed. programme with an enriched curriculum as suggested by NCTE for which universities may be persuaded to award the degree of B.Ed. (Hons.). Hopefully, sooner than later the two-year Honours programme will become popular with the degree-conscious psyche of students and parents. Subsequently, B.Ed. (Pass) course can be tailored to the needs of secondary classes while the B.Ed. (Hons.) curriculum can be specifically tailored to senior secondary classes. In fact, the system today badly requires an advanced degree specially suited to senior secondary classes, in view of the different specialisations opted by the students and also due to the emergence of vocational and skill oriented subjects.

Another innovative idea worth experimenting is the establishment of separate universities of teacher education both at the Centre and at the

State levels on the lines of technological and agricultural universities. This step would focus the need and importance of teacher education within the university system. This is also necessary to obviate the effect of academic orientation of the present university system in which teacher education becomes yet another option rather than a rigorous professional training programme. A specifically directed mandate of the said university will allow it to address the total system of teacher education right from the pre-school to higher education level in a structured and graded manner by establishing much needed horizontal and vertical linkages. Also, teacher education courses of varied specialisations and durations can be developed and experimented upon to create a cadre of job-specific professional teachers. An inbuilt mechanism of vertical mobility will ensure professional growth and onward specialisation both in content and pedagogy for teachers at different levels.

Also initiatives need to be taken for developing a cadre of rural teachers. Just as Jawahar Navodaya Vidyalayas have been created for nurturing rural talents; on similar lines rural teacher education colleges need to be created and based in rural areas with content cum methodology courses suiting to rural needs and specialisations. These colleges will attract rural talents to the teaching profession. These colleges can be affiliated to the rural universities. The trainees being from the rural areas will be well conversant with rural ethos, needs and limitations. They will not only stay in rural areas but also

slowly develop into a cadre of teachers based in rural areas having specialised knowledge of rural adolescents.

In the field of in-service teacher education as well the situation is not very rosy. Driven by the need for continuous training and retraining, it has become almost customary to organise orientation or refresher courses for teachers and teacher educators with a view to coaxing and cajoling the kingpin for better performance. An in-service training or orientation programme can have lasting impact only if parallel and simultaneous inputs are provided into the school system like provision of desired infrastructural facilities, curriculum reform, efficient systemic management, use of ICT and due recognition of teacher's status. Opportunities for professional growth and a helping and innovative institutional ethos are other requirements for bringing out the best in a person as a teacher. In other words the teacher has to be seen in a total perspective and dealt accordingly.

### **Conclusion**

We require a new generation of teachers nay managers or facilitators who can create intellectually strong, creatively inclined and versatile workforce. As someone has rightly said 'You cannot manufacture great teachers but you can always manufacture great facilitators'. In the forthcoming knowledge age a paradigm shift is required from the authoritarian teaching to joyful and active, participative, democratic learning opportunities. Also, there is a need to re-examine the teacher

education curriculum to humanise it to eliminate the inhuman activities and incidents. This is more so because to get quick material comfort and money, educated youths are taking the path of unsocial acts like cheating, stealing and killing. Teacher education thus is facing many challenges due to contemporary socio-economic and political compulsions. If we want to continue our march towards an enlightened and humane society, many more possibilities have to be explored

to prepare teachers who can befittingly face challenges posed by the forces of modernisation, globalisation and consequent rising aspirations. Rich experimental experiences are available in this country that should be looked into carefully to evolve parallel or alternative models of teacher education that can take care of the needs of the 21<sup>st</sup> century in which Indian manpower has to take a leading role for creating a peaceful, prosperous and progressive society.

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# Attitudes of Teachers towards Teaching Profession Trained through Formal and Distance Mode

RACHNA JAIN\*

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## Abstract

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*This study was undertaken with the objective to compare the attitudes of teachers towards teaching profession who have been trained through formal and distance mode with respect to type of school and teaching experience. A standardised attitude scale developed by Goyal (1984) is used profitably for measuring attitude of teachers towards teaching. The scale consists of 22 items. Ten items are favourable, ten items are unfavourable and the remaining two are neutral towards teaching. The scale was administered to 75 teachers trained through distance mode teaching in secondary classes of Delhi schools to collect the data. There was significant difference in the attitude towards teaching profession, of government and private school teachers. The private school teachers have more favourable attitude towards teaching profession as compared to government school teachers. Though both the groups were trained through distance mode, less experienced teachers have more favourable attitude towards teaching profession as compared to more experienced teachers.*

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Teacher education has acquired recognition as an integral part of our education system. Need for it at all levels of education is no longer a matter of debate. During the past five decades, the role of teacher has continually evolved, making it necessary for incumbents to be much more than mere pedagogues.

With increased specialisation within the educational system, the need for differentiation in teacher education has surfaced, in order to cater to the variety of professional needs of more specific groups.

Teachers themselves also need to be a lifelong learner; to be able to articulate their teaching with the new

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paradigm of learning; be adaptive and flexible in dealing with a new brand of students comprising different age groups of diverse ethnicity, and with a wide range of prior knowledge and background; and be conversant with the new technologies which are developing rapidly at an ever increasing speed (Elliott and Morris, 2001; Pang, 2001; Tsui and Cheng, 1997). There are many activities that the teacher has to perform in the classroom and outside the classroom, in order to provide the required learning experiences to the students. The focus of the teacher should be on what we call the pedagogical, i.e., the complexity of rational, personal, moral, emotional aspects of teachers' everyday acting with children or young people they teach (Van Manen, 2002).

In teacher education, the systems of curriculum transaction have essentially been of two categories, viz., the formal (face to face) system and distance system. The formal system of education refers to the instructional interactions in which teachers and learners transact a curriculum in a face-to-face situation. The distance system of education, as the term indicates, pertains to all kinds of interactions between the teacher and the learners in which they are not in direct contact with one another and require a third channel or medium for contact. These include the print, audio, video or any other mode.

The formal system is the oldest and the most widely accepted mode of teacher preparation in India. The distance mode emerged as an alternative to the formal system mainly

because of the demographic problems of a large number of people desiring education, and shortage of trained teachers after independence. Perraton (1991), Kulundaiswamy (1993) observed that distance education was neither a supplement nor a mere alternative to the conventional system, but a new stage in the evolution of education, which recognises the fact that in many situations it was easier to transport knowledge to people, than transport people to the place of knowledge. Very few studies have been conducted in the area of comparison of two systems, which has been a debatable topic with regard to the fundamental function of education and teaching training. A comparison of the two systems of education is essential for formulating future plans and taking decisions regarding the crucial aspects of teacher education programmes in the country.

One of the objectives of teacher education programme is to develop a positive attitude or favourable attitude towards teaching in prospective teachers.

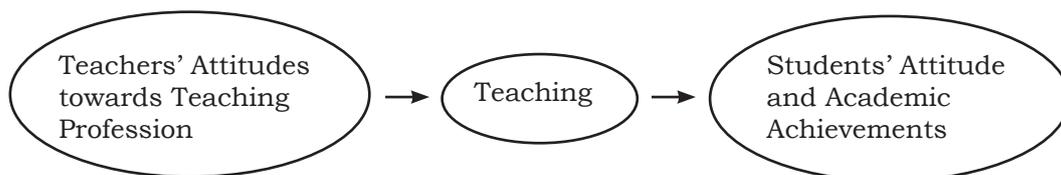
The Education Commission (1966) had also pointed out:

“Methods of teaching and evaluation in training institution are extremely important and the attitude of the student teacher will be influenced more by the methods used with them, than by what they are formally taught about the methods they should use in schools.”

The word attitude is defined within the framework of social psychology as a subjective or mental preparation for action. It defines outward and visible

postures, and human beliefs. Attitudes determine what each individual will see, hear, think and do. They are rooted in experience and *do not become automatic routine conduct*. Attitude means the individual's prevailing tendency to respond favourably or unfavourably to an *object* (person or group of people, institutions or events). Attitudes can be positive (values) or negative (prejudice). The concept of attitude is perhaps the most widely discussed topic in social psychology. Social psychologists distinguish and study three components of the responses: a) *cognitive component*, which is knowledge about an attitude object, whether accurate or not; b) *affective component*; feelings towards the object and c) *conative or behavioural component*, which is the action taken towards the object. Baysal (1981) defines the attitude as a cognitive, affective and behavioural response which is organised on the basis of experience and knowledge, to the individual's himself/herself, or any object or event around his/

her environment. According to these definitions, attitude can be defined as a response which can be positive or negative to any situation, event or object. Individuals' attitudes towards their profession have an effect on their performance (Hussain et al., 2011). This is the reason why attitude has been identified as an important variable for the present study. Social psychologists believe that attitude measurements serve as a guide to the understanding and prediction of human behaviour (Murphy and others, 1960). A good teacher is expected to be committed to his work and have the ability to take the initiative (Sparks, 1978). A teacher is expected not only to master the subject and various methods of teaching but also to show that she/he is capable of selecting the various study materials according to the teaching goals and varied group of pupils. She/he also possesses the potentials to create a learning environment for the students. Vermunt and Verschaffel (2000), Smith (1993) schematises this cause and effect relationship as follows:



Attitude towards profession means a person's feelings, behaviours and commitment to the profession or job. If a teacher is committed and has positive attitude, then it is sure that his/her performance will be better

and his/her efforts will be fruitful. Richardson (1991) narrated that education is a nation building activity. The quality of education depends upon ability and efficiency of teachers. Singh and Sharma (1977) found significant

positive relationship between teaching attitude and verbal interaction of teachers. Khatoon (1988) revealed that there exists no correlation between teacher's classroom behaviour and attitude towards teaching. Naik and Pathy (1997) concluded that female science teachers had significantly positive attitude towards their teaching of science than male counterparts. Shakuntala and Sabapathy (1999) found that there was a significant and positive correlation between adjustment of secondary school teachers and their interest in and attitude towards teaching profession. Attitude of teachers have also been determined to be influenced by gender (Dodeen, et al., 2003). They found that female teachers had more positive attitude towards teaching profession as compared to male teachers.

In order to understand the attitudes of teachers towards teaching profession, need was felt to compare the teachers trained through both the systems of teacher preparation (formal and distance mode) while on job. Hence, the investigators attempted to examine and compare the attitudes towards teaching profession of government and private teachers; and their teaching experience trained through formal and distance mode.

### **Objectives of the Study**

The study purports to meet the following objectives:

- (i) To compare the attitudes of teachers towards teaching profession trained through formal and distance mode.

- (ii) To compare the attitudes towards teaching profession of government and private school teachers trained through formal mode.
- (iii) To compare the attitudes towards teaching profession of government and private school teachers trained through distance mode.
- (iv) To compare the attitudes towards teaching profession of government school teachers trained through formal and distance mode.
- (v) To compare the attitudes towards teaching profession of private school teachers trained through formal and distance mode.
- (vi) To compare the attitudes of more and less experienced teachers towards teaching profession trained through formal mode.
- (vii) To compare the attitudes of more and less experienced teachers towards teaching profession trained through distance mode.
- (viii) To compare the attitudes of less experienced teachers towards teaching profession trained through formal and distance mode.
- (ix) To compare the attitudes of more experienced teachers towards teaching profession trained through formal and distance mode.

### **Methodology**

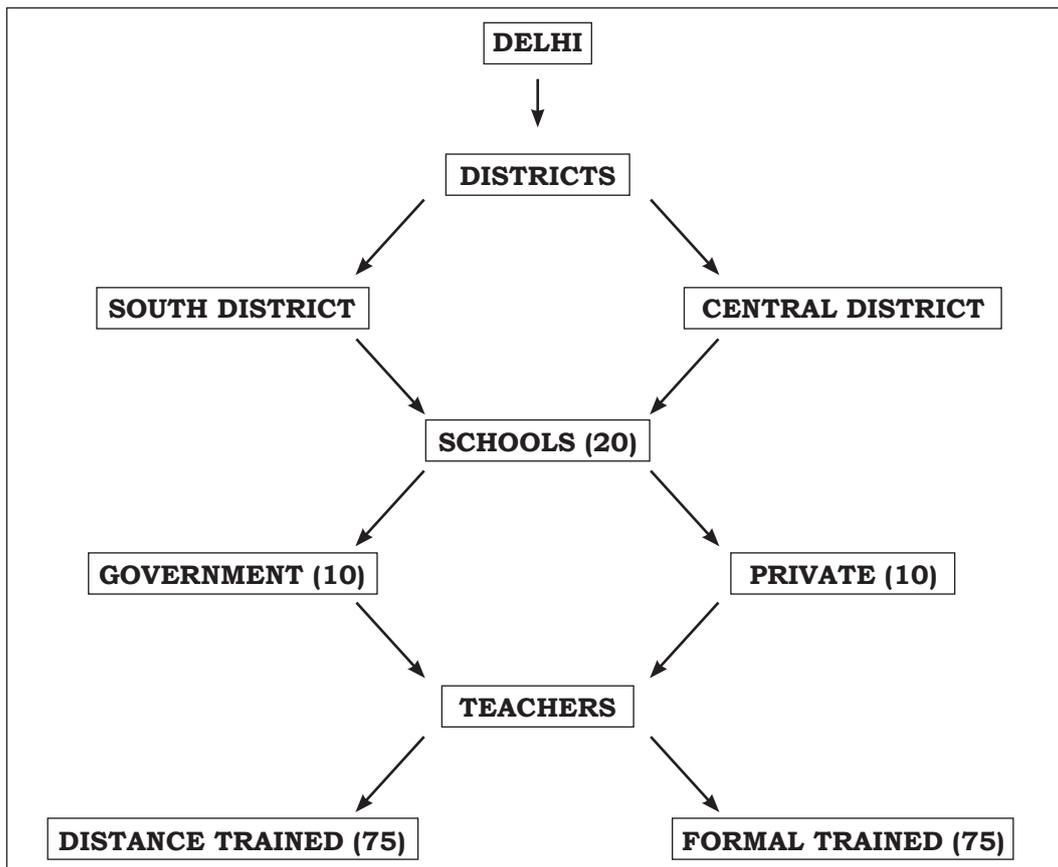
As per requirement of the problem and keeping the objectives of the study in mind, survey method was employed to collect the data.

### **Sample**

In order to keep the study manageable,

two districts from nine districts of Delhi was selected on the assumption that it would represent the population. Two districts, i.e., South and Central Delhi were selected in the first stage of sampling. The schools in each district were selected from the list prepared by the Directorate of Education by using a table of random numbers. In this way, twenty schools (10 government and 10 private) from the two districts were selected for the second stage of sampling. After that, 150 teachers, i.e.

75 teachers trained through distance mode and 75 teachers trained through formal mode were selected from these 20 schools by administering personal data sheet prepared by the investigator. Due to administrative difficulties in applying randomising procedures, the method of purposive sampling was selected. The sample drawn from the population of secondary teachers working in Delhi is given in Fig. 1, and the breakup details of the sample are given in Table 1.



**Figure 1** : Sample drawn from the Population of Secondary Teachers working in Delhi

Table 1  
**The Breakup Details of the Sample used for the Study**

S.No	Variables		Formally trained teachers (75)	Distance trained teachers (75)	Total
1.	Type of School	Government	37	37	74
		Private	38	38	76
		<b>Total</b>	<b>75</b>	<b>75</b>	<b>150</b>
2.	Teaching Experience	More Experienced Teachers*	40	32	72
		Less Experienced Teachers**	35	43	78
		<b>Total</b>	<b>75</b>	<b>75</b>	<b>150</b>

\* Teachers who are having more than 10 years teaching experience were considered as more experienced teachers in the present study.

\*\* Teachers who are having less than 10 years teaching experience were considered as less experienced teachers in the present study.

### Variables Involved

- Dependent variable: Attitude of teachers trained through formal and distance mode
- Independent variables:
  1. Mode of training (Formal and Distance mode)
  2. Type of Schools (Government and Private schools)
  3. Teaching Experience (more than 10 years and less than 10 years)

### Tools Used

**Personal data sheet :** This was used for gathering information specifying whether teacher is trained through formal or distance mode, and about the type of school and teaching experience of the teachers.

**Attitude Scale:** A standardised Teacher Attitude Scale developed by Goyal (1984) is used for measuring attitudes of teachers towards teaching

profession. The scale consists of 22 items. Ten items are favourable, ten items are unfavourable and the remaining two are neutral towards teaching. The mean attitude score of a teacher is the average score value of the statements endorsed by each teacher. The teacher with lower mean scores indicate a favourable attitude and the higher mean scores indicate unfavourable attitude of a teacher towards teaching profession.

### Procedure of the Study

In the beginning of the study, teachers were categorised with respect to mode of training, type of school and teaching experience, on the basis of information given in the personal data sheet. Teacher Attitude Scale towards teaching profession was individually filled up by the teachers. They were assured that all the information

given by them will be kept strictly confidential and used only for research purpose. While tabulating the data, the scores of attitudes received for 'most unfavourable' were negligible and therefore attitude scores of 'unfavourable' and 'most unfavourable'

were clubbed together to work out the results statistically.

### Results and Discussions

The obtained results, which are statistically analysed, have been presented in the following tables.

## 2. Comparison of Attitudes of Teachers towards Teaching Profession, who have been Trained through Formal and Distance Mode

Table 2  
 $\chi^2$  For Teachers' Attitudes towards Teaching Profession  
Trained through Formal and Distance Mode

Category	Formally Trained Teachers	Distance Trained Teachers	Total	Value of Chi-square
Most favourable	8	9	17	8.6*
Favourable	43	37	80	
Neutral	18	20	38	
Unfavourable/ Most Unfavourable	6	9	15	
Total	75	75	150	

\* indicates significant at 0.05 level

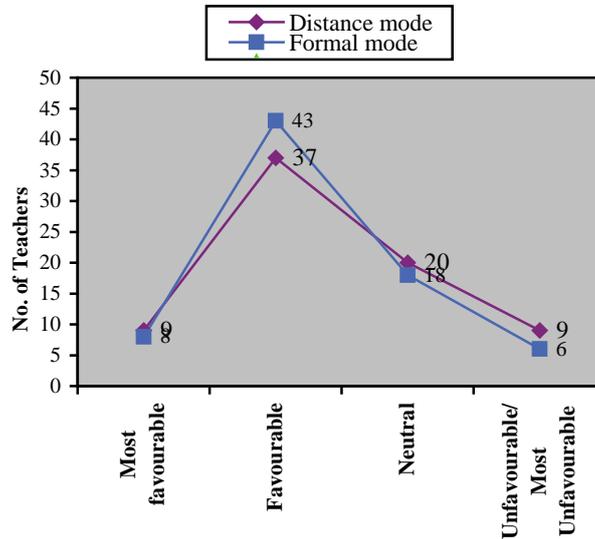


Figure 2 : Attitudes of Teachers Towards Teaching Profession Trained through Formal and Distance Mode

Table 2 exhibits that the value of chi-square for the attitudes of teachers trained through formal and distance mode, teaching in secondary classes was found to be significant at 0.05 level. Higher frequency scores of the formal trained teachers (as represented in the frequency polygon in Fig.2) show that they have favourable attitudes towards teaching profession. The finding may be due to the fact that in most of the formal teachers training institutions,

one of the criteria for the selection of the students is based on attitude test and, therefore, this may be the reason that formal trained teachers had better attitudes towards teaching profession as compared to teachers who did their training through distance mode. Bush (1959), Verma (1968), Singh R.S (1987) and NCERT (1971) results also indicated that training had a favourable effect on the attitudes of teachers towards their jobs.

### 3. Attitudes of Government and Private School Teachers Trained through Formal Mode

Table 3  
 **$\chi^2$  For Attitudes of Government and Private School Teachers towards Teaching Profession Trained through Formal Mode**

Category	Formal Trained Teachers		Total	Value of Chi-square
	Government School	Private School		
Most favourable	7	3	10	7.81*
Favourable	16	27	43	
Neutral	9	3	12	
Unfavourable/ Most Unfavourable	5	5	10	
Total	37	38	75	

\* indicates significant at 0.05 level

Table 3 shows that the value of chi-square (7.81) for the attitudes of formal trained government and private school teachers towards teaching profession was found to be significant at 0.05 level. It can be inferred that private school teachers had favourable attitudes towards teaching profession as compared to their counterparts. This may be due to the availability

of better teaching facilities in the private schools. On the other hand, government school teachers may have developed less favourable attitude due to several reasons, like lack of teaching facilities and also lack of leadership in authority. These frequency scores have been presented in the form of a frequency polygon in Fig.3.

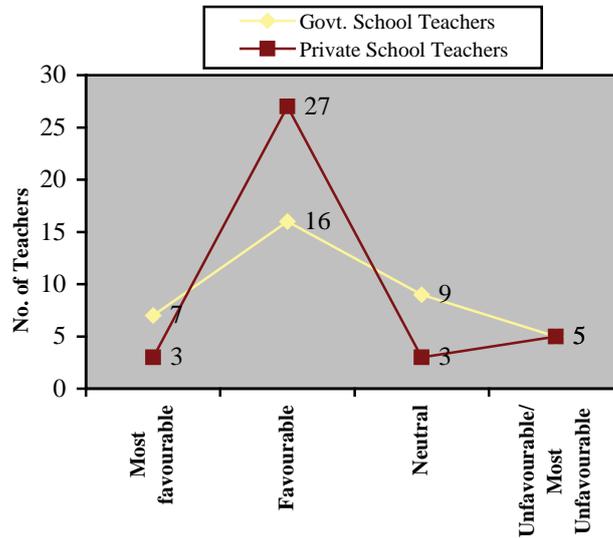


Figure 3 : Attitudes of Government and Private School Teachers Towards Teaching Profession Trained Through Formal Mode

4. Attitudes of Government and Private School Teachers Trained through Distance Mode

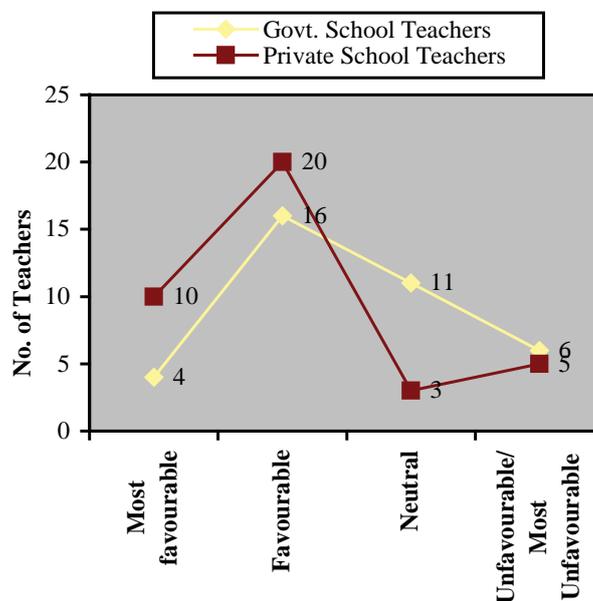
Table 4  
 $\chi^2$  for Attitudes of Government and Private School Teachers towards teaching profession Trained through Distance Mode

Category	Distance Trained Teachers		Total	Value of Chi-square
	Government School	Private School		
Most favourable	4	10	14	7.86*
Favourable	16	20	36	
Neutral	11	3	14	
Unfavourable/ Most Unfavourable	6	5	11	
Total	37	38	75	

\* indicates significant at 0.05 level

Table 4 shows that the value of chi-square for the attitudes of distance trained government and private school teachers towards teaching profession was found to be significant at 0.05 level. Higher frequency scores (as

represented in the frequency polygon in Fig.4) in case of private school teachers show that they have favourable attitudes towards teaching profession, as compared to their counterparts. This difference might be due to the



**Figure 4 :** Attitudes of Government and Private School Teachers Towards Teaching Profession Trained Through Distance Mode

fact that though both the groups were trained through distance mode, the private school teachers have better teaching facilities and have frequent

in-service programmes for innovative teaching. This may be perhaps one of the reasons for favourable attitude in case of private school teachers.

##### 5. Attitudes of Government School Teachers Trained through Formal and Distance Mode

Table 5  
 **$\chi^2$  for Attitudes of Government School Teachers towards Teaching Profession Trained through Formal and Distance Mode**

Category	Government School Teachers		Total	Value of Chi-square
	Formal Trained	Distance Trained		
Most favourable	7	4	11	1.12 (NS)
Favourable	16	16	32	
Neutral	9	11	20	
Unfavourable/ Most Unfavourable	5	6	11	
Total	37	37	74	

NS - Not Significant

Table 5 reflects that the value of chi-square for the attitudes of government school teachers towards teaching profession trained through formal and distance mode was found to be insignificant. However, Fig. 5 reveals that the response of teachers in all four groups indicate that there is almost equal

representation of government school teachers trained through formal and distance mode.

It may be reasonable to interpret that, irrespective of their training background teaching facilities in the school plays an important role in the attitudes of teachers towards teaching profession.

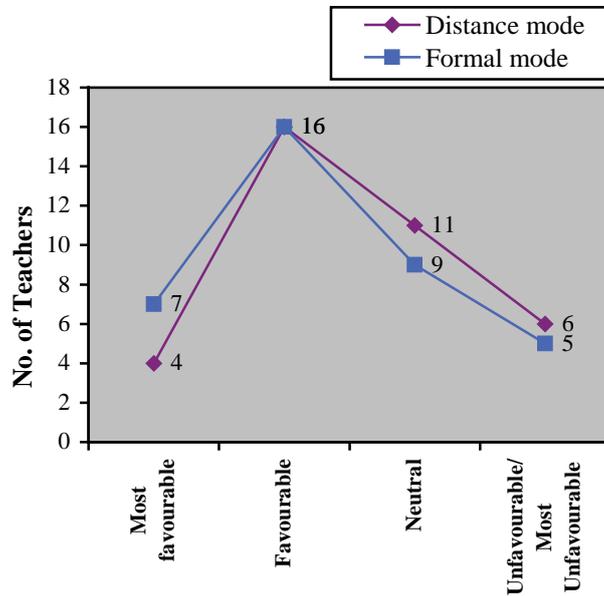


Figure 5 : Attitudes of Government School Teachers towards Teaching Profession Trained through Formal and Distance Mode

**6. Attitudes of Private School Teachers Trained through Formal and Distance Mode**

Table 6  
 $\chi^2$  For Attitudes of Private School Teachers towards Teaching Profession Trained through Formal and Distance Mode

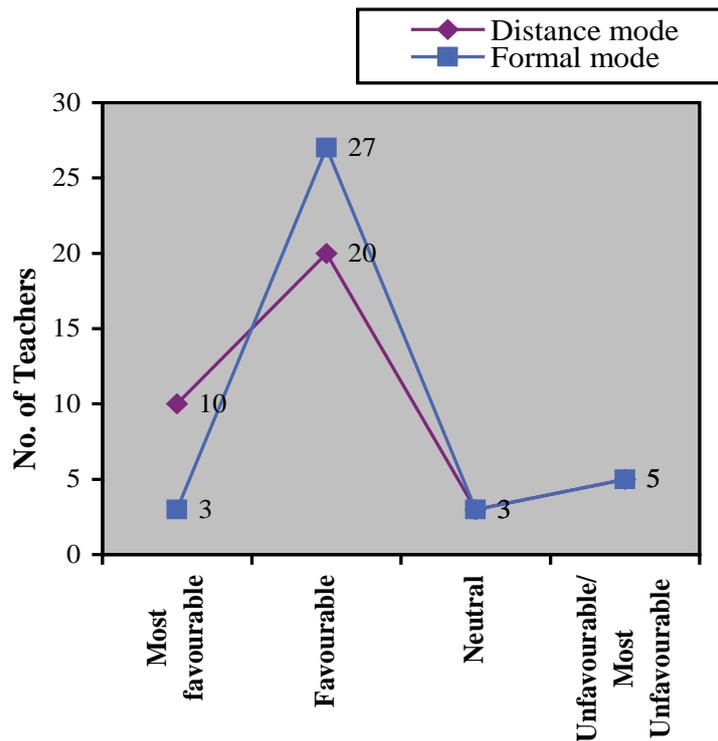
Category	Private School Teachers		Total	Value of Chi-square
	Formal Trained	Distance Trained		
Most favourable	3	10	13	4.82 (NS)
Favourable	27	20	47	

Neutral	3	3	6
Unfavourable/ Most Unfavourable	5	5	10
Total	38	38	76

NS - Not Significant

Table 6 shows that the value of chi-square for the attitudes of private school teachers towards teaching profession trained through formal and distance mode was found to be insignificant. It can be further revealed from the frequency polygon in Fig. 6. that both the groups have

almost equal representation at most favourable/favourable level. This may be due to the fact that irrespective of their training background, teaching facilities in school and their orientation programme from time to time plays an important role in the attitudes of teachers.



**Figure 6 :** Attitudes of Private School Teachers towards Teaching Profession trained through Formal and Distance Mode

### 7. Attitudes of More and Less Experienced Teachers towards Teaching Profession Trained through Formal Mode

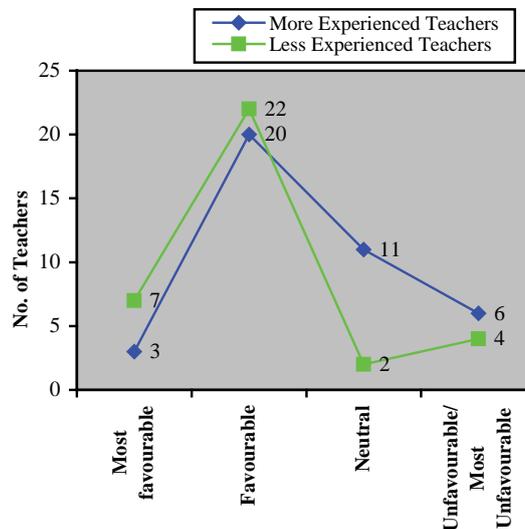
Table 7  
 $\chi^2$  for Attitudes of More and Less Experienced Teachers towards Teaching Profession Trained through Formal Mode

Category	Formally Trained Teachers		Total	Value of Chi-square
	More Experienced	Less Experienced		
Most favourable	3	7	10	8.03*
Favourable	20	22	42	
Neutral	11	2	13	
Unfavourable/ Most Unfavourable	6	4	10	
Total	40	35	75	

\* indicates significant at 0.05 level

Table 7 shows that the value of chi-square for the attitudes of more and less experienced teachers trained through formal mode was found to be significant

at 0.05 level. It can be inferred that less experienced teachers trained through formal mode exhibited favourable attitudes towards teaching profession.



**Figure 7 :** Attitudes of More and Less Experienced Teachers towards Teaching Profession Trained through Formal Mode

This may be due to the fact that now-a-days in most of the teachers training institutions, one of the criteria for the selection of the students is based on the attitude test. Sukhwal (1977),

Mahapatra (1987), Padmanabhaiah (1986) and Prakasham (1986) came to the same conclusion in their studies. These mean scores have been presented in the form of a frequency polygon in Fig. 7.

### 8. Attitudes of More and Less Experienced Teachers towards Teaching Profession Trained through Distance Mode

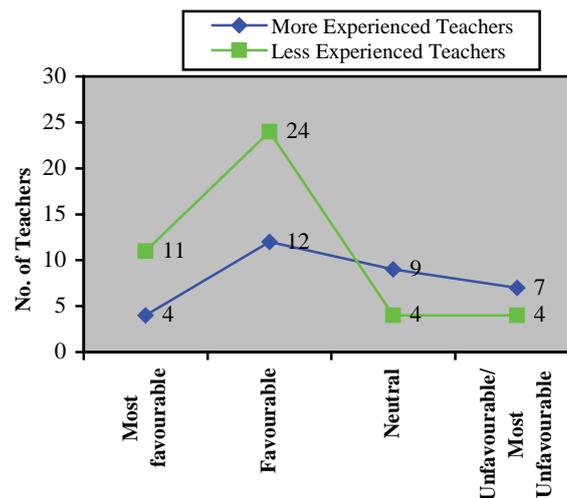
Table 8  
 $\chi^2$  for Attitudes of More and Less Experienced Teachers towards Teaching Profession Trained through Distance Mode

Category	Distance Trained Teachers		Total	Value of Chi-square
	More Experienced	Less Experienced		
Most favourable	4	11	15	8.6*
Favourable	12	24	36	
Neutral	9	4	13	
Unfavourable/ Most Unfavourable	7	4	11	
Total	32	43	75	

\* indicates significant at 0.05 level

Table 8 shows that the value of chi-square (8.6) for the attitudes of more and less experienced teachers towards teaching profession trained through distance mode was found to be significant at 0.05 level. It can be revealed from the frequency polygon in fig. 8 that less experienced teachers have more favourable attitudes as compared to their counterparts. It

may be because of the fact that they are more adaptive and acceptable to the new ideas in teaching, and as a result may develop favourable attitudes towards teaching profession. In case of more experienced teachers, acceptability to learn new innovative teaching is less and gets involved in negative thinking of certain need dissatisfaction.



**Figure 8 :** Attitudes of More and Less Experienced Teachers towards Teaching Profession Trained through Distance Mode

### 9. Attitudes of Less Experienced Teacher Trained through Formal and Distance Mode

Table 9  
 $\chi^2$  for Attitudes of Less Experienced Teachers towards Teaching Profession Trained through Formal and Distance Mode

Category	Less Experienced Teachers		Total	Value of Chi-square
	Formal Trained	Distance Trained		
Most favourable	7	11	18	.83 (NS)
Favourable	22	24	46	
Neutral	2	4	6	
Unfavourable/ Most Unfavourable	4	4	8	
Total	35	43	78	

NS - Not Significant

Table 9 shows that value of chi-square for the attitudes of less experienced teachers trained through formal and distance mode was found to be insignificant.

It can be revealed from the frequency polygon in Fig. 9 that frequencies of distance trained teachers were

more favourable as compared to their counterparts. It may be due to the fact that though distance trained teachers did not undertake their training practice through formal mode, they preferred teaching as their career and hence opted for this profession.

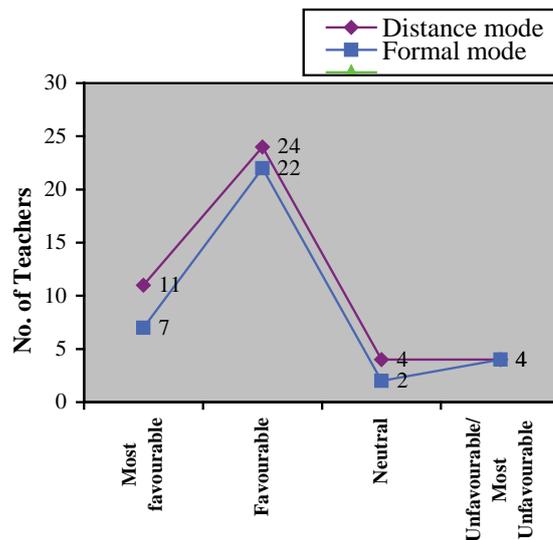


Figure 9 : Attitudes of Less Experienced Teacher Trained through Formal and Distance Mode

### 10. Attitudes of More Experienced Teachers towards Teaching Profession Trained through Formal and Distance Mode

Table 10  
 $\chi^2$  for Attitudes of More Experienced Teachers towards Teaching Profession Trained through Formal and Distance Mode

Category	More Experienced Teachers		Total	Value of Chi-square
	Formally Trained	Distance Trained		
Most favourable	3	4	7	1.56 (NS)
Favourable	20	12	32	
Neutral	11	9	20	
Unfavourable/ Most Unfavourable	6	7	13	
Total	40	32	72	

NS - Not Significant

Table 10 shows that the value of chi-square for the attitudes of more experienced teachers towards teaching profession trained through formal and distance mode was found to be insignificant. It is revealed from the frequency polygon in Fig, 10 that the number of teachers trained through distance mode was less than the

number of teachers trained through formal mode at favourable level. This may be because the teachers trained through formal mode had opted for teaching career with favourable attitude towards the profession and therefore, more experience in teaching has not affected their attitudes towards the profession.

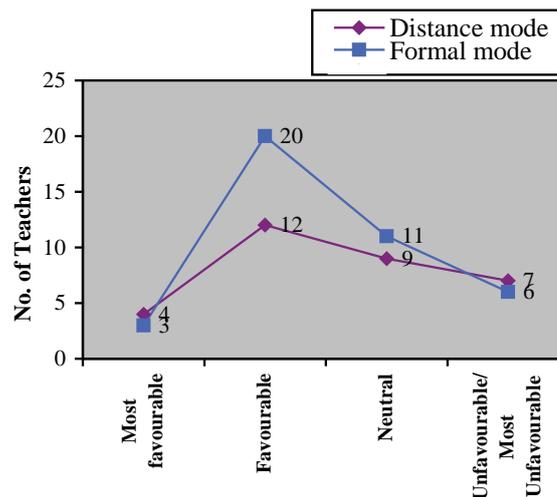


Figure 10 : Attitudes of Less Experienced Teachers Trained through Formal and Distance Mode

**Conclusions:**

- (i) There was significant difference in the attitudes of teachers towards teaching profession trained through formal and distance mode. Teachers trained through formal mode were found to have more favourable attitudes towards teaching profession as compared to the teachers trained through distance mode.
- (ii) There was significant difference in the attitudes towards teaching profession of government and private school teachers trained through formal mode. The private school teachers have more favourable attitudes towards teaching profession as compared to government school teachers.
- (iii) There was significant difference in the attitudes towards teaching profession of government and private school teachers trained through distance mode. The private school teachers have more favourable attitudes towards teaching profession as compared to government school teachers.
- (iv) There is no significant difference in the attitudes towards teaching profession of government school teachers trained through formal and distance mode.
- (v) There is no significant difference in the attitudes towards teaching of private school teachers trained through formal and distance mode.
- (vi) There was significant difference in the attitudes of more and less experienced teachers towards their teaching profession trained through formal mode. Though both the groups were trained through formal mode, yet less experienced teachers have favourable attitudes towards teaching profession as compared to more experienced teachers.
- (vii) There was significant difference in the attitudes of more and less experienced teachers towards teaching profession trained through distance mode. Though both the groups were trained through distance mode, yet less experienced teachers have more favourable attitudes towards teaching profession as compared to more experienced teachers.
- (viii) There was no significant difference in the attitudes of less experienced teachers towards teaching profession trained through formal and distance mode.
- (xi) There was no significant difference in the attitudes of more experienced teachers towards teaching profession trained through formal and distance mode.

**Educational Implications**

Findings of the present study reveal some important educational implications for teacher-educators, formal training institutions, distance training institutions, school authorities and teachers.

The attitude of teachers towards teaching profession is very important for the teachers' performance and their students. It emphasises an

important aspect, that attitude has a major role to play in the manner a teacher behaves in class. If a teacher has a favourable attitude towards profession, she will also make better use of skills of teaching while teaching in the classroom. The school authorities should adopt uniform pattern in the process of recruitment of teachers. At present, there is a random variation in admission procedures. Also, to bridge the gulf between training institutions and schools, there should be extension service departments at the pre-primary, primary and secondary levels, in each training establishment. The analysis of the data revealed that majority of the private school teachers have more favourable attitude towards teaching profession as compared to government

school teachers. Steps should be taken by the concerned authorities to develop favourable attitude of government school teachers towards teaching profession. The analysis of the data further revealed that though both the groups were trained through distance mode, yet less experienced teachers had more favourable attitudes towards teaching profession as compared to more experienced teachers. Frequent evaluation of how much, or in what directions, attitudes change throughout teaching career. While selecting candidates for the training programmes, it should be ascertained through interviews and use of aptitude tests, that they have an inclination towards teaching, which can be worked upon and developed by giving them right inputs.

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# Effect of Professional Development Programme on the Attitudes of Pre-service Teachers towards Students with Special Needs

R.K. PARUA\*

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## Abstract

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*For effective inclusion of students with special needs in general education classrooms, the teacher educators' community must overcome barriers toward inclusion, including existing attitudes. The purpose of this study was to determine the effects of professional development programme on the attitudes of pre-service teachers toward students with special needs. The intervention programme was conducted in six weeks for the pre-service teachers. The sample consisted of 42 pre-service teachers studying bachelor degree programme of special education. Results provided evidence that after receiving professional development programme, pre-service teachers had positive attitudes towards students with special needs. The overall findings suggest that this programme had significant effect on changing the attitude of pre-service teachers towards students with special needs with respect to all the four aspects, i.e. academic, cognitive, emotional and social development of the students.*

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## Introduction

The prime concern of any country is the equal care and attention of its children, including students with special needs. Such ideas led to the emergence of the concept of Inclusive Education for differently abled.

But the effective implementation of this inclusive education has many barriers even in government policy, practice and procedures. The United Nations Educational, Scientific and Cultural Organisation (UNESCO) has highlighted inclusion as a dynamic

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approach of responding positively to pupil diversity and seeing individual differences not as problems, but as opportunities for enriching learning (UNESCO, 2005). For the successful implementation of inclusive education, the actions of teachers, students and all stakeholders must overcome the obstacles of existing attitudes and values; lack of understanding; lack of necessary skills; limited resources; and inappropriate resources (UNESCO, 2005).

Pre-service teachers enter the classroom with their own personal beliefs, attitudes towards inclusion and their new challenging responsibility to teach all students, especially students with special needs. New programmes and policies laid down time to time by apex bodies of higher education of respective state and country expects that all students, including students with disabilities, be educated by highly qualified teachers with positive attitudes towards students and learn free of cost in appropriate educational settings.

Pre-service teachers, have to meet the challenge of providing effective teaching to the students with special needs in a supportive general education learning environment. They were more negative about the impact of children with special needs on other children in the general education classroom (Hastings and Oakford, 2003). But, after experiencing teaching at inclusive classroom, there is better acceptance and understanding of inclusion of students and attitude towards inclusion (Forlin et.al., 2009). Yellen et al. (2003) added that changing the attitudes of

pre-service teachers towards students with special needs would require more than simple exposure and acceptance in the general education classrooms. If students with special needs are to be completely integrated and accepted in the general education classroom, long-term changes in the attitudes of educational professionals would be required. So the present study attempted to find out the effectiveness of professional development programme on the attitude of pre-service teachers.

The purpose of this study was to determine the effects of professional development programme on the attitudes of pre-service teachers towards students with special needs. This intervention programme includes six weeks of professional development programme like participation in seminars, workshops and lectures and other different professional development programmes.

### **Concept of Inclusive Education**

Inclusive education is a pedagogical model which is based on the basic curriculum of psycho-social support to the differently abled child. The philosophy of inclusive education envisions the idea of providing opportunities for students with disabilities to study as equal partners with their classmates without disabilities (Forlin, 2008; Mitchell, 2008). It is found that students with disabilities improved their educational, social and emotional performance after getting appropriate accommodations and proper support in the general classroom (Parua, 2008). Inclusion is the provision of services to students

with disabilities in their neighbourhood schools with necessary support services and supplementary aids for both children and teachers. It means, meeting the needs of children with disabilities for a free and quality public education, in the least restrictive and most effective environment. Thus, an inclusive classroom is one in which the continuing emphasis on valuing individual differences leads all pupils, irrespective of social or cultural background, disability or difficulty in learning, to succeed in terms of the fulfillment of academic and social goals, and the development of positive attitudes to self and others (Alban-Metcalf and Alban-Metcalf, 2001).

Inclusion, thus understood, contributes to a better understanding of education, its purpose and importance. It is most closely connected to educational, cultural and social values. In the same sense, it contributes to the boosting of self-esteem, security and self respects. Inclusive education is the framework "that aims at ensuring that all stakeholders can participate in a meaningful way in this common task, contribute in different ways, and be valued and respected as equal members of the community of the educational institution. As a catalyst for change, inclusive education provides not only for institutional improvement, but also for an increased awareness of human rights and a reduction in discrimination. Essentially, inclusive education involves changes in attitudes, behaviour and ways of working, and has the potential to make an effective starting point to address the right of learners in a range of cultures and

contexts." (Moodley, 2002). Thus a professional development programme was designed in the present study to determine the attitudes of pre-service teachers towards students with special needs.

### **Attitudes of Pre-service Teachers**

The inclusion of learners with special educational needs in general education is becoming more prevalent. As a result, various special education researchers have begun to examine the success of inclusion, as well as the attitude and beliefs of general educators towards the inclusion of learners with disabilities in the general education classroom. Sze (2009) carried a research on pre-service teachers' attitudes towards students with disabilities. The study revealed that the attitude of the general education teacher is one of the most important predictors of successful integration of students with disabilities in general education classrooms. Mdikana et al. (2007) analysed the literature and their study revealed that pre service teachers had positive attitude towards inclusive education. The results of this investigation are significant in the sense that the understanding of pre-service educators' attitudes is critical for the successful implementation of inclusive education (Mowes, 2000).

Dawn (2001) examined the attitudes of teachers towards inclusion. Forty-eight teachers who were enrolled on a Master's programme in Special and Inclusive Education were surveyed via a questionnaire at the beginning and end of a ten-week introductory module. The results indicated overall

attitudinal shift for four categories of inclusion, to suggest more positive attitudes at the end of the module, compared to the beginning. The implications for providers of pre and in-service education and training courses for teachers are discussed.

Wilkins and Nietfeld (2004) compared survey responses of teachers from a reform-based programme focused on promoting inclusion-based classrooms, namely Project WINS (Winning Ideas Network for Schools), schools with teachers from non-Project WINS schools with regard to their attitude about inclusion in the classroom. Surprisingly, the results of this study revealed no differences between the two groups of teachers on most facets of inclusion. The one significant difference found a greater preference for inclusion by non-Project WINS teachers with regard to classroom climate. The study also revealed a higher preference for inclusion of teachers with higher self-reported expertise in special education regardless of what group the teacher was surveyed from. Findings from this study indicate the need for further research and improvements in training methods for Project WINS and similar programmes that attempt to change teachers' attitudes towards inclusion as the first important step in improving practice in inclusion-based classrooms.

Golmic and Hansen (2012) determined the effects of an Included Experience, a special programme on the attitudes, sentiments and concerns of pre-service teachers towards students with exceptional learning needs

after 12 weeks of student teaching in secondary education classrooms. Results provided evidence that after completing an Included Experience, pre-service teachers had positive attitudes and decreased concerns towards inclusion. The overall findings suggest that the Included Experience shows promise as a model that pre-service teachers should follow to support, teach and engage students with exceptional learning needs in general education classrooms.

Forlin et al, (2009) concluded that the personal engagement and involvement in teaching students with disabilities will most likely lead to further acceptance and understanding of inclusion of students with disabilities in general education classrooms and improve attitudes toward inclusion. Yellan et al, (2003) added that changing the attitudes of pre-service teachers towards students with special needs will require more than simple exposure to the students in general education classrooms. If students with special needs are to be completely integrated and accepted in the general education classroom, long-term changes in the attitudes of educational professionals would be required.

## **Method**

### ***Design***

Professional Development Programme is a six-week long designed intervention programme for pre-service teachers. Professional development programme includes the following approaches: (1) Teaching approach that consists of identifying elements that affects learning in inclusive setting. (2)

Participation in seminars, workshops and lectures to clarify and address immediate concerns of students with special needs (3) Enhance teacher's competencies in a specific skill area by providing a process of observation, reflection, and action. Each approach is provided to the pre-service teachers in two weeks duration.

After reading and signing the required consent, 42 pre-service teachers agreed to participate. Students were informed that the Attitudes Scale would be used to determine their attitudes towards students with disabilities. After the pre-service teachers completed a pre-experience survey, the intervention programme was conducted. All the students attended an introductory seminar that provided the directions and instructions to receive the intervention programme. Prior to the end of the professional development programme, students were administered the same survey as a post-attitude measure.

### **Sample**

The sample consisted of a total of 42 pre-service teachers from a training college in Odisha including female 57.14 per cent (n=24) and male 42.85 per cent (n=18) student teachers. The student teachers represented a wide range of ages, with 40.47 per cent (n=17) reporting that they were 24 and

below, 26.19 per cent (n=11) falling between the ages of 25-29, and 33.33 per cent (n=14) being 30-35 years old.

### **Tools**

An Attitude scale is prepared and standardised by the investigator for the collection of the data. The statement of the scale is expressing definite favourableness or unfavourableness about students with special needs.

This scale has 40 items/statements spread over in four factors. There is no right or wrong answers to the statements. This scale is designed to understand the differences in individual reactions to various situations. The scale is self administering. The four factors in the test such as academic, cognitive, emotional and social development are mentioned in the table below:

The respondents are required to record their response in five categories i.e., strongly agree, agree, uncertain, disagree and strongly disagree.

Internal consistency reliability coefficients in the current study as measured by Cronbach's coefficient alpha for the pre-test were high for the overall scale ( $r = 0.87$ ) and for the attitude towards Academic Development ( $r = 0.43$ ), Cognitive Development ( $r = 0.85$ ), Emotional Development and Social Development ( $r = 0.85$ ) item subsets on the pre-survey.

**Distribution of Items in the Attitude Scale**

<i>Sr. No.</i>	<i>Factor</i>	<i>Item Serial Number</i>	<i>Total</i>
1	Academic development	1-10	10
2	Cognitive development	11-20	10
3	Emotional development	21-30	10
4	Social development	31-40	10

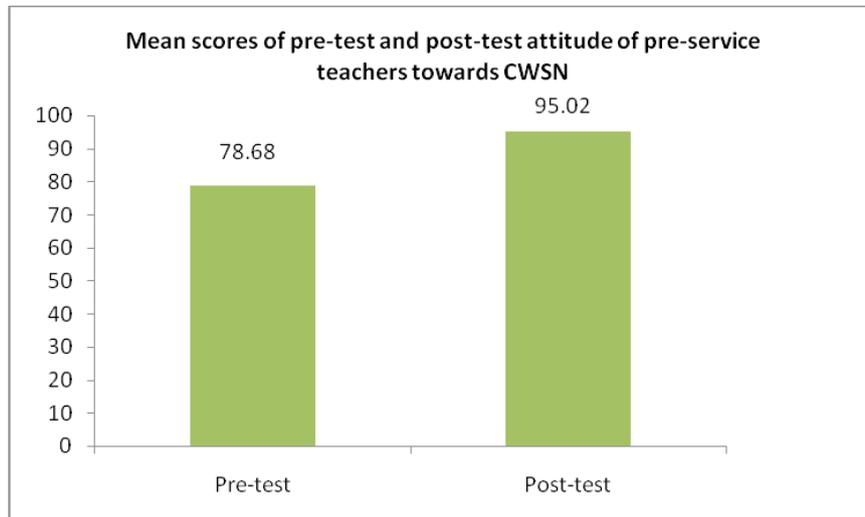
Table 1  
**Significance of Difference between Pre-Test and Post-Test Attitude Scores of Pre-Service Teachers towards Students with Special Needs**

<i>Variables</i>	<i>Group</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>SED</i>	<i>t-ratio</i>	<i>Level of Significance</i>
Attitude towards students with special needs	Pre-test	42	78.68	11.34	2.15	7.60	.01
	Post-test	42	95.02	10.17			

Table value of 82 df At .05 level =1.96  
 At .01 level= 2.58

It is revealed from Table 1 that the mean scores of pre-test and post test on the attitude scale of pre-service teachers towards students with special needs are 78.68 and 95.02 with SD's 11.34 and 10.17 respectively. The t-ratio came out from the above two groups is 7.60, which is significant at .01 level of significance. That means there is significant difference between pre-test and post-test scores of pre-service teachers on their attitude towards students with special needs.

Furthermore, it shows that that professional development programme had significant effects on the attitudes of pre-service teachers. Again, from the Figure-1 shown below, the mean post-test score of pre-service teachers was more than the pre-test score. It indicates that teachers who received professional development programme had more favorable attitude towards students with special needs than the teachers who did not receive intervention programme.



**Figure 1**

Table 2  
**Significance of Difference between Pre-Test and Post-Test Attitude Scores of Pre-Service Teachers towards 'Academic Development' of Students with Special Needs**

Variables	Group	N	Mean	SD	SED	t-ratio	Level of Significance
Attitude towards students with special needs	Pre-test	42	22.16	6.82	1.35	4.27	.01
	Post-test	42	27.93	5.61			

Table value of 98 df At .05 level =1.96  
 At .01 level= 2.58

Table 2 shows that the mean scores of pre-test and post-test of pre-service teachers attitude towards 'academic development' of students with special needs are 22.16 and 27.93 with SD's 6.82 and 5.61 respectively. The t-ratio came out from the above two groups is 4.27, which is significant at .01 level of significance. That means there is significant difference between pre-test and post-test scores of

pre-service teachers on their attitude towards 'academic development' of students with special needs. Further, from Figure 2 we can find that the mean score of post-test was more than the pre-test of teachers. It indicates that teachers included in developmental programme had more favourable attitude towards students with special needs than the teachers not included in professional development programme.

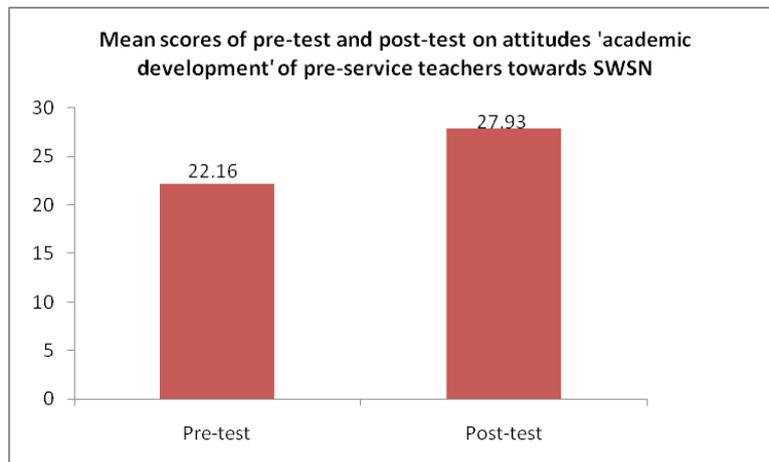


Figure 2

Table 3  
**Significance of Difference between Pre-Test and Post-Test Attitude Scores of Pre-Service teachers Towards 'Cognitive Development' of Students with Special Needs**

Variables	Group	N	Mean	SD	SED	t-ratio	Level of Significance
Cognitive Development	Pre-test	42	16.99	6.14	1.34	3.41	.01
	Post-test	42	21.03	5.87			

Table value of 98 df At .05 level =1.96  
 At .01 level= 2.58

Table 3 revealed that the mean scores of pre-test and post-test scores of pre-service teachers on the attitude towards 'cognitive development' of students with special needs are 16.99 and 21.03 with SD's 6.14 and 5.87 respectively. The t-ratio came out from the above two groups is 3.41, which is significant at .01 level of significance. That means there is significant difference between pre-test and post-test scores of pre-service teachers

on their attitude towards Cognitive Development of students with special needs. Further, from Figure 3 we can find that the mean score of post-test was more than the pre-test scores of pre-service teachers. It indicates that professional development programme had significant effect on the attitude of pre-service teachers towards cognitive development of students with special needs students.

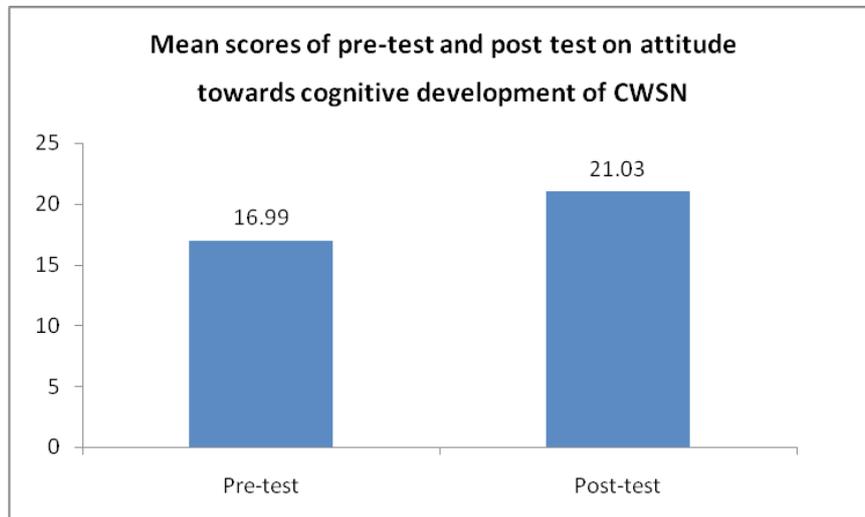


Figure 3

Table 4  
**Significance of Difference between Pre-Test and Post-Test Attitude Scores of Pre-Service Teachers Towards 'Emotional Development' of Students with Special Needs**

Variables	Group	N	Mean	SD	SED	t-ratio	Level of Significance
Emotional Development	Pre-test	90	16.45	6.02	1.18	3.02	.01
	Post-test	90	20.01	5.88			

Table value of 98 df At .05 level =1.96  
 At .01 level= 2.58

Table 4 indicates that the mean scores of pre-test and post-test of pre-service teachers on their attitude towards 'emotional development' of students with special needs are 16.45 and 20.02 with SD's 6.02 and 5.88 respectively. The t-ratio came out from the above two groups is 3.02, which is significant at .01 level of significance. That means there is significant difference between pre-test and post-test scores

of pre-service teachers on their attitude towards Emotional Development of students with special needs. Further, from Figure 4 we can find that the mean score of post-test was more than the pre-test mean score of pre-service teachers. It indicates that professional development programme had significant effect on the attitude of pre-service teachers towards 'emotional development' of students with special needs.

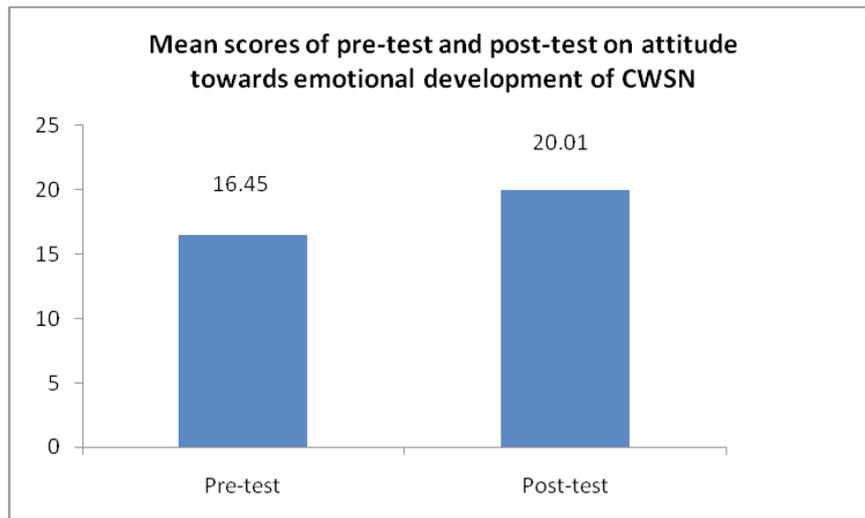


Figure 4

Table 5  
**Significance of Difference between Pre-Test and Post-Test Attitude Scores of Pre-Service Teachers towards 'Social Development' of Students with Special Needs**

Variables	Group	N	Mean	SD	SED	t-ratio	Level of Significance
Social Development	Pre-test	42	23.08	6.02	1.29	2.30	.05
	Post-test	42	26.05	5.88			

Value of 98 df At .05 level =1.96  
 At .01 level= 2.58

It is observed from Table 5 that the mean scores of the pre-test and post-test scores of pre-service teachers' attitude towards 'social development' of students with special needs 23.08 and 26.05 with SD's 6.02 and 5.88 respectively. The t-ratio came out from the above two groups is 2.30, which is significant at .05 level of significance. That means there is significant difference between pre-test and post-test scores of pre-service

teachers on their attitudes towards 'social development' of students with special needs. Further, from Figure 5 we can find that the mean score of post-test was more than the pre-test score of pre-service teachers. It indicates that teachers participating in professional development programme had more favourable attitude towards social development of students with special needs than the teachers not participating in the programme.

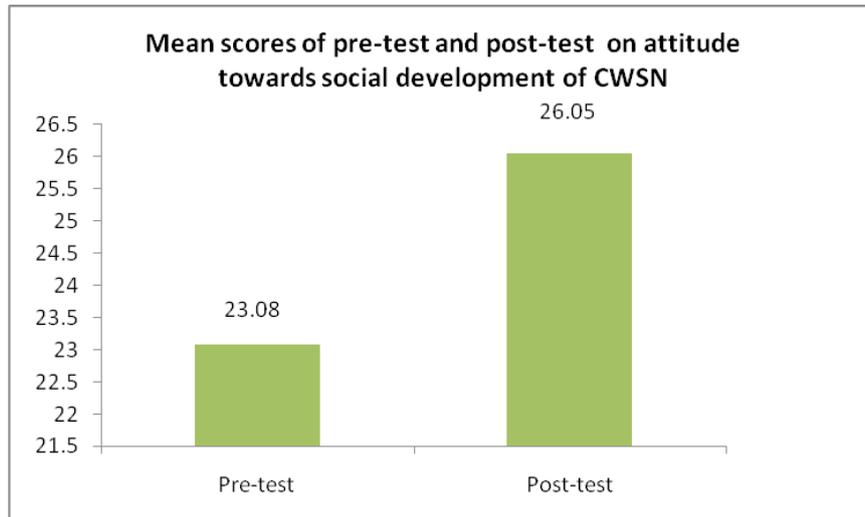


Figure 5

### Discussion

The purpose of this study was to determine the effects of a professional development programme on the attitude of pre-service teachers towards students with special needs. Designing a structured professional development programme has encouraged pre-service teachers to teach and support students with exceptional learning needs in inclusive secondary education classrooms. Results of the study show that after participating in the professional development programme, attitudes were even more positive among teachers. Specifically, results of pre-post mean comparisons were statistically significant for all the developmental factors including academic, cognitive, emotional and social.

Pre- and post-survey results provided encouraging evidence that pre-service teachers had positive attitudes towards students with special needs. These results are meaningful because they show that pre-service teachers found the experience of teaching students with special needs more comfortable after their involvement in professional development programme. The findings of this study are consistent with the study by Henning and Mitchell (2002) that reported improved attitudes towards students with exceptional

learning needs when pre-service teachers were required to adapt lessons, reflect on improving their own practices, and collaborate with general education and special education teachers about curriculum.

The findings of improvement in pre-service teachers' attitudes also suggest increased opportunities for pre-service teachers to achieve and apply specific knowledge and skills which are very helpful for the students with special needs.

### Future Studies

The sample in this study includes only secondary education pre-service teachers who have received professional development programme. It would be useful to examine the impact of the included experience on the attitude of teachers.

Research has suggested that the attitudes of secondary education teachers are less positive than those of elementary students (McHatton and McCray, 2007). While our data showed positive attitudes from secondary education students both pre and post participation in the professional development programme, it would be useful to compare attitudes of secondary and elementary pre-service teachers.

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# Educational Issues of Children of the Tiwa Community of Assam

## A Statistical Interpretation

TULIKA DEY\*  
MANAB DEKA\*\*

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### **Abstract**

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*Tiwa community is one of the prominent tribes and a major ethnic group of Assam. Independent India has been paying due attention to the problems of the Scheduled Tribes and attempts are being made to deal effectively with their problems. In spite of all kinds of steps taken by the government for providing educational facilities, the Tiwa community is far below national literacy average as far as education is concerned. Our objective is to study the causes of the problems faced by the students of the Tiwa community in terms of likings, facilities, enrollment and retention. More specifically, an attempt has been made to identify causes of students' disliking for going to school, which in turn may be useful for reducing students' drop-outs. The study was undertaken in two districts of Assam namely Morigaon and Nagaon, where the density of population of the Tiwas is the highest. Altogether, eight villages were considered wherefrom 148 students were interviewed during data collection. Some bivariate analyses were done for a few characteristics, whereas multivariate analysis has been done using logistic regression analysis with liking for going to school by the students as the dependent variable. The analysis indicates that characteristics like gender, mid-day meal, cleanliness of school, reward by teacher and students' liking of the teachers have significant effect on the liking of students for going to school, whereas, attributes like education of parents, mode of transportation, play material and toilets in school do not appear to have any significant effect.*

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### **Introduction**

The Tiwas are one of the prominent Scheduled Tribes and a major ethnic group of Assam. They have enlisted themselves as a plain Scheduled Tribe but a section of them resides in the hilly areas also. The Tiwas have a population of 1,37,388 in the State of Assam (Census of 1991), which comprises both Hill Tiwas and the plain Tiwas. The plain Tiwas although, in due course of time assimilated with the Assamese society, culture and religions in their day-to-day life, a section of the Tiwas still follow the old traditions. They have their own dialect, dress, festival and beliefs.

However, like most of the backward classes of our country, Tiwa people are also suffering from many problems. Independent India has been paying due attention to the problems of the Scheduled Tribes and attempts are being made to deal effectively with those problems. Nevertheless, the Tiwa people are far away from receiving all the benefits given by the government. And at present, the Tiwas allege that all the allocated money is not properly utilised by the government and corrupt officials. So, no significant development has been promoted by the government and most of all there is a wide spread problem faced by the educational institutions. They do not have any recognition about their need from the government. Thus, Tiwa people are backward educationally, socially and are politically exploited. There are also other related problems which is a hurdle in the way of educational development among the Tiwas. Moreover, ignorance,

superstitious beliefs, lack of scientific knowledge, geographical separation, etc. are the major problems of Tiwa people.

It is evident that there is dearth of research work and reports on the issues of Tiwa community and their problems regarding school education. Among those very few researchers, Sarma Thakur (1985) gave a vivid account of the Tiwa community. He brought out the life and culture of the Tiwas living in both plains and hills of Assam. Bordoloi et al (1987) also tried to portray a picture of the Tiwas in terms of socio-economic and education status.

### **Objectives**

The Tiwa community suffers from low Socio Economic Status (SES). This low SES of the villagers is affecting the educational upliftment of the community. The education level of the parents is also very low to understand the benefits of being educated and therefore, their aspiration is very low. They are not even sure about what they want their children to do in life or how far they should study. The children too do not have high aspiration due to lack of support from the parents or exposure. While there was progress in improvement of literacy the phenomenon of school dropouts has remained a blot in the face of an otherwise good performance. Identification of factors influencing dropouts have not been widely discussed in the north-eastern part of the country (Choudhury, 2006). With this backdrop, the objectives in the present study are:

- to put light on general education scenario and the causes of the problems faced by the students of the Tiwa community in terms of facilities, enrolment and retention; and
- to identify causes of students' liking/disliking for going to school, identification of which should help reduce school drop-outs.

### **Data Base and Methodology**

The Tiwa population is scattered in 17 districts of Assam, out of which Morigaon district is densely populated followed by Nagaon district. Nagaon district has a population of 20,38,570 of which 1,01,209 is Scheduled Tribe population and Morigaon district has an overall population of 7,76,256, of which the tribal population is 1,20,730. Therefore, these two districts were considered for the study. Each of these districts has a number of blocks and for convenience two blocks from each district were considered, i.e., four blocks in total. The blocks are namely Nagaon district (Kopili block and Raha block); Morigaon district (Mayang block and Bhurbandha development block). From each of these blocks again two villages were selected. They are Khaplangkuchi and Niz-Tarabari village from the Kapili block; Garoimari and Marjung gaon from Raha block of Nagaon district and Dabarghat and Kumarbari from Mayang block; Paschim merua gaon and Bar-Manipur village from

Bhurbandha development block of Morigaon district.

### **Data Set**

In the present study, interview, observation and questionnaires have been used for collecting the required data. Interview technique has been used widely in the study. As the Tiwa villagers are either illiterate or of low educational status, interview method was found to be the most suitable method to gather information about the problems of education. For conducting the study, two districts of Assam dominantly inhabited by the Tiwa Community were considered, viz. Morigaon and Nagaon districts. The sample of the work has been taken by random technique. Altogether, 148 students were selected for the study.

### **Analysis**

The analysis of the results has been divided into two parts keeping in view the objectives of the study. First part is devoted to focus on general education scenario and the causes of the problems faced by the students of the Tiwa community in terms of facilities, enrolment and retention. The second part consists of identifying the causes of students' liking/disliking for going to school. For this purpose Logistic Regression technique is adopted. The variable of interest is binary, whether the student likes going to school or not. The endeavour is to analyse the odds of a student likes going to school.

**Part I: General educational scenario and the causes of problem faced by the students**

Table 1  
**Frequency distribution of Socio-demographic factors**

Variable	Fre- quency	% age
<b>Gender</b>		
Male	81	54.7
Female	67	45.3
<b>Class of study</b>		
LP	103	69.6
ME	30	20.3
Secondary	13	8.8
Higher Secondary	2	1.4
<b>Education of Father</b>		
Illiterate	31	20.9
Primary	90	60.8
Secondary	16	10.8
HS and above	11	7.4
<b>Education of Mother</b>		
Illiterate	74	50.0
Primary	58	39.2
Secondary	15	10.1
HS and above	1	0.7
<b>Occupation of Father</b>		
Agriculture	95	64.2
Business	6	4.1
Govt. service	11	7.4
Pvt. Service	5	3.4
Others	31	20.9
<b>Occupation of Mother</b>		
Housewife	36	24.3
Agricultural labourer	97	65.5
Labourer	6	4.1
Govt. service	5	3.4
Others	4	2.7
<b>Type of House</b>		
Kaccha	126	85.1
Pucca	22	14.9
<b>Drinking water facility</b>		
No	24	16.2
Yes	124	83.8

<b>Toilet facility</b>		
No	117	79.1
Yes	31	20.9
<b>Domestic animals</b>		
No	6	4.1
Yes	142	95.9

A few variables were studied to identify the Socio-demographic factors. It was seen that

- (i) *Class of study*: 69.6 per cent of the other members in the family studied upto lower primary level, 20.3 per cent up to middle school, 8.8 per cent up to secondary level and rest 1.4 per cent up to higher secondary level.
- (ii) *Education of father*: It was observed that 20.9 per cent of the fathers were illiterate, 60.8 per cent have studied till the primary level, 10.8 per cent up to secondary level and 7.4 per cent have studied till higher secondary or above.
- (iii) *Education of mother*: 50.0 per cent of the mothers were illiterate, 39.2 per cent have studied till the primary level, 10.1 per cent up to secondary level and 0.7 per cent have studied till higher secondary or above.
- (iv) *Occupation of father*: It was observed that 64.2 per cent of the father's occupation was agriculture, 4.1 per cent were in business, 7.4 per cent were in government service, 3.4 per cent in private service and the rest 20.9 per cent were engaged in sources of livelihood.
- (v) *Occupation of mother*: It was observed that 24.3 per cent of the

mothers were housewives, 65.5 per cent were agricultural labourers, 4.1 per cent were engaged in other labour works, 3.4 per cent were in government service, and the rest 2.7 per cent were engaged in other occupations.

- (vi) *Type of house*: 85.1 per cent of the respondents lived in *kaccha* house whereas the rest 14.9 per cent lived in *pucca* house.
- (vii) *Drinking water facility*: 16.2 per cent responded that they did not have drinking water facility whereas 83.8 per cent responded that they did have drinking water facility.
- (viii) *Toilet facility*: 79.1 per cent of the respondents replied that there was no toilet facility for them whereas 20.9 per cent had toilet facility.
- (ix) *Domestic animals*: A minimal of 4.1 per cent responded that they did not have any domestic animal, but 95.9 per cent had domestic animals of their own.

Table 2  
Frequency distribution of facilities in the schools

Variable	Frequency	% age
<b>Blackboard in school</b>		
No	20	13.5
Yes	128	86.5
<b>Play ground in school</b>		
No	90	60.8
Yes	58	39.2
<b>Providing Textbook</b>		
No	32	21.6
Yes	116	78.4

<b>Providing note book</b>		
No	146	98.6
Yes	2	1.4
<b>Providing pen/pencil</b>		
No	146	98.6
Yes	2	1.4
<b>Knowledge of drop-outs</b>		
No response	12	8.1
No	40	64.9
Yes	96	27.0
<b>Reasons of drop-outs</b>		
No idea	117	79.1
Financial problems	10	6.8
Loss of interest in study	21	14.2

Systematic analyses of the facilities available in the schools were done by administering an interview schedule among 148 students.

- (i) *Black Board in school*: 13.5 per cent of the respondents (school students) said that they did not have blackboard in school or it was not usable. The rest 86.5 per cent did have blackboards at school.
- (ii) *Play ground in school*: 60.8 per cent of the respondents said that there was no play ground in their school whereas 39.2 per cent said they had playgrounds.
- (iii) *Textbook*: 21.6 per cent respondents did not possess any textbook while the rest 78.4 per cent had textbooks with them.
- (iv) *Providing Note Book*: 98.6 per cent of the respondents replied that no Note Books were provided by the school but a very negligible section (1.4 per cent) replied that they were provided Note Books by the school.

- (v) *Providing Pen/Pencil*: 98.6 per cent of the respondents said that no Pen/Pencil was provided by the school but 1.4 per cent replied that they were provided Pen/Pencil by the school.
- (vi) *Knowledge of drop-outs*: 8.1 per cent of the respondents did not have any knowledge of drop out from their school while 64.9 per cent did not have any knowledge of drop-outs and 27 per cent said that they knew students who have dropped out.
- (vii) *Reasons of drop-outs*: 79.1 per cent of the students did not know the reasons of drop-outs. 6.8 per cent replied that financial problems were the reason for drop-outs and 14.2 per cent said loss of interest in studies is the reason for drop-out.
- Part II: Identification of the causes of students' liking/disliking for going to school**
- Following explanatory variables are considered for the logistic regression analysis:
- (i) *Gender of the respondents*: The variable has been categorised as M representing 'male' and F representing 'female'.
- (ii) *Education of father*: Code 1 represents illiterate, 2 represents primary education, code 3 is for secondary education and 4 for HS and above.
- (iii) *Education of mother*: This variable has been coded similar to that of father of the respondents.
- (iv) *Mode of transport*: The variable has been categorised as 1 for 'on foot' and 2 for 'others', which consists of those coming by 'cycle' and by 'public transport'.
- (v) *Cleanliness of school*. Intention is to check if cleanliness of school motivates students to come to school. It has been coded 0 for 'no' and 1 for 'yes'.
- (vi) *Play materials in the school*: We wished to check if availability of play materials in the school has any effect on students for going to school. It has also been coded 0 for 'no' and 1 for 'yes'.
- (vii) *Mid day meal*. It was included in the study to check if mid day meal induces students to school.
- (viii) *Drinking water facility in school*: The variable has been coded 0 for 'no' and 1 for 'yes'.
- (ix) *Toilet in school*. It is particularly important for girl students, which is one of the significant factors responsible for girls' drop-outs as evident from earlier literature.
- (x) *Reward by the teachers*: Aim is to check if reward by teachers in the school has any effect on the students.
- (xi) *Students' liking of the teachers*: The variable has been coded 0 for 'no' and 1 for 'yes'. It is included in the study to know whether the variable has any effect on students.
- (xii) *Comfortable with the language in the school*: Our objective was to examine whether students are comfortable in the language used

as medium of instruction in the class room.

### Logistic Modelling

Result of logistic regression is placed in Table 3. The classification table provided evidence on adequacy of the model with correct prediction over 84

per cent (the cut off is taken at 0.79 following the procedure outlined by Crammer (1999)). The coefficient estimates, their standard errors, p-values for testing their significance and the change in odds corresponding to unit increase in the dependent variable is given in Table 3.

Table 3  
Results of Logistic Regression

Independent Variables	Estimate of Coefficient (B)	Std. Error	p-value	Odds Ratio	95% C.I. for Odds Ratio	
					Lower	Upper
<b>Gender</b>						
Male	-2.530	.968	.019	.180	.112	.531
Female ®						
<b>Education of Father</b>			.625			
Illiterate	1.553	1.796	.387	4.725	.140	159.768
Primary	.919	1.601	.566	2.506	.109	57.785
Secondary HS and above®	2.470	2.101	.240	11.817	.192	726.150
<b>Education of Mother</b>			.793			
Illiterate	-22.234	40192.4	1.000	.000	.000	_
Primary	-21.604	40192.4	1.000	.000	.000	_
Secondary HS and above®	-21.055	40192.4	1.000	.000	.000	_
<b>Mid Day Meal</b>						
No	-3.653	1.037	.000	.103	.113	.198
Yes ®						
<b>Cleanliness of school</b>						
No	-2.071	.766	.007	.126	.028	.566
Yes ®						
<b>Play Material in school</b>						
No	-.793	.811	.328	.452	.092	2.216
Yes ®						
<b>Students like teacher</b>						
No	-3.326	1.329	.012	.036	.003	.486
Yes ®						
<b>Mode of transport</b>						
On foot	-17.252	28420.6	1.000	.000	.000	_
Others ®						
<b>Toilet in School</b>						
No	-.983	.957	.304	.374	.057	2.440
Yes ®						

<b>Drinking water in School</b>						
No	2.779	1.816	.126	16.104	.459	56.45
Yes ®						
<b>Reward by teacher</b>						
No	-2.024	.830	.015	.132	.026	.672
Yes ®						
<b>Comfortable with the language in school</b>						
No	-1.618	1.136	.048	.739	.058	2.002
Yes ®						

Note: ® stands for reference category

### Discussions

The p-values in Table 3, reveal that gender is a significant (p-value being 0.019) factor for respondents' liking for going to school. The odds ratio of the same table shows that males are less interested (odds ratio being 0.180) in going to school as compared to their female counterparts. Another important factor for students' liking for going to school is the provision of mid day meal. Mid day meal is provided to the students by the Government to attract them to school. Mid day meal scheme of Government has been quite successful throughout the state. Our data also support the Government claim. The variable *mid day meal* is also a highly significant factor with p-value of <.01. The odds ratio of 0.103 suggests that students are more interested in going to schools where *mid day meal* is being provided.

It has been observed during data collection that the surroundings of the schools of those villages were very unhygienic and quite grubby. Students obviously want cleanliness of their schools, which is also supported by our data set. The p-value 0.007 suggests a highly significant case and

the odds ratio of 0.126 indicates that less clean schools could attract fewer students as far as liking to go to school is concerned. Moreover, we wished to check whether students' fondness of the teachers have any effect on their students liking to go to school. A p-value of 0.012 shows significant effect of the students' fondness of the teachers on their liking to go to school. The corresponding odds ratio (0.036) suggests that students disliking of the teachers have negative impact on students liking for going to school.

Furthermore, reward by teachers significantly (p-value being 0.015) influences students liking for going to school. Students not rewarded by teachers are less willing to go to school as compared to those rewarded by teachers as evidenced by the odds ratio of 0.132. Additionally, we considered another variable called comfortable with the language in which classes are being taught. The p-value indicates a significant effect of the variable on students liking for going to school. The corresponding odds ratio suggests that those who have no problem with the language in which classes are taught are more willing to go to school.

### Conclusions

The analysis reveals that the Tiwas are an agro-based community. Their educational background as well as economic condition is very poor. Large section of the people was devoid of basic amenities of life. Similarly, infrastructural facilities in schools are also very poor. However, financial problems in their family, and loss of interest in studies or non comprehension of the syllabi, lack of connection of school knowledge with life, etc. are the prominent reasons for drop out. The mid day meal has been

highly significant in increasing the enrolment in school. The unhygienic and filthy surroundings of the schools, fondness of the teachers, reward by teachers and comfortability with the medium of instruction significantly influence students liking for going to school. It has also been felt that with the Right to Education Act (RTE) and *Rashtriya Madhyamik Siksha Abhiyan* (RMSA) coming in a big way, immediate attention to the infrastructural quality enhancement and teacher training with new dimension of teaching as outlined in RTE, should get immediate attention.

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# Village Education Committees in Uttar Pradesh: Structure and Member Profile

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## Abstract

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*Decentralised management of education through community participation and community mobilisation is conceived to be essential for successful and effective management of elementary education. Policy of decentralisation in India at the grass-root level has institutionally metamorphosed in the formation of Village Education Committees (VEC). Structure of VEC and profile of its members give a glimpse of the nature and level of community participation. Therefore, every state government including UP (Uttar Pradesh) has prescribed the structure of VEC through GO/ordinance/statutes. This study presents the structure of VEC and the profile of its members in UP. In UP, at some places VECs are formed against the norms. Low education of the members of VEC, no timely reorganisation of VEC and absence of VEC members' wards from VEC managed school denotes passive or no participation of community in educational management.*

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Management is an important component of all effectively running systems and this is true for education system also. The components of education system i.e., teachers, curriculum, methods, physical resources etc. become ineffective, if not managed properly. Increased demand of quality education from all walks of society, increasing size of school education and focus on

demand of democratic participation in public delivery system have enforced the policy makers of the country to decentralize the management of education. Although decentralisation has been an inherent part of the culture of our nation, the genesis of the system of decentralised management of present time can be traced from the 73rd and 74th Constitutional

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Amendment 1992, National Policy on Education 1986 (as modified in 1992) and the recommendations of CABE Committee on Decentralised Management of Education (1993). Owing to the aforesaid modifications mentioned in the different national policies, a three tier system of decentralised management of education, parallel to the system of Panchayati Raj Institutions has been evolved throughout the country and responsibilities of *Education for All* have been devolved to the bodies formed at district, block (intermediate) and village levels. Different states of India have legislated different structures for Village Education Committees (VECs) and assigned different roles. This paper delineates the structure of VECs under the light of rules and regulations formed by the Government of Uttar Pradesh (2000, 2006).

Government of Uttar Pradesh, under Basic Education Ordinance 1972 (as amended in 2000), has prescribed the structure of the Village Education Committees in each Gram Panchayat of the State as follows:-

Chairperson - Gram Pradhan  
(village head)  
Secretary - School Principal (service senior)  
Members - Three parents nominated by Asst. BSA. (Participation of one woman and one SC candidate is mandatory among guardian members) (Gov. of U.P. 2006). [Active Women Self Help Groups should be invited to

participate in the VEC activities. (Banerjee, A., Duflo, Glennerster and Khemani, 2006)]

This paper is based on a study conducted to see the observance of stated regulations as well as to know the innovations, if any, in the formation and organisation of the village education committees in Uttar Pradesh. The questions which the study aimed to answer were:

- Are there only five members in the VECs or some volunteers, self-help groups, women groups are also included?
- What is the demographic structure of the VEC? (Here demographic structure refers to caste, sex, tenure, age, profession, and educational qualification of the members.)
- How many children are there in the families of the VEC members?
- Do all children/wards of the members of VECs study in the schools managed by VECs?

#### Objectives of the Study

1. To know the structure of the VECs, formed under the Uttar Pradesh Basic Education Ordinance 1972 (as amended in 2000) with reference to the following demographic variables:
  - Caste and religion based participation of members.
  - Gender based participation.
  - Tenure of the members.
  - Educational levels of the members.
  - Professions of the members.
  - Age groups of the members.

- School types in which the children/wards of the families of the members of VEC study.

Justification of the above mentioned variables included in the study:

- **Caste:** Government of U.P. had regulated the membership of one person from SC/ST caste among three guardian members of the VEC.
- **Gender:** Government of U.P. had mandated the participation of one woman among three guardian members of the VEC.
- **Tenure** of the members of VEC was included to know the experiences of the members and reorganisation of VECs.
- **Educational level** of the members became important because they were the members of such a committee which was assigned administrative, academic and financial management of school in their respective villages.
- **Profession** of the members was studied to know the participation of the people of different professions.
- **Age** became a variable of the study to know the participation of the person of different age groups.
- **School type**, in which the children/wards of the family of the members were studying, was very important as it reflects the interest of the people towards school and quality of education in the schools of a Gram Panchayat (one village or cluster of two to five villages).

### **Method**

In accordance with the objectives of the study, *Survey* method was used to collect the relevant data.

### **Tool**

Interview schedules (one for Chairpersons and Secretaries of VECs and one for Members of VECs) were used to get the information about the VECs.

### **Structure of the Block**

In this study 20 VECs of one Block of District Ramabai Nagar (earlier Kanpur Dehat) in Uttar Pradesh was studied. Structure of the block was as following:

- Block – 01 (Sandalpur)
- Clusters – 10
- Gram Panchayats (G P) – 53
- VECs – 53 (*According to rule*) (*In study of 20 GP 28 VEC were found*)
- Primary schools – 109 (in 2009)
- Upper Primary schools – 61 (in 2009)
- Population – 3.5 lakh (approx., Census 2001)

### **Sampling**

One block of district Ramabai Nagar of Uttar Pradesh was selected to know the structures of the VECs, hence purposive sampling technique was used. There were ten clusters in this block where Cluster Resource Centres (*Nyay Panchayat Sansadhan Kendra*) were established and permanent officers known as NPRC Coordinators (*Nyay Panchayat Resource Centre Coordinators/NPRCC*) were appointed. The structure of a VEC could be affected by Cluster Resource Centres (CRCs) and Block Resource Centre (BRC), therefore beginning with the selection

of one block as the case, all 10 CRCs/ NPRCs had been included and two Gram Panchayats from each CRC were selected to study the structure of VECs therein. Thus, this study presents the structure of the VECs in 20 Gram Panchayats of Block Sandalpur, Ramabai Nagar, Uttar Pradesh.

### **Sample size**

Twenty Gram Panchayats were selected from all ten clusters of the block, i.e., two from each CRC. Within those 20 Gram Panchayats there were 28 VECs. As there should be one VEC in a Gram Panchayat, 20 VECs were selected in which service wise senior school principals were secretaries, which were considered as main VECs of Gram Panchayat by principals, school teachers, Pradhans (village heads) and Block Resource Centre (BRC) coordinator. In those 20 VECs there were 20 presidents, 20 secretaries and 60 guardian members. Data were collected from 20 presidents and 20 secretaries. Only two members from each VEC were selected for interviews. Thus sample size contained 80 respondents.

### **Results**

#### **Structure**

As per the government order there should be one VEC in each Gram

Panchayat, members of which should be selected through an open forum or meeting of the Gram Panchayat. But such type of member selection process was reported nowhere by the members of VECs. During this survey, variations were found against the recommendation of 'One VEC one Gram Panchayat'. Table No.1 shows that there are variations from one VEC in one Gram Panchayat to four VECs in one Gram Panchayat. At some places it was only one VEC in a Gram Panchayat of three to five villages and at some other places there were as many VECs as the number of schools in one Gram Panchayat. Two VECs were also found in one single village, one for each school in the village. Thus there was no uniformity in the organisation of the VECs in the Block. Block Resource Centre (BRC) coordinators and a few principals of the schools told that when it came to official representation of the VEC, they consider the VEC of that village or school (if formed per school) in which service-wise senior principal of school would be the secretary. Therefore in this research, VECs which were recognised by the BRC as *main* were taken into account, thus only 20 VECs, one from each Gram Panchayats were selected.

Table 1  
**Numbers of VECs in a Gram Panchayat**

No. of Gram Panchayats	No. of Consisting Villages	No. of VECs	No. of Villages representing in VEC
1	4	1	Members from two villages.
2	3	1	One member from each village.
3	1	1	_____

4	1	1	_____
5	1	1	_____
6	3	2	Main VEC representing two villages. One village has separate VEC.
7	2	2	_____
8	4	1	Members from two villages only.
9	2	1	All Members from one village only.
10	2	1	All members from one village only.
11	3	2	One village has no separate VEC and does not have a representative member in VECs of other village.
12	2	2	_____
13	3	1	One member from each village.
14	3	4	Each school has separate VEC.
15	1	2	Members are same. Secretary different. No representation of SC member.
16	3	1	All Members from one village only.
17	3	1	All Members from one village only.
18	1	1	One member was Aganwadi worker.
19	4	1	All members from one village.
20	5	1	Members from two villages.

In 6 out of 20 Gram Panchayats rule of 'one VEC One Gram Panchayat' was not followed. In one gram panchayat neither the name of the VEC members were written on the wall of the schools (as required) nor the register was maintained by the Secretary of the VEC. This Gram Panchayat consisted of three villages, two large villages and one small village, which had common VEC before two years. After that, no VEC was formulated by the new secretary who joined the upper primary school. Researcher contacted the Secretary of VEC of that time (secretary before two

years and now principal of primary school) and got the name of members during the tenure. Researcher found only one member of VEC living in that village and got the information about the VEC's activities during tenure. In the small village, principal of primary school had formed a separate VEC. In the case of non availability of the VEC members in the schools (villages) where senior principals were posted, researcher had to contact one member of VEC in that small village and obtain the data of VEC in that Gram Panchayat.

### **Chairpersons of VECs**

Chairperson or president of Village Education Committee is involuntarily selected because of the government regulation. Gram Pradhan (Village Head) is presiding over the VEC in each village. In this study, information about 20 Village Heads were collected through the direct interview schedule. But it is astonishing to find that where there are female village-heads, they do not perform the tasks of the village head due to the local culture and male dominance. Some facts about presidents of the VECs are as follows:

Out of 20 village heads nine were male (all farmers/related to agricultural works) and eleven were females (all housewives), in which one male and one female village heads were not living in their respective villages (both were living in cities, about 100 km away) all their duties were performed by their representatives in the villages.

### **Caste and Religion**

Study of castes of the members of the VECs was important because of two reasons:

- (i) Policy mandates the membership of one person from SC/ST community among three guardian members.
- (ii) To know the participation of different communities in the

village education, as in that particular area, village streets were divided on the basis of different sub-communities, i.e., caste and religion.

Caste-based report of chairman and secretary is not of much importance because they are selected involuntarily, so we come directly to the caste of guardian members. Besides caste, religion of the members was also recorded as there was a minority group in the area. Thus four types of categories were made deliberately to represent all types of sub-communities in the area, i.e., General, OBC, SC and Muslim (minority). Scheduled Tribes and other religious communities were not living in the block of the study.

- 19 out of 20 selected Gram Panchayat people from SC communities had representatives in the VECs. In one Gram Panchayat all the three members of VEC were from general caste.
- At one place, the sweeper of the school (one of the school staff) was the member representative of SC community in the VEC.
- In two Gram Panchayats two SC members were nominated.
- In one Gram Panchayat two women, both from SC community were members of VEC.
- In two Gram Panchayats one member was representing both SC community as well as females.

Table 2

#### **Caste and Religion based numbers of members interviewed**

<i>General</i>	<i>OBC</i>	<i>SC</i>	<i>Minority (Muslims)</i>	<i>Total</i>
11	11	14	4	40

**Gender:** The regulation under which VECs were formed had mandated the participation of one female guardian member among the three guardian members. It was found during the survey that at least one woman was nominated in each VEC of the block. It was also observed that in one Gram Panchayat two female members were nominated. Most of the female members were unaware or less aware about the school activities in comparison to their male counterparts. Some variations in the type of the nomination/representation here which are as follows:

- In one VEC, *Aganwadi* (ECCE) worker (who was one among the school staff, as *Aganwadi* centre was established in Primary school)

was the representative of female guardian member in the VEC.

- In two Gram Panchayats female members of VECs were residing out of their villages.
- In another case VEC was not formulated for last two years, so no female member of VEC resided in those three villages (constituting one Gram Panchayat).
- A female member of VEC said that she had never visited school, so did not know whether she was member of VEC at present or not.
- One female member of VEC explicitly said that she did not know about the members who attended the meetings of VEC held in the school premises, as her husband used to represent her in meetings.

Table 3  
**Gender of the VEC members**

<i>President of VEC</i>		<i>Secretary</i>		<i>Members Interviewed</i>	
Male	Female	Male	Female	Male	Female
09	11	17	3	26	14
20		20		40	

**Tenure of VEC members**

When the data was collected for this study, the Gram Panchayats were finishing their five-year tenure. In this area, VECs were formed with the formation of the Gram Panchayats. Most of the chairpersons and members of the VEC were experienced, as they were members for the last five years. Tenure of the secretaries depended on their seniority among the school principals of the Gram Panchayats.

- One Village Head was the chairperson of the VEC for the last 10 years and remaining 19 village heads were working as chairpersons of VECs for the last five years.
- Amongst 40 guardian members of the VEC, one member was holding the post for the last 15 years, six members were holding the post in VECs for the last 10 years, two were members for the last eight years and two were holding the

post for the last seven years. These facts show that at many places VECs were not reconstituted from time to time.

- 23 guardian members were holding the post of VECs for the last five years. Remaining six were members of VEC from one to four years.

#### **Educational levels of VEC Personnel**

It was essential to know the educational level of the persons who were planning and managing

the education for the whole Gram Panchayat (1-5 villages). In this study, education level was categorised into four main categories i.e., Illiterate, educated upto elementary, secondary and graduation and above. Here, educational qualification of president of VEC and other two members needs to be mentioned. Secretaries of VECs and Principals of schools are qualified, therefore their educational qualification need not be discussed.

Table 4  
**Educational levels of Chairpersons and Guardian members of VECs**

<i>Educational Levels of VEC personnel↓</i>	<i>Illiterate</i>	<i>Upto Elementary level</i>	<i>Upto Secondary level</i>	<i>Upto Graduation and Above</i>	<i>Total</i>
Chairpersons	3	5	6	6	20
Guardian Members	7	9	21	3	40
Total	10	14	27	9	60

Table 4 indicates that :

- Three out of 20 (15 per cent) chairpersons and 7 out of 40 (17.5 per cent) guardian members were illiterate.
- Five (25 per cent) chairpersons and nine (22.5 per cent) guardian members were having education up to elementary level. In a similar study conducted in 1998-99 in Haryana, all VEC members were reported to be formally educated up to secondary level and above (Menon, 1998). It is also true that members of low educational level in such type of institutions do not have their say in the meetings and

are not able to raise their issues, unless they are properly oriented and trained for their duties (Varghese and Zaidi, 1999).

- Only six (30 per cent) chairpersons and three (7.5 per cent) members were having educational qualification up to graduation and above level.

Under U.P. government rules, Panchayat Head must be the chairman of VEC thus they were selected involuntarily. But in case of educational level of guardian members, it is the Assistant Basic Shiksha Adhikari (ABSA) who nominates and the secretary of VEC suggests the names

of the members. They have the right to select highly educated guardian members but they do not do it in most of the cases. It cannot be said that the area concerned does not have higher education facilities. It has graduates in villages because this district has about 20 Degree colleges including one which has completed four decades. Many in these villages have attended and are attending degree colleges in the nearby districts i.e., Aurraiya (16 K.M. from the block centre) and Kanpur Nagar (at a distance about 80 K.M.).

#### **Profession of the members**

Professions of members of VEC were divided into following categories:

##### **1. Agricultural works**

20 members (50 per cent) out of 40 were engaged in agriculture.

##### **2. Laborer**

Seven members (17.5 per cent) were labourers by professions

##### **3. Teacher**

Two members (5 per cent) were teachers, (one was in private school and one has retired as principal from a government primary school).

##### **4. Self-employed**

Six out of 40 members (15 per cent) were self employed (i.e. shopkeeper, taxi driver etc).

##### **5. Housewife**

Five guardian members (12.5%) were housewives. Nine *chairpersons* (all males) were involved in agricultural works and 11 *chairpersons* (all females) were housewives.

#### **Age of the Members of VECs**

In the block of the study a variation had been found regarding the age of the members of VEC which ranges from 25 years to 75 years. Overall view of the block (Table 5) shows that most of the members of the VECs were middle aged.

Table 5  
**Age of the members of the VECs**

<i>Age group in years</i>	25-35	36-45	46-55	56-65	66-75
No. of members	14 (35%)	15(37.5%)	8(20%)	2(5%)	1(2.5%)

#### **Children/wards in the families of the members of VEC and details of their education:**

In this study, members of VECs were asked to report the details of children in their families between six and fourteen years of age and the children studying in Class I to Class VIII. As joint families existed in the area of study the term 'children in the family'

was used. The term connotes members' sons, daughters and children of their relatives (brother, sister etc.), whose education is guarded by them (members of VECs).

#### **Schooling of chairperson's children/wards**

Out of 20 village heads (VHs) 19 have children belonging to six to

fourteen (6-14) age group. Out of 19 VHs who have school-going children only four were sending their wards to Government school, one VH has sent his children in both type of schools and fourteen VHs were sending their wards to private schools. Among the school going children from the families of village heads, some are commuting a long distance for education, while the government is providing school within the range of one kilometre. Only the wards of six VHs were studying in their own villages, three VHs' wards were commuting 2-4 km daily and four VHs' wards were commuting 10-16 km daily. While six VH's wards were studying 40-100 km away from their homes. Most of these children commuted in the buses sent by private English medium schools situated in the nearby towns.

#### **Schooling of children of VEC Secretaries and their school types:**

In this study, data related to the schooling of children of secretaries of VECs were collected from twenty Gram Panchayats.

- Eight VEC secretaries belonged to general caste. Three had no school going child in their families. Remaining five send their wards to private schools. Most of those children were commuting 10 to 20 km daily.
- Three VEC Secretaries belonged to OBC caste group. Among them one had no school going child in her family. One had his wards studying in private school. Another member reported sending his/her ward to government school was of 59 years old.
- Six VEC secretaries belonged to the SC caste. One had no ward in the family, four reported that their wards were in government schools and one had wards in both type of schools. (Ages of the secretaries who had children in their families ranged between 42 and 61. Age distribution shows that it is possible that secretaries might have informed about the children of their relatives not about their own sons and daughters.)
- Three VEC secretaries were from minority group (Muslim). Two had no wards in their families and one had nine wards of school going age in his family. All his wards were attending private schools.

#### **Guardian-members' children**

Among 40 guardian members, two had no children. Remaining 38 members had children of 6-14 years age group in their families:

1. Six members had one child of 6-14 years age group in their families.
  - Five were sending their wards to Government school and
  - One was sending his ward to private school.
2. Thirteen members were having two children in their family.
  - Nine members' wards were in government schools.
  - One member got his ward enrolled in private school at the distance of 3 km.
  - Three members of VECs were sending their wards to both type of schools (government and private). Out of these three members, two had one girl

and one boy in their families. Boys were going to private schools and girls were going to government schools.

3. Ten members of VECs had three children in their families:

- Four members had their wards in government schools.
- Three had their wards in private school.
- Three members' wards were going to both types of schools. Among these three members, two were having one boy and two girls. Boys of both members were attending private school. One was sending girls to government schools and other was sending them to both types of schools. One ward of these members was commuting 15 km daily.

Four members had four children of school-going age in their families. One was sending all his wards to government run school and three were sending their wards to both types of schools. Among the members who were using both types of schools for educating their children, two were having one girl child. One of the member's girl child was attending private school and other was attending government school. School distance of these four members wards were 0, 20, 50 and 2 km respectively.

Three members were having five school-going children in their families. Two were sending all of them to government schools and one was sending children to both types of schools.

One member, having six children, was sending them to both types of schools. All three boys were in private schools and girls were in both types of schools.

One VEC member had nine children in his family, all three girls were attending government school and boys were attending both types of schools.

#### **Tenure of the members and school type of children**

- One person was a member of VEC since last 15 years but all his wards were attending private school.
- One person was guardian member of VEC since last ten years but his wards were not attending VEC-managed government schools.
- Three members were members of VEC since last five years but all their wards were attending private schools.

Remaining 35 members were sending their wards to government schools or to both types of schools. Five members who were not sending their wards to government schools (VEC managed schools) were members of VECs against the government directions.

#### **Caste and religion of the members and school types of their children**

- There were 11 general caste members, 6 out of these 11 got their wards enrolled in government schools, one in private school and four in both types of schools. Among four members who sent their wards to both types of schools, first had one boy in private school and one

girl in government school, second member had one boy in private school and two girls in government school, third member of VEC had three boys in both types of schools and fourth member had four girls in both types of schools.

- There were 11 VEC members belonging to OBC group. Seven members had their wards in government schools, one member had her wards in private schools and three members had their wards in both types of schools. Among three members who had their wards in both type of schools, first member had one boy in private school and two girls in both types of schools; second member had one boy in private school and one girl in government school and third member had three boys in both types of schools and one girl in private school.
- Fourteen members belonged to SC community. One member had no children. Seven members had their children in government schools. Two members had their wards in private schools and four members had their wards in both types of schools. The members who had their children in both types of schools, first had three boys in both types of schools and one girl in government school; second had four boys in both types of schools

and one girl in private school; third member's three boys were attending private schools and three girls were attending government schools and fourth member had six boys in both types of schools and three girls in government schools.

- Four members belonged to Muslim community. Out of four only three had school going children, first member's ward was in government school, second member's ward was in private school and third member's wards (two boys) were in both types of schools.

Thus the caste of the members does not seem to affect the members of VECs for their children. But the gender of the wards seems to be an affecting factor in the choice of the schools of guardians, as many of the guardian members had chosen government schools for their girls and private schools for their boys.

Overall five VEC guardian members out of forty interviewed in the block had no child attending the government school managed by Village Education Committees. While under the government rules and regulations three guardian members of VEC must be the guardians of children studying in the school. (U.P. 2000 as cited in U.P.2006)

To conclude, it can be said that rules and regulations, under which VECs were formed in Uttar Pradesh, were not observed strictly. There was

Table 7

**School type of children of Guardian Members of VECs**

<i>Government School</i>	<i>Private School</i>	<i>Both types of schools</i>	<i>No child in Family</i>	<i>Total</i>
21	5	12	2	40

no unanimity in the structures of VECs. Ordinance says one VEC in one Gram Panchayat, but the VECs were formed in different ways, i.e., Gram Panchayat wise, village wise and school-wise. Local needs were not taken into account during the formation of VECs. Also, general meetings of Gram Panchayat or meetings of all guardians of school children were not conducted for the formation of VECs. Some members did not know that they were still members of VEC (as also found by Banerjee, Banerji, Duflo, Glennerster and Khemani, 2006 in a study conducted in Jaunpur district, U.P.). Consequently local educational needs were not fulfilled in the case of building construction, maintenance, and enrolment. VECs were not revived annually or time to time. A few persons were members of VECs whose children were not attending the school managed by VECs. No volunteer or member of women self-help groups were included beyond mandated five member structure. There was also variation in the caste-based participation of the members. In one VEC no candidate of SC community was included which was against the norms. Most of the children

from the families of president and secretaries and members of VECs were not attending the schools managed by VECs which shows that the members of VECs were not interested in the good management of schools or believe that these government schools are not providing proper educational facilities. In four or five cases members of VECs were sending their boys to private schools and girls to government schools. Only in one case a girl was studying in private school and boys were going to both types of schools. Children studying in lower classes were attending schools in their own villages and children of upper classes were going to schools (private or government) in other villages which are thought to be better by their guardians. Affluent people of the block were sending all their wards (of all classes) to private schools which were providing school buses. Therefore, we cannot hope to seek the favour of whole village community for better management of the government schools. The concept of decentralisation through community participation still needs more efforts and voluntary involvement of the people.

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# The Relationship between Students' Motivation to Learn and Teachers' Self-efficacy in Mathematics among Secondary School Students in Kenya

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P. N. SINGH\*\*

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## Abstract

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*This study focuses on the relationship between students' motivation to learn and teachers' self-efficacy in mathematics. It was found that there is a significant gender difference in motivation to learn mathematics, favouring males. Students' motivation to learn did not differ significantly with respect to locality. Teachers' self-efficacy in mathematics significantly contributed to the prediction of motivation to learn mathematics. Mathematics teachers should enhance students' motivation to learn especially for females. Teachers and educators should place emphasis on awareness of sources and enhancement strategies of teachers' sense of efficacy for students' success in mathematics.*

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In Kenya, greater emphasis is being placed on industrial and technological development (KIE, 2002). As a result students are being encouraged to take up science-related subjects. One subject that cuts across all sciences is mathematics. Mathematics is just one among many subjects which are included in the school curriculum, yet there is great pressure for children

to succeed in mathematics when compared to other subjects. Indeed, mathematics plays a fundamental role in the life of human beings, and life without mathematics is almost an impossibility (Cockcroft, 1982). Kenya relies, to a great extent, on its human resource power to meet the challenges of the technological developments, and a substantial

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core of mathematics is needed to prepare students for their involvement in these challenges. Furthermore, those students who understand and can do mathematics will have significantly enhanced opportunities and options for shaping their future (Bandura et al., 2001). In the move towards scientific and technological advancement, Kenya needs nothing short of good performance in mathematics at all levels of schooling. Unfortunately, the performance of students in mathematics at the end of secondary education has not improved in the past decade (KNEC Statistics, 2009). Indeed, Middleton and Spanias (1999) indicated that children enjoy mathematics in the primary grades, but this enjoyment tends to fall drastically when children reach secondary school.

Several factors cause poor performance in mathematics such as, negative attitude towards the subject, lack of interest in the subject, use of traditional methods of teaching and so on. According to Tella (2007), of all the personal and psychological variables that have attracted researchers, motivation seems to be gaining more popularity and leading other variables. Therefore, the issue of motivation of students and the impact on academic performance is considered as an important aspect of effective learning. Infact, psychologists believe that motivation is a necessary ingredient in learning (Biehler and Snowman, 1997; Brophy, 2004; Huitt, 2001; Ormrod, 2006; Stipek, 1998). It is believed that satisfactory school learning is unlikely to take place in the absence of sufficient

motivation to learn (Brophy, 2004; Stipek, 1998). A motivated learner strives to understand the subject matter, seeks challenges and persist on tasks even in the face of difficulties (Meece et al. 2006; Pajares and Schunk, 2001). Furthermore, Bandura (1994) suggested that motivation can manifest itself in various forms such as effort expended, persistence and choice of activities.

In Kenya, despite the poor performance in mathematics at the end of secondary school education, there is lack of information on the influence of teachers' self-efficacy in the learning of mathematics. Specifically, the influence of teachers' efficacy in motivation to learn mathematics has received no attention. Skaalvik and Skaalvik (2010) defined teacher efficacy as teacher's beliefs in the ability to plan, organise, and carry out activities required to attain given educational goals. More specifically, it is the confidence that a teacher holds about his/her individual and collective responsibility to influence student learning (Klassen et al., 2010). Bandura (1986, 1994, 1997) identified four sources that impact personal efficacy. They are (i) mastery experiences, (ii) vicarious experiences, (iii) verbal persuasions, and (iv) physiological/emotional states.

Teacher self-efficacy has been found to be one of the important variables influencing positive teaching behaviour and student outcomes. It is strongly related to job satisfaction and students' achievement (Caprara et al., 2006) and affects the efforts teachers invest in teaching, the goals

they set, and their levels of aspiration (Tschannen-Moran and Hoy, 2001). Among other things, efficacious teachers plan more (Bembenuddy, 2007; Gibbs, 2002), persist longer with students who struggle (Tschannen-Moran and Hoy, 2001), are less critical of students who make errors and work longer with low ability students (Hoy and Davis 2006). According to Bruce et al. (2010), generally it appears that students learn more from high efficacious teachers when compared to what they learn from those teachers whose sense of efficacy is low.

In the present study, it is hypothesised that students' motivation to learn is related to teachers' self-efficacy in mathematics. The four dimensions of motivation to learn, which are the focus of this study are: (i) attention, (ii) relevance, (iii) confidence or expectancy for success and (iv) satisfaction (Brophy, 2004; Driscoll, 2005; Keller, 1999, 2006). Tschannen-Moran et al. (1998) suggested that the major influences on efficacy beliefs about teaching are cognitive interpretations of the four sources of self-efficacy information as described by Bandura (1986, 1994, 1997). These sources of efficacy and other strategies for enhancing teacher efficacy as suggested in this study can be more effective if the relationship between students' motivation to learn and teachers' self-efficacy is established. In Kenya, such empirical evidence is lacking and hence the need for this study.

The purpose of this study is to determine whether:

- (i) motivation to learn vary with respect to gender and locality, and
- (ii) teachers' self-efficacy makes a significant contribution to the prediction of motivation to learn mathematics among secondary school students in Kenya.

### **Null Hypotheses**

(All hypotheses are tested at 0.05 level of significance).

**H01 :** There is no significant gender difference in motivation to learn mathematics among secondary school students.

**H02 :** There is no significant difference in motivation to learn between rural and urban secondary school students.

**H03 :** There is no significant contribution of teachers' self-efficacy to motivation to learn mathematics among secondary school students.

### **Method**

The descriptive survey method was used in the study.

### **Sample**

The subjects for the study were drawn from twenty four randomly selected public secondary schools from Nakuru County Region of Kenya. Simple random sampling was used in the selection of schools. The sample included students from boys schools, girls schools and mixed schools. In all, a total of 493 secondary Form Four students (256 males and 237 females) were randomly selected from the sample classes.

### Instrumentation

In carrying out the study, the Students' Motivation to Learn Mathematics (MTL) scale (Keller, 2006), and Teacher's Self-Efficacy in mathematics (TSE) scale (Skaalvik and Skaalvik, 2010) were used. The MTL consisted of 34 items. Twenty five items are positively worded and nine items are negatively worded. The items were scored on a five-point scale from strongly disagree (=1) to strongly agree (=5). Keller (2006) reported on alpha reliability of 0.95 for the scale. The TSE scale consisted of 24 items. The scale has six-subcales. All the items are presented in the form of positive statements, and the responses were scored on an 11-point scale (Bandura, 2006) from 0 (the lowest) to 10 (the highest). The cronbach's alpha coefficients for the subscales were 0.83, 0.90, 0.83, 0.91, 0.77 and 0.81 respectively. On the basis of the magnitude of the reliability coefficients of the two scales, which were also

reported to be valid, the instruments were found to be adequate for testing purposes. They were subsequently administered to the subjects at the second term (May to July, 2011) of the academic session in Kenya.

### Data Analysis

The t-test, Pearson's correlation coefficient ( $r$ ) and ANOVA were used for data analysis.

### Results

The results are presented in the following tables:

The result of the t-test (Table 1) indicates that there is a significant difference between male and female students in motivation to learn mathematics, favouring males (HO1 is rejected).

The result of the t-test (Table 2) indicates that there is no significant difference between rural and urban students in motivation to learn mathematics (HO2).

Table 1  
t-test of the mean scores of male and female students  
in motivation to learn mathematics

S.No.	Gender	N	Mean	SD	t-value	p-value	significance
1	Male	256	129.70	14.71	3.172	0.002	S*
2	Female	237	125.33	15.92			

df = 491, Table-value of t = 1.96, S\* = Significant at 0.05 level.

Table 2  
t-test of the mean scores of rural and urban students  
in motivation to learn mathematics

S.No.	Locality	N	Mean	SD	t-value	p-value	significance
1	Urban	283	127.5618	15.41	-0.064	0.949	NS
2	Rural	210	127.6524	15.51			

df = 491, Table-value of t = 1.96, NS = Not significant

Table 3  
**Simple regression of students' motivation to learn on teachers' self-efficacy in mathematics of total sample (N = 493)**

	<i>Dependent variable</i>	<i>r</i>	<i>r</i> <sup>2</sup>	<i>Constant</i>	<i>df</i>		<i>F</i>	<i>p - value</i>	<i>Significance (F)</i>
					<i>k</i>	<i>N-k-1</i>			
1	Motivation to learn	0.187	0.035	106.363	1	491	17.70	0.000	S
	<i>Independent variable</i>	<i>beta (β)</i>		<i>regression coefficient</i>				<i>p - value</i>	<i>Significance (β)</i>
1	Teacher self-efficacy	0.187		0.114	-			0.000	S

S = Significant at 0.05 level., df = degrees of freedom

The results in Table 3 show that F-value from ANOVA was significant at 0.05 level. Teachers' self-efficacy explained 3.5 per cent of variance in motivation to learn mathematics. The result of the F-ratio indicate that there is a significant contribution of teachers' self-efficacy to the prediction of motivation to learn mathematics of total sample (HO3 is rejected).

### Discussion

From the analysis of data, it was found that students' motivation to learn mathematics was moderate. There was a significant difference between male and female students in motivation to learn, favouring males. This agrees with the finding of Tella (2007), who indicated that motivation has an impact on academic achievement of secondary school students in mathematics and that boys reported a significantly higher ( $p < 0.05$ ) motivation than girls. Meece et al. (2006) argued that when students are motivated, they persist longer on tasks, conquer more challenges, and achieve more in their academic endeavours.

Driscoll (2005) and Keller (1999) have provided the motivational

techniques (based on Keller's ARCS model) that can be applied to classroom or similar settings in an effort to promote academic achievement. The techniques are: begin the lesson by telling students what you want to accomplish, make students set short term goals, use spoken or written praise, use test and grades judiciously, capitalise on the arousal of suspense, discovery, curiosity, exploration, control and fantasy, use familiar materials for examples, make students use what they have previously learned, use simulation and games, minimise unpleasant consequences of student involvement and so on. These techniques could be easily applied or integrated in the mathematics classroom. Therefore, teachers need to conduct activities during class time that would develop enthusiasm in mathematics, thus enhancing students' motivation in learning mathematics. Special attention must also be given to female students so as to reduce the gap in motivation between male and female students. It was also observed that motivation to learn did not significantly vary with respect to locality, and this is remarkable.

The results also revealed that there is a positive significant correlation between motivation to learn and teachers' self-efficacy in mathematics. This means that any increase in teachers' efficacy in mathematics is associated with a corresponding increase in students' motivation to learn mathematics. Furthermore, it was found that teachers' self-efficacy made a significant contribution to the prediction of students' motivation to learn mathematics. These findings correspond with the claim that teachers' self-efficacy beliefs are significantly related to students' achievement (Caprara et al. 2006; Singh, 2010). The implication that arises is that mathematics teachers should be aware of the sources of efficacy that influence teacher efficacy. Bruce et al. (2010) posits that the four sources that influence teacher efficacy are: (i) mastery experiences (i.e., direct teaching experiences that are challenging but successful), vicarious experiences (i.e., watching peer teachers of similar ability teach challenging ideas with success), (iii) verbal persuasions (i.e., receiving positive feedback from students, peer teachers and superiors, and (iv) emotional states (i.e., feelings of success and confidence). The resultant efficacy judgments influence the goals teachers set for themselves, the effort they invest in teaching to achieve these goals, and their persistence when facing difficulties. Furthermore, Dembo and Gibson (1985) suggested strategies for enhancing teachers' sense of efficacy. These are: (i) providing preservice

teachers with a range of experiences in different social contexts, (ii) providing teachers with strategies to deal with student failure and help them analyse specific aspect of their teaching so that they can identify the sources of their sense of inefficacy, (iii) analyse the differences between teaching efficacy and personal teaching efficacy in order to determine needs of various teachers, (iv) develop school programmes to help new teachers deal with the role transition from student teaching to full-time classroom instruction, (v) providing teachers with accurate feedback regarding their performance, (vi) assessing the social norms and incentive in the school organisation that may enhance or impede teachers' organisational involvement, (vii) evaluating administrative leadership styles to determine how they may affect teacher involvement in decision making, (viii) encouraging collegial approaches to personal and organisational problem solving, and (ix) providing teachers with skills and opportunities to interact more effectively with parents. These strategies can help teachers improve their efficacy beliefs about teaching, which appears to be related to motivation and achievement in mathematics.

### **Conclusion**

The findings of this study showed that male students had a significantly better motivation to learn mathematics than female students. Therefore, mathematics teachers should put more effort to ensure that both boys and girls are equally motivated. There was no significant difference

in motivation to learn mathematics between rural and urban students and this is remarkable. Teachers' self-efficacy significantly contributed to the prediction of motivation to learn mathematics among secondary

school students. Therefore, it emerges that teachers' self-efficacy plays an important part in the development of students' motivation to learn mathematics among secondary school students in Kenya.

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# 5E Model in Science Classroom

## A Shift towards Constructivism

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### Abstract

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*Learning by doing is the essence of science and for science classroom, constructivism seems promising learning philosophy. Constructivism is the buzz word of learner-centred education, today we find textbooks structured on the philosophy of constructivism. Unfortunately, the type of pedagogical approach students facing in science classrooms is still old fashioned, behaviouristic one. Science teacher is an important person in structuring and guiding students' understanding of living in the changing world. They play the role of facilitator and help students to bridge between nature of science and inquiry practices. They also need to learn new ways of pedagogical sciences to promote scientific literacy based on inquiry-oriented classroom. For practising constructivist methods in science classrooms, there is need to restructure the curriculum of teacher education and to orient pre-service and in-service teachers towards using these constructivist strategies in classroom. In our country still prospective science teachers are practising their teaching based on contemporary teaching models of Herbart, Bloom indirectly emphasising behaviourism. These teachers use the oldest and the most traditional approach, deductive reasoning that focuses on the content of the science organised from general concepts to particular concepts, with less emphasis on the development of skills. Teachers need to change their lesson plan format from behaviourist to constructivist one. Several studies have shown that instructions based on 5E model has positive impact on academic achievement and attitude towards learning among students. In the light of these, in the present paper, the authors attempt to enlighten the 5E model based on constructivism and tries to comprehend its usage in our science classrooms for better understanding of scientific concepts.*

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### **Introduction**

Today school science curricula are commonly placed on a continuum from 'textbook-centred' to 'teacher-centred' and the textbook is the vehicle that drives the teaching. The present science textbooks are restructured on the guidelines of constructivism philosophy. Constructivist teaching offers a bold departure from traditional objectivist classroom strategies. The goal is to make the learner play an active role in assimilating knowledge onto his/her existing mental framework. The ability of students to apply their school-learned knowledge to the real world is valued over memorising bits and pieces of knowledge that may seem unrelated to them. The constructivist approach requires the teacher to relinquish his/her role as sole information-dispenser and instead, to continually analyse his/her curriculum planning and instructional methodologies. Clearly, the constructivist approach opens new avenues for learning as well as challenges for the teacher trying to implement it.

Research in science education indicates that an effective method of teaching includes the use of constructivist learning theory to promote student learning. Constructivist theory allows students to construct their own knowledge about a concept by integrating their prior knowledge views with new information that is being presented. Through this method of instruction, student learning is inquiry-based, as students are more actively engaged in doing science, they are more motivated

to learn and they develop higher-order thinking skills. The main objective of this instructional application is to improve student knowledge outcomes through the creation of a more effective learning community which may more accurately reflect real-life employment settings. Student-based instructional models have been linked to greater learning gains (Blumberg, 2008), greater student autonomy (Bruton, 2005), and greater student opportunities for leadership (Gressick and Derry, 2008). The 5E Model/5E Learning Cycle is an inquiry approach originating with the Science Curriculum Improvement Study. Robert Karplus and his colleagues based the learning cycle format on Piaget's cognitive development principles. Students "learn through their own involvement and action...the goal is to allow students apply previous knowledge, develop interests, and initiate and maintain a curiosity toward the materials at hand" (Trowbridge and Bybee, 1990).

The findings of several studies suggest that the Biological Science Curriculum Study (BSCS) 5E Instructional Model is effective than alternative teaching methods in helping students reach important learning outcomes in science. For example, several comparative studies suggest that the BSCS 5E Instructional Model is more effective than alternative approaches at helping students master science subject matter (for example, Akar, 2005; Coulson, 2002). Coulson (2002) also explored how varying levels of fidelity

to the BSCS 5E model affected student learning. Coulson found that students whose teachers taught with medium or high levels of fidelity to the BSCS 5E Instructional Model experienced learning gains that were nearly double when compared to students whose teachers did not use the model or used it with low levels of fidelity. However, some studies indicated that the BSCS 5E Instructional Model had a positive effect on scientific reasoning (Boddy, 2003) and on interest and attitudes toward science (Akar, 2005; Boddy, 2003; Tinnin, 2001). One study reported a decrease in understanding of the nature of science among middle school students who used field-test curriculum materials based on the BSCS 5E Instructional Model (Meichtry, 1991). Given the novel and unfinished nature of the field-test curriculum materials, these results should probably be considered in the light of Coulson's (2002) findings about the impact of fidelity of use on learning gains, described previously.

Marek, Eubanks and Gallaher (1990) examined the relationship that exists between high school science teachers' understanding of the Piagetian developmental model of intelligence, its inherent teaching procedure – the 5E Learning Cycle – and classroom teaching practices. The teachers who exhibited a sound understanding of the Piagetian model of intelligence and the learning cycle were able to successfully integrate their students' laboratory experiences with class discussions to construct science concepts. Caprio (1994)

published a study that compared a class in which the traditional (lecture) methodology was used with 5E Learning Cycle method. The exam grades were much higher for the class that used constructivist methodology. In addition to the test scores, the experimental group had a high energy level and gave positive feedback on the course. It also enhances teachers' classroom behaviors. Bevenino, Dengel and Adams (1999) have explored 5E Learning Cycle approach and concluded that 5E Learning Cycle approach encourage students to develop their own frames of thought and it is effective in the classroom. Balci, and Tekkaya (2003) investigated the effects of the 5E Learning Cycle, conceptual change texts, and traditional instructions on 8th grade students' understanding of photosynthesis and respiration in plants. The results showed statistically significant difference between the experimental and control groups in the favour of experimental groups after treatment. However, no statistically significant difference between two experimental groups (5E versus conceptual change text instruction) was found. Castori, Davis; (2006) looked at the relationship between the use of teaching strategies consistent with the Constructivist Learning Model (CLM) in secondary science classrooms and the attitudes of students toward science and found a significant increase in positive student's attitudes toward science. Orgill and Thomas (2007) described the use of analogies for each of the

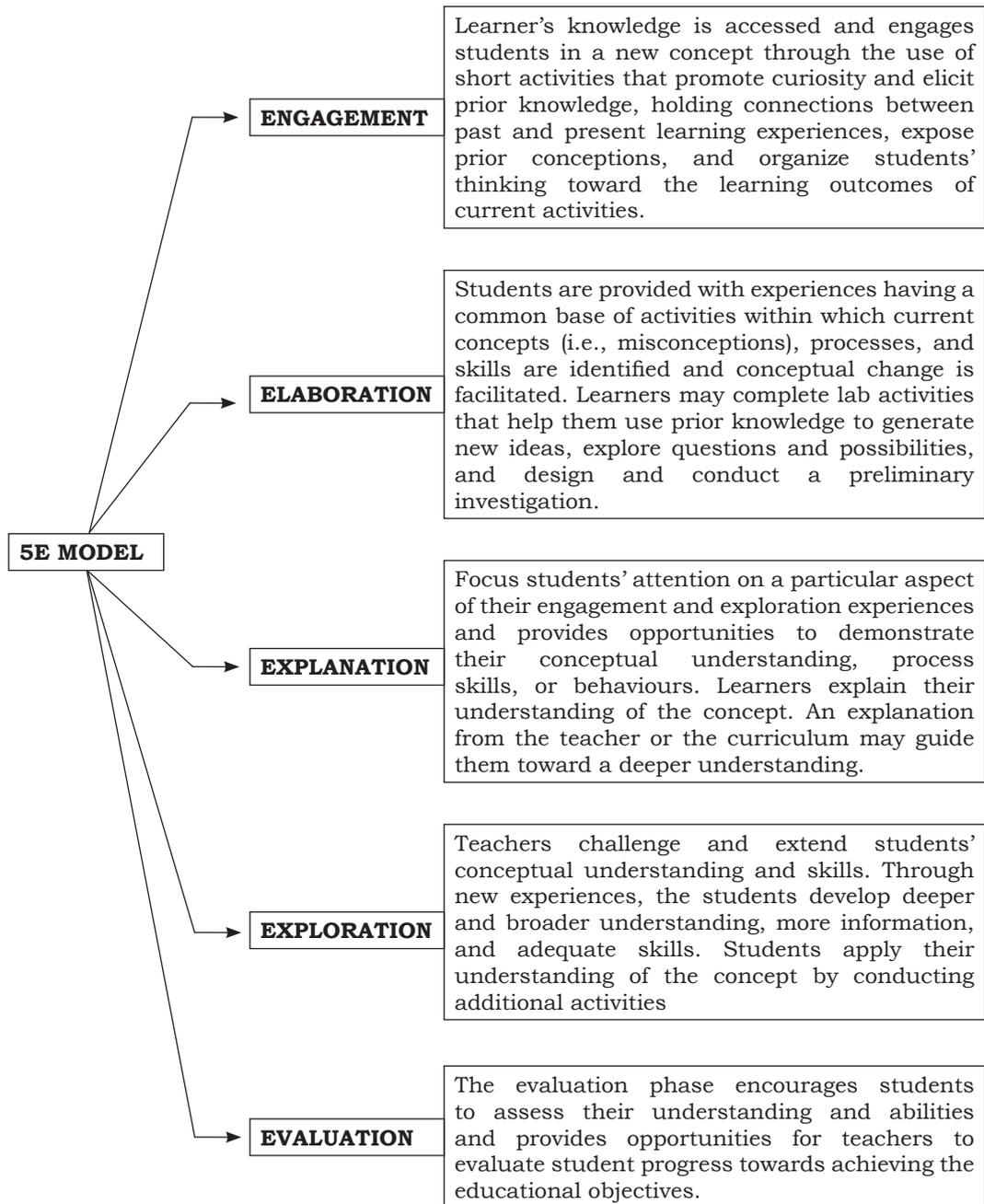
steps of the 5E model. They argued analogies motivate and help students visualise abstract concepts by comparing a familiar concept or the analog with a new concept referred to as the target. Cardak, Dikmenli and Saritas (2008) studied about the Effect of 5E instructional model in student success in primary school 6th year circulatory system topic and a significant difference between post test score of control and experimental group has been found. Pirasa, Tirgil and Tekbiyik (2008) studied about the effect of learning environment with 5E Model and Dynamic Geometry Software Cabri on Learning Levels. It is concluded that, activities developed for Cabri as to 5E model, affect students' learning positively and improve their thinking abilities.

### **What is 5E Model?**

In 1997 (BSCS) Biological Science Curriculum Study (Colorado), a team whose Principal Investigator is Roger Bybee, received a grant from IBM to conduct a design study that would produce specifications for a new science and health curriculum for elementary schools. Among the innovations that resulted from this design study was the BSCS 5E Instructional Model for constructivism, called the 'Five Es'. The BSCS model has five phases: engagement, exploration, explanation, elaboration, and evaluation. *Engagement:* The

activities in this section captures the students' attention, stimulates their thinking, and helps them access prior knowledge. *Exploration:* Students are given time to think, plan, investigate, and organise collected information. *Explanation:* Students are now involved in an analysis of their explorations. Their understanding is clarified and modified because of reflective activities. *Elaboration:* This section gives students the opportunity to expand and solidify their understanding of the concept and/or apply it to a real world situation. *Evaluation:* Evaluation occurs throughout the lesson. The teacher should observe students' knowledge and skills along with their application of new concepts and a change in thinking. Designed primarily by science educators for secondary science teaching, the 5E model has a classic constructivist structure.

In 5E Model initial phase is designed to engage the learner's prior knowledge and final phase, to evaluate the student's understanding. 5E Instructional Model, or the 5Es, consists of the following phases: engagement, exploration, explanation, elaboration, and evaluation. Each phase has a specific function and contributes to the teacher's coherent instruction and to the learners' formulation of a better understanding of scientific and technological knowledge, attitudes, and skills (see Figure 1).



**Figure 1:** Outline of BSCS 5E Model (Source: Bybee et, al. 2006)

The model use the work of Jean Piaget (Piaget and Inhelder, 1969; Piaget, 1975) and subsequent research consistent with the Piagetian theory, specifically the focus of cognitive sciences and the work on misconceptions, the difference between novice and expert explanations of phenomena, and naive versus canonical theories.

Briefly, the theory underlying BSCS 5Es views learning as dynamic and interactive. Individuals redefine, reorganise elaborate, and change their initial concepts through interaction with their environment, other individuals, or both. The learner 'interprets' objects and phenomena and internalises the interpretation in terms of the current experience encountered. To change and improve conceptions, it is necessary to challenge the students' current conceptions and showing them to be incomplete or inadequate. If a current conception is challenged, there must be opportunity, in the form of time and experiences, to develop a

more accurate conception. In sum, the students' construction of knowledge can be assisted by using sequences of lessons designed to challenge current conceptions and provide time and opportunities for reconstruction to occur.

In summary, the BSCS 5E Instructional Model, is grounded in sound educational theory, has a growing base of research to support its effectiveness, and has had a significant impact on science education. While encouraging, these conclusions indicate that it is important to conduct research on the effectiveness of the model, including when and how it is used, and continue to refine the model based on direct research and related research on learning. To ensure that the materials have the greatest chance of being implemented in the way they were intended and to honour the integrity of the 5Es, BSCS developed two charts that explicitly show the salient characteristics of each stage of the 5Es (see Tables 1 and 2).

Table 1  
**The BSCS 5E Instructional Model: What the Student Does**  
(Source: Bybee *et al.* 2006)

<i>Stage of the Instructional Model</i>	<i>The BSCS 5E Instructional Model: What the Student Does</i>	
	<i>That Is Consistent with This Model</i>	<i>That Is Inconsistent with This Model</i>
<i>Engagement</i>	<ul style="list-style-type: none"> <li>• Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"</li> <li>• Shows interest in the topic</li> </ul>	<ul style="list-style-type: none"> <li>• Asks for the "right" answer</li> <li>• Offers the "right" answer</li> <li>• Seeks one solution</li> </ul>

<i>Exploration</i>	<ul style="list-style-type: none"> <li>• Thinks freely, within the limits of the activity</li> <li>• Tests predictions and hypotheses</li> <li>• Forms new predictions and hypotheses</li> <li>• Tries alternatives and discusses them with others</li> <li>• Suspends judgment</li> <li>• Records observations and ideas</li> <li>• Asks related questions</li> </ul>	<ul style="list-style-type: none"> <li>• Lets others do the thinking and exploring (passive involvement)</li> <li>• “Plays around” indiscriminately with no goal in mind</li> <li>• Stops with one solution</li> </ul>
<i>Explanation</i>	<ul style="list-style-type: none"> <li>• Explains possible solutions or answers to others</li> <li>• Listens critically to others’ explanations</li> <li>• Questions others’ explanations</li> <li>• Listens to and tries to comprehend explanations that the teacher offers</li> <li>• Refers to previous activities</li> <li>• Uses recorded observations in explanations</li> <li>• Assesses own understanding</li> </ul>	<ul style="list-style-type: none"> <li>• Proposes explanations from ‘thin air’ with no relationship to previous experiences</li> <li>• Brings up irrelevant experiences and examples</li> <li>• Accepts explanations without justification</li> <li>• Does not attend to other plausible explanations</li> </ul>
<i>Elaboration</i>	<ul style="list-style-type: none"> <li>• Applies new labels, definitions, explanations, and skills in new but similar situations</li> <li>• Uses previous information to ask questions, propose solutions, make decisions, and design experiments</li> <li>• Draws reasonable conclusions from evidence</li> <li>• Records observations and explanations</li> <li>• Checks for understanding among peers</li> </ul>	<ul style="list-style-type: none"> <li>• Plays around with no goal in mind</li> <li>• Ignores previous information or evidence</li> <li>• Draws conclusions from thin air</li> <li>• In discussion, uses only those labels that the teacher provided</li> </ul>
<i>Evaluation</i>	<ul style="list-style-type: none"> <li>• Answers open-ended questions by using observations, evidence, and previously accepted explanations</li> <li>• Demonstrates an understanding or knowledge of the concept or skill</li> <li>• Evaluates his or her own progress and knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Draws conclusions, not using evidence or previously accepted explanations</li> <li>• Offers only yes-or-no answers and memorised definitions or explanations as answers</li> <li>• Fails to express satisfactory explanations in his or her own words</li> </ul>

Table 2.  
**The BSCS 5E Instructional Model: What the Teacher Does**  
 (Source: Bybee et al. 2006)

<i>Stage of the Instructional Model</i>	<i>The BSCS 5E Instructional Model: What the Teacher Does</i>	
	<i>That Is Consistent with This Model</i>	<i>That Is Inconsistent with This Model</i>
<i>Engagement</i>	<ul style="list-style-type: none"> <li>• Creates interest</li> <li>• Generates curiosity</li> <li>• Raises questions</li> <li>• Elicits responses that uncover what the students know or think about the concept or topic</li> </ul>	<ul style="list-style-type: none"> <li>• Explains concepts</li> <li>• Provides definitions and answers</li> <li>• States conclusions</li> <li>• Provides closure</li> <li>• Lectures</li> </ul>
<i>Exploration</i>	<ul style="list-style-type: none"> <li>• Encourages the students to work together without direct instruction from the teacher</li> <li>• Observes and listens to the students as they interact</li> <li>• Asks probing questions to redirect the students' investigations when necessary</li> <li>• Provides time for the students to puzzle through problems</li> <li>• Acts as a consultant for students</li> <li>• Creates a 'need to know' setting</li> </ul>	<ul style="list-style-type: none"> <li>• Provides answers</li> <li>• Tells or explains how to work through the problem</li> <li>• Provides closure</li> <li>• Directly tells the students that they are wrong</li> <li>• Gives information or facts that solve the problem</li> <li>• Leads the students step by step to a solution</li> </ul>
<i>Explanation</i>	<ul style="list-style-type: none"> <li>• Encourages the students to explain concepts and definitions in their own words</li> <li>• Asks for justification (evidence) and clarification from students</li> <li>• Formally clarifies definitions, explanations, and new labels when needed</li> <li>• Uses students' previous experiences as the basis for explaining concepts</li> <li>• Assesses students' growing understanding</li> </ul>	<ul style="list-style-type: none"> <li>• Accepts explanations that have no justification</li> <li>• Neglects to solicit the students' explanations</li> <li>• Introduces unrelated concepts or skills</li> </ul>

<i>Elaboration</i>	<ul style="list-style-type: none"> <li>• Expects the students to use formal labels, definitions and explanations provided previously</li> <li>• Encourages the students to apply or extend the concepts and skills in new situations</li> <li>• Reminds the students of alternate explanations</li> <li>• Refers the students to existing data and evidence and asks, “What do you already know?” “Why do you think ...?”</li> </ul>	<ul style="list-style-type: none"> <li>• Provides definitive answers</li> <li>• Directly tells the students that they are wrong</li> <li>• Lectures</li> <li>• Leads students step by step to a solution</li> <li>• Explains</li> </ul>
<i>Evaluation</i>	<ul style="list-style-type: none"> <li>• Observes the students as they apply new concepts and skills</li> <li>• Assesses students’ knowledge and skills</li> <li>• Looks for evidence that the students have changed their thinking or behaviours</li> <li>• Allows students to assess their own learning and group-process skills</li> <li>• Asks open-ended questions such as, “Why do you think ...?” “What evidence do you have?” “What do you know about x?” “How would you explain x?”</li> </ul>	<ul style="list-style-type: none"> <li>• Draws conclusions, not using evidence Tests vocabulary words, terms, and isolated facts</li> <li>• Introduces new ideas or concepts</li> <li>• Creates ambiguity</li> <li>• Promotes open-ended discussion unrelated words</li> </ul>

### How to Prepare a Lesson based on 5E Model

In order to use the model in science classroom the teacher need to prepare a lesson plan based on it. For this, following things need to be kept in mind for planning activities at each phase.

#### Engagement

- Describe how the teacher will capture students’ interest.
- What kind of questions should the students ask themselves after the engagement?

#### Exploration

- Describe what hands-on/minds-on activities students will be doing.
- List ‘big idea’ conceptual questions the teacher will use to encourage and/or focus students’ exploration.

#### Explanation

- Student explanations should precede introduction of terms or explanations by the teacher. What questions or techniques will the teacher use to help students connect their exploration to the concept under examination?

- List higher order thinking questions which teachers will use to solicit *student* explanations and help them to justify their explanations.

### **Elaboration**

- Describe how students will develop a more sophisticated understanding of the concept.
- What vocabulary will be introduced and how will it connect to students' observations?
- How is this knowledge applied in our daily lives?

### **Evaluation**

- How will students demonstrate that they have achieved the lesson objective?
- This should be embedded throughout the lesson as well as at the end of the lesson.

### **Conclusion**

The BSCS 5E Instructional Model is grounded in sound educational theory, has a growing base of research to support its effectiveness, and has had a significant impact on science education. Although encouraging,

these conclusions indicate the need to conduct research on the effectiveness of the model, including when and how it is used, and continue to refine the model based on direct research and related research on learning. The research base around the BSCS 5E Instructional Model should be elaborated on through additional studies that compare its effect on mastery of subject matter, scientific reasoning, and interest and attitudes with other modes of instruction. The five phases of the BSCS 5E Instructional Model are designed to facilitate the process of conceptual change. The use of this model brings coherence to different teaching strategies, provides connections among educational activities, and helps science teachers make decisions about interactions with students.

There is need to introduce the concept of this model and other constructivist strategies in teacher education curriculum so that we can produce competent constructivist teachers to meet the challenging demands of present day.

### **Example: (Classroom Process Plan Based on 5E Model) Topic - Diffusion (Grade IX)**

#### **ENGAGE**

In this phase the teacher will ask some thought-provoking questions in order to capture students' interest and to increase their level of curiosity towards the topic.

1. Placing three balls in triangular pattern the teacher will ask- What do you find in between these balls?
2. Placing a chalk piece in the spaces between balls the teacher will ask – where is this chalk piece placed?
3. How salt gets dissolved in water?
4. What do we call a phenomenon where particles of two matters mix with each other?
5. Among solid and liquid states which state has larger spaces among particles?

6. Among solid and liquid states which has higher rate of diffusion? temperature and rate of diffusion? Do we have to search answers to these questions?
7. What is the relation between these questions?

#### **EXPLORATION**

In this phase students will perform some activities and try to find out the answers of questions asked in the previous phase. Students will be divided into four groups and each group has to go to a workstation which is preplanned. At each workstation students will find a format of activity to be performed and its required materials. Students will perform that activity and try to find out different scientific facts involved in the activity. After working on a workstation each group will interchange their workstation.

#### **Workstation I**

##### **Materials Required**

Chalk, scale, few students, etc.

##### **Format of Activity**

- a. Make three squares of one metre square on the floor.
- b. Ask six students to stand in the first square holding their hands. Make sure no student comes out of the boundaries.
- c. Similarly ask four students to stand inside the second square and two students inside the third square.
- d. Ask students of all squares to move in their square without crossing the boundaries.
- e. Write down whatever you have observed.

#### **Workstation II**

##### **Materials Required**

Chalk, scale, four caps tagged salt, eight caps tagged water, twelve students etc.

##### **Format of Activity**

- a. Make one square of 4 m<sup>2</sup> on floor.
- b. Ask eight students to stand inside the square after wearing caps tagged water.

- c. Now ask four students to put on caps tagged salt and ask them to go inside the square.
- d. Observe carefully and note down the conclusions.

#### **Workstation III**

##### **Materials Required**

Scentssticks, match box etc.

##### **Format of Activity**

- a. Place scent stick in the corner of the classroom.
- b. Ask a student to smell its fragrance.
- c. Now with a matchstick light it up and ask students to smell its fragrance.
- d. Observe carefully and pen down the conclusions.

#### **Workstation IV**

##### **Materials Required**

A glass of warm water, a glass of cold water, crystals of potassium permanganate.

##### **Format of Activity**

- a. Put a crystal of potassium permanganate in both glasses of warm water and cold water. Do not disturb the glass.

- b. Let the crystal settle on the bottom of the glass.      c. Observe carefully and pen down the conclusions.

#### **EXPLANATION**

In this phase, students, on the basis of observation, will try to explain different concepts under consideration.

- a. Each group will discuss their results.      their experience with the scientific concepts.  
 b. After this students will watch a power point presentation based on diffusion so that they can relate      c. After watching presentations students will again discuss about their findings.

#### **ELABORATION**

In this phase students will have in depth knowledge about the concepts and use scientific dictionary to explain.

In this phase students will be divided in to two groups. Each group will be given a pre-planned topic. The students will have to derive conclusions on the topics after inter and intra-group discussions.

#### **Topic – 1**

You can inhale the smell of hot meal

from a considerable distance while to inhale the smell of cold meal we have to go nearer. Why?

#### **Topic – 1**

How does the whole water in a glass turns colourful when we drop a single drop of colour in that?

#### **EVALUATION**

In this phase, the students will demonstrate that they have well acquired the objectives of the lesson by answering the questions and the teacher will also make sure of the same.

1. Explain the process of diffusion with a live example?      topic in the classroom and present the conclusions.  
 2. Why the rate of diffusion increases with temperature? Discuss the      How aquatic animals get oxygen in water for respiration?

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# Teaching-learning in EVS through Integrated Approach in Early Grades Perceptions and Awareness of Teachers

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LEISANGTHEM BINITA DEVI\*\*

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## Abstract

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*Environmental Studies (EVS) is aimed at developing the knowledge, attitude, commitments and skills amongst all, especially the future generations, to enable them work towards the solution of current problems and the prevention of new ones. The National Policy on Education (NPE, 1986) and subsequent Curriculum Frameworks brought out by the NCERT, highlighted the need for including environmental concerns at all levels of schooling. According to NCF-2005, at the primary level, EVS should be a separate curricular area in Classes III-V. However in Classes I and II, the environmental skills and concerns need to be addressed through Language and Mathematics. This paper highlights the importance of integrated learning in EVS, and perceptions and awareness of the teachers teaching Language and Mathematics in Classes I and II.*

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Prior to the year 2000, Environmental Studies at the entire primary stage was taught in two distinct parts Science and Social Studies in Classes III-V. Integrated approach for EVS curriculum at the primary stage was adopted by NCF-2000, wherein, it recommended that in Classes III-V, children would be introduced to the environment in its totality with no

clear-cut distinction between natural and social environment. In Classes I and II, it was not kept as a curricular area and environmental concerns were addressed through Language, Mathematics and Art of Healthy and Productive Living.

NCF-2005, while supporting the continuation and further strengthening of the integrated approach for

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Environmental Studies during the primary years, recommends it as a separate subject for Classes III-V. Accordingly, the syllabi of EVS at these levels bring insights from sciences, social studies and environmental education. In early grades, at Classes I and II it recommends that the environmental issues and concerns will be transacted through the two essential curricular areas Language and Mathematics.

### **Learning in Early Grades**

The NCF-2005 states that during the early childhood years the, child's interests and priorities must direct learning. It should be contextualised by her/his experiences rather than being structured formally. An enabling environment for children would be that which is rich in stimulation and experiences, and allows children to explore, experiment and freely express themselves. We know that learning is always holistic as children do not construct knowledge in a compartmentalised manner, but observe and understand their surroundings in totality. At primary stage, children should be engaged in joyful exploration of the world around. To nurture the curiosity among them, they should be engaged in exploratory and hands on activities. The children between the ages of four and seven begin to identify the characteristics of different objects, make functional correlation between them and learn by understanding the context. They are curious by nature and love to explore and raise questions. They also love to play and work together, doing different

activities with their hands/bodies. Inculcation of different skills among the children helps create a sound base for the concept formation in different curricular areas at a later stage.

Keeping in view their abilities, it is important to emphasise that Language and Mathematics for children in early grades should be transacted in a joyful, value based and action-oriented manner so as to develop an attitude of the learners and sensitise them towards various issues and concerns of environment.

### **Integrated Perspective of Curricular Areas**

NCF-2005 states that at the pre-primary stage, all learning occurs through play rather than through didactic communication. Thus, instead of rote learning, children need to learn and understand mathematics in their context. Mathematics learning should enable children to acquire knowledge and skills of learning that include literacy, numeracy, reasoning, logical thinking, problem solving, critical thinking. It should also enable them to access relevant information so as to apply it meaningfully to help them solve day-to-day problems. Recognising the fact that mathematics is all around us, the process of its teaching learning should therefore be contextual and relate to a child's immediate environment and experiences associated with it. Further, the skills identified for mathematics also overlap with that of EVS, that, one wonders how the two curricular areas are different. It is essentially the concepts of Mathematics and the concerns in

EVS related to natural, social, physical and cultural environment that make these two curricular areas distinct from each other.

We also know that language is an effective tool for communication, and listening, speaking, reading and writing are its important skills. Very few of us also know that minute observation, classification, expression, discussion, questioning, estimation, thinking, memorisation, creativity and problem solving are also an important part of language learning and are nurtured through it which are otherwise considered to be the dominance of EVS. Moreover, the content of language doesn't come from vacuum, but our surroundings form the base for it. On a whole, one may conclude, language includes all processes related to other disciplines in it. In day-to-day life, language is a pre-requisite to peep-in, inquire and understand other subjects. It is an essential component for any discipline to exist. Thus, development of knowledge and language is simultaneous and these two are inseparable.

Hence, there should be a second thought that Language and Mathematics teaching-learning should project environmental concerns. A careful observation will reveal that Language and Mathematics are essential tools to explain the interaction and mutual relationship between natural processes and human activities. Language and Mathematics have an important role to play in learning of EVS, Arts, Health and Physical Education and other disciplines. Therefore, different activities designed

for teaching-learning of Language and Mathematics are that of the EVS by themselves. Therefore, in order to promote learning, emphasis should be given on the following for taking care of the environmental component through languages and mathematics. The teacher should:

- Provide scaffolding to the child for constructive interaction with her/his environment to facilitate the processes of assimilation and accommodation for the child to build a mental representation.
- Provide greater opportunities to explore the physical and social environment around children through active learning and play-based experiences, which will nurture their curiosity and encourage habits of questioning and experimentation.
- Develop of psychomotor skills by keeping diversity in activities to accommodate individual abilities and skills of children.
- Emphasise pre-number concepts, such as patterns, colours, size and distance etc., to facilitate development of skills of observation, comparison and interpretations in the later years.
- In addition to providing opportunities through group work and peer learning to children, they must be exposed to the rich sources of knowledge, i.e. their elders and community as well.

#### **Rationale of the Paper**

Thus we can say that, sensitivity for the environment is an important concern of the curriculum which can be nurtured

and promoted through integrated perspective of various subjects. Different environmental concerns that are true to all stages, from pre primary stage onwards include:

- Relationships between natural, social, physical and cultural environment.
- Conservation (preservation and improvement) of natural resources, culture and heritage, and public property.
- Safety, security, health and hygiene of self and others.
- Equality and justice against issues of human dignity, gender bias, disability, marginalisation, rights and duties of different living organisms.
- Nurturing creativity and aesthetic sense.

Early grades are best to sensitise children towards these concerns and teachers can use integrated approach for that. This makes them achieve the desired objectives of the curricular areas without enhancing their load. Since, teachers are the key agents for the success of any curriculum related exercise, they should essentially be clear about the transactional strategies to make Language and Mathematics learning EVS oriented.

Therefore, an attempt was made to understand the awareness and perceptions of teachers about the teaching-learning of EVS through Language and Mathematics in early grades.

A questionnaire was developed which had eight items. Thirty-five primary teachers teaching classes in I and II in Kendriya Vidyalayas of Delhi

region were selected for administering this questionnaire. Each teacher was given sixty minutes to fill up the questionnaire. There were eight items in the questionnaire, question no.1, 2 and 4 dealt with some general information, two questions (no.5 and 6) were to assess their awareness and three questions (no.3, 7 and 8) were related to the perceptions of these teachers. Each teacher was asked to design one learning situation each for the four mathematical concepts - shapes, patterns, time and data handling reflecting integration with EVS. Likewise, they were asked to design one learning situation each for the four learning modes-story/poem, game/puzzle, drama and interview/interaction for language enrichment, where skills and concerns of EVS will also be strengthened.

#### **Item-wise Analysis of the Questionnaire**

The analysis and discussion of each of the eight items in the questionnaire related to the integration of EVS with Language and Mathematics is given below. First two items were of general information about the teachers.

#### **Item No.1 inquired about the classes in which each teacher was teaching**

The respondents were primary teachers teaching in Classes I and II and some teachers were also teaching in Classes III, IV and V.

#### **Item No.2 inquired which subject they teach in the class.**

These respondents were primary teachers teaching Language and

Mathematics and most of them were teaching EVS for Classes III-V.

<i>Subjects Taught</i>	<i>No. of Teachers</i>
Language, Maths, EVS	14
Language, Maths	9
Maths, EVS	2
Language, EVS	10
Total	35

**Item No. 3 inquired if EVS could be integrated with other subjects. If the answer is no, what are the reasons and if the answer is yes, which are those subject areas.**

In response to a closed ended (Yes/No) question, twenty-six participants opined that EVS can be integrated with Language and Mathematics. One of the respondents said that it can be integrated with Social Studies and Science. Another one expressed that it can be co-related with drawing. Six of them said that it can be integrated but they have not mentioned the subject areas. One teacher did not respond to this item.

**Item No. 4 inquired whether they use an integrated approach in teaching learning of EVS.**

Thirty-three respondents said that they used an integrated approach in teaching learning of EVS. Two teachers did not respond to this item.

**In item No. 5, the teachers were asked to design a learning situation in the four mathematical concepts (shapes, patterns, time and data handling), where skills of EVS would be strengthened.**

Four respondents designed learning

situations on the concept – ‘**Data handling**’.

- Two of them mentioned that children can name, count and differentiate different vegetables, fruits, birds and animals, and classify them on the basis of the shapes and colour of vegetables and fruits, and shape of the beaks, claws and habitat of birds and animals. But they didn't mention the skills of Mathematics and EVS that can be strengthened through this activity.

*It may be difficult for children of Classes I and II, to classify animals/birds on the basis of their claws, beaks, habitat, etc. However, if presented pictorially, as puzzles or games, it could be brought to the cognitive level of children below eight years. Since the teachers did not design the activity, it was not clear that how they would have introduced these to the young children.*

- Another teacher mentioned that children could be asked about means of transport using pictures and it would strengthen observation (skill of Mathematics) and discovery of facts (skill of EVS).
- Another respondent said that children could be made to count the number of boys and girls in each section of Class II in their school and it would enrich the ability of computation (skill of mathematics) and observation and discovery of facts (skills of EVS).

*All these responses show that these teachers think that environment-related themes/concepts such as birds, animals, plants and means of transport etc. as EVS and do not seem to be*

*familiar with the issues, concerns and skills of EVS.*

Three teachers designed learning situation on the concept - 'Patterns'.

- One of them stated that children could make patterns with small leaves by pasting them on a sheet. According to her, it will strengthen the concept of arrangement and identification of leaves and flowers.
- Another one said that children would learn through patterns on different things in the house, school and surroundings such as glass, cup, bed sheet, table cloth, tiles, paintings and floor designs etc. to identify the sequence of the patterns.

*Although the activities reflect integration, the teachers seemed to be oblivious about the skills and concerns of EVS and they could not identify/mention these.*

- Another teacher stated that they could make children co-relate various things in surroundings with EVS and Mathematics, for example, wheel is just like a circle, some stones are like squares, rectangles and children could make patterns with these.

*It is not clear that the teacher intends to teach shapes or patterns. Further, she does not seem to be familiar with the skills of both the subject areas.*

Eight teachers designed learning situations on the concept- 'Time'.

- Three teachers said that they could start with children's daily routine, i.e. different activities children do at different intervals of a day, for example, going to bed, getting up in the morning, going to school,

having lunch, going out to play, studying and having dinner, etc. One of them expressed that it will enhance observation as the EVS skill and the other two teachers were of the view that through this activity good habits can be discussed.

- Two teachers responded that students can observe the sun during morning, day time and evening for a day. Then on the next day, they will be shown a clock to understand how the time changes.

Although these activities do reflect the integration of Maths and EVS, the non familiarity of the teachers with the issues, concerns and skills of EVS that may be effectively addressed/ nurtured through these activities is a problem. For example, if the teachers asked children to sequence the activities of their daily routine or group them on the basis of the time intervals. Similarly, if they allowed children to observe the morning, evening and night sky, and ask those children to draw or colour followed by relevant discussion on their experiences, observations and relating them with time, would have helped enrich the processes of Maths and EVS, and the concerns of EVS. However, using these activities to inculcate good habits among children shows the ambiguity of value education as EVS in the minds of teachers.

Individual responses of the other three teachers are given below. None of them could mention the skills of Maths and EVS integrated with these activities.

- Children can be shown the model of clock.

- Asking children that at what time they listen a cock's voice.
- Solving sums during the target time.

These activities do not seem to be appropriate and reveal ignorance of the teachers even about the objectives of the respective curricular areas.

Ten teachers designed the learning situation in the concept – 'Shapes'.

- One of the teachers said that children could identify shapes in a house and another said that through training it can be done. Both were of the view that skills of computation in Maths, and observation and identification in EVS, will be strengthened through it.

The teachers talked about identification of shapes but strengthening of computation was not clear.

- Two respondents said that different items such as match-box, pencil box, ball, toys and other things which they saw in their environment could be given to children to learn shapes.
- Another teacher wrote that shapes could be introduced through road signs.
- One of the teachers designed a learning situation where students can be taken to the playground and would be asked to observe different shapes over there.

The responses show that these teachers wish to introduce shapes through surroundings but they too seem to be ignorant about the issues, concerns and skills of the concerned subjects.

- Two teachers said that children could be made to count the number of shapes such as circles, triangles, rectangles in a given picture. One of them said that this would strengthen the skills of EVS like observation and identification.
- Another respondent stated that students would be shown different shapes and then, they can be taken to ground and made to stand in the shapes drawn as triangular, rectangular, circular and square. But she didn't mention the skills that would be enriched through this activity.

These two learning situations do not reflect integration of Maths and EVS but may enhance the skills of observation and identification.

- Five respondents wrote that shapes in Maths can be taught in integration with EVS through observation of leaves, fruits, vegetables or solar system. But none of them mentioned anything about enrichment of skills or concerns of EVS or the skills of maths through these.

It may create confusion in children's minds as majority of vegetables, fruits, leaves and plants do not have any regular shapes. Further, all these teachers do not have much clarity about concerns of EVS and skills of both EVS and maths.

**In item No. 6 the teachers were asked to design a learning situation in language (Hindi or English) for the learning modes such as story or poem, game or puzzle, drama and interview/interaction for language enrichment where skills of EVS would be strengthened.**

Four respondents mentioned that through dramatisation, skills of language such as speaking, listening and that of EVS such as identification and observations, are enhanced. However, only one of them made an attempt to design a learning situation in which children can enact a drama based on the body parts and their functions. She mentioned that they would be given dialogues related to various functions of body parts.

However, when encouraged, even young children came up with dialogues by themselves and this also helped nurture creativity among them.

One of the teachers was of the view that children could say a few lines about themselves or interview someone. She mentioned about enrichment of skills of language such as speaking and listening and skills in EVS like observation and group discussion.

However, she did not design any questions, which children can ask or children could say about themselves.

For poems as a learning mode, none of the participants tried to design any activity. However, four respondents agreed that poem recitation helps enhance the skills of language (speaking and reading) and skills of EVS (identification, describing, and group discussion) but it was not explained how it would lead to that. Only one teacher mentioned that while teaching a poem on 'Trees' parts of a tree could be taught.

It must be noted that all of them mentioned speaking and listening as skills of language exclusively and others such as observation, identification and group discussion as

the skills only of EVS. Further, it can also be observed that in EVS, teachers think of transacting the content such as parts of a tree, body parts and their functions, but no emphasis is given to the skills of language and EVS, and to address the concerns of the environment.

One of them was of the view that vocabulary enrichment is feasible through stories. She said that outlines/pictures might be provided to children who could use them to extend their ideas to narrate stories. However, she expressed that integration could be effective only through moral-based stories. One of the teachers explained that cleanliness of our body could be taught through the following poem,

'Brush, Brush your Teeth, Brush them every day,

Father, Mother, Brother, Sister,  
Brush them every day.'

She did not mention any skills of language and EVS that could be enriched through this poem.

From this, it may be inferred that according to these teachers EVS is about value inculcation.

One of the teachers mentioned that cross word puzzles could be given for words (new vocabulary) such as the names of animals and birds, means of transport, etc. Another one mentioned that puzzles such as maze with clues, could help strengthen the skills of language (such as reading, understanding) and skills of EVS (such as logical reasoning and analysis). Two respondents expressed that different games could be used based on animals, birds, vegetables, water animals and land animals. Crossword puzzles can

be used to find out the names of fruits, animals, flowers, trees, helpers, means of transport etc.

Majority of teachers who designed the puzzles/games thought of only paper pencil tasks and the activities were also limited to creating awareness. Also none of them knew anything about the skills and concerns of EVS integrated with these activities except the one who mentioned enrichment of observation and logical reasoning through the activity of maze.

**Item No. 7 inquired whether integration of EVS helped in Language and Mathematics.**

Five categories emerged out of fifteen responses.

The most prominent one was that;

- It helps children to express effectively.(9)
- The other was that it helps in vocabulary development.(3)

The other three categories which occurred only once are the following;

- To enhance listening, speaking, identification and understanding skills.
- Children frame better sentences.
- In clarifying different concepts.

For integration of EVS with Mathematics, following are the four major responses.

- The one with the highest frequency (10) was that integration helps in making the concept clear.
- It helps children acquire problem solving ability.(4)
- It develops interest and psychomotor skills.(1)
- To develop skills of logical reasoning and analysis.(1)

**Item No. 8 tried to find out whether integration of EVS leads to the difficulties/problems in Language and Mathematics.**

Following two types of responses appeared four times.

- Integration of EVS with Language leads to lack of expression.
- Integration of EVS with mathematics leads to lack of accuracy.

Some other category of responses which had a frequency of one is following:

- It leads to difficulties in speaking skills and understanding of the English language.
- It leads to lack of concentration and practice.
- It creates problems in different subject areas.
- It leaves behind the concept.
- Sometimes children go off the track.
- Another respondent said that it would lead to problems in understanding.

**Findings**

- Although 28 teachers were teaching Maths at Classes I and II and eighteen out of them were also teaching EVS at the primary level, yet only 3-10 teachers made an attempt to design the activities under the given concepts of maths.
- Similarly, 32 teachers were teaching language (Hindi or English or both) at Classes I and II and 23 out of them were also teaching EVS at the primary level, but only 5-7 teachers tried their hand at creating learning situation

in languages having integration with EVS.

- Majority of the teachers appeared to be ignorant about the objectives of learning EVS, Mathematics and Languages at the primary level as they considered only the concepts or themes under each curricular area, and were not aware about the rationale behind choosing those at each level.
- They were also not familiar with the skills of each curricular area. According to them, listening, speaking etc. were language skills. Observation, identification, group discussion etc. were EVS skills and computation, problem solving etc. were mathematics skills.
- Most of them considered birds, animals, plants and means of transport i.e. environment related themes/concepts as EVS and do not seem to be familiar with the issues, concerns and skills of EVS.
- At times some of them were not aware about the concepts as well.
- Some of the teachers considered inculcation of values and good habits as EVS.
- Majority of the designed activities were limited only to creating awareness and did not have enough scope for experiential learning.
- These also had a limited scope to go beyond the classroom having paper pencil tasks.
- Their responses under item no.8 reflect their lack of understanding of the integrated approach to teaching-learning. The responses such as 'it might lead to lack of accuracy, concentration and

students going off the topic' show that the teachers think about each curricular area in a compartmentalised manner.

### **Conclusion**

NCF-05 has recommended using integrated approach towards teaching-learning across all curricular areas at all stages. The teachers teaching early grades are quite optimistic about the implementation and use of integrated approach to teaching-learning. However, the awareness about it is almost lacking which is apparent from the learning situations designed by them. Their views about the problems faced due to integration of the curricular areas also reflect that they need to be thoroughly oriented not only towards the integrated approach but even for the aims and objectives of each curricular area.

To achieve the desired objectives of different curricular areas at the primary level, five guiding principles are envisaged in NCF-05. The two most important ones are; to go beyond the classroom and provide opportunities for experiential learning relating with the daily life of children. The teachers were either unaware or were unable to put those into practice. The foundation of learning is laid in the early grades, therefore, to propagate and implement the ethos of NCF-05 in right spirit, there is an urgent need to build the capacity of teachers teaching these grades. Relevant support material in addition to textbooks that enables teachers to design context-specific learning situations needs to be developed and provided to the them.

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# Comparative Study of Environmental Education in Adolescents and Higher Education Students

BILQUES SHAIR\*  
RUKHSANA AKHTAR\*\*

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## Abstract

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*The present study is aimed at examining levels of environmental awareness and implementation of environmental knowledge amongst cross section of students in Jammu and Kashmir. The study is designed to compare the extent of awareness amongst adolescent and higher education students. It was found that overall awareness and implementation of environmental knowledge in adolescents is far below the expectations. Students with higher education were found to have largely satisfactory knowledge and skills for solving environment problems.*

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### Introduction

Environment is defined comprehensively to include all relationships between humans and all that impact upon them, and all that they impact (Caldwell L. K., 1993). Environmental education (EE) refers to organised efforts to teach about how natural environments function and, particularly, how human beings can manage their behaviour and ecosystems in order to live sustainably. Indeed environmental education must

be accepted as a prerequisite for sustainable development (Howell C. A., 1993) and programmes must be chalked out both through formal and non-formal systems. It is at the level of basic education that the coverage is the broadest and the general orientations and values have the highest impact (Edwards B., 1993).

Education and awareness in this regard is one of the most effective forces towards saving our besieged

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environment. The basis of a healthy environment is good air, water and soil. These basic building blocks of life are obviously essential for life to continue and must be cared for, preserved and enhanced. No programme can be a success without education as it is what makes people aware of the need for any activity and it can generate much needed support for that activity. Hence, there should be initiation of awareness programmes to understand the economic, political and ecological interdependence in the form of exhibitions and fairs, seminars and discussions, group projects, field trips, games, debates, lectures, elocution competitions, quiz, effective use of mass media, etc. (Schwaab Karl E., 1982).

One of the landmarks in the history of environmental education is the Stockholm Conference on Human Environment, organised by UNESCO in 1972. Thereafter, UNESCO launched the International Environmental Education Programme (IEEP) in the year 1975. The activities under IEEP in the first phase culminated in the organization of the first inter-governmental conference on 'Environmental Education' at Tbilisi (USSR) in 1977. This specified the nature and scope of environmental education and also laid down the aims and objectives as well as the repertoire of strategies to be adopted at the national and international levels (Bhushan *et al.* 1990).

It is now a universally recognised fact that the most effective approach to solve environmental problem is environmental awareness

(Agarwal, 2008). There have been some comprehensive studies at national level regarding comparative studies of general awareness about environmental issues in populations, but special emphasis has been put on students in this regard in our state.

The present study was an attempt in this regard to see impact of different awareness campaigns amongst adolescents and higher education students, and to explore the attitudes of the sample of students from higher secondary school and degree colleges towards the environment.

### **Methodology**

The study was based on a survey with a sample size of 100 students with 50 students selected from higher secondary school, Nawakadal, and 50 BA/BSc/B.Com students of Government Women's College, Nawakadal. A comprehensive questionnaire was designed to achieve the objectives of the study using stratified Random Sampling Technique. Students were instructed to answer the questionnaire in a relaxed condition in the allotted time. The questionnaires were divided into three parts.

#### **Part A**

This covered questions related to awareness and consisted of 15 questions each having 5 options: Strongly agree (SA), Agree (A), Neutral (N), Disagree (D) and Strongly disagree (SD).

#### **Part B**

Part B of the questionnaire covered questions related to state-level

knowledge. It consisted of 10 questions each having four options and the students were asked to choose the correct option.

### Part C

It covered the implementation part which consisted of seven questions to which each student had to respond with options and suggestions. It was more of subjective nature.

The questions covered issues such as deforestation, ecological imbalance, green house gases, acid rain, global warming, ozone depletion, hazardous industrial waste, environmental constituents, different pollutants, use of natural resources, Ecosystem, role of the state in enforcing laws regarding environment, forest cover, river topography biodiversity conservation, endangered species, interaction between man and wild animals, problem

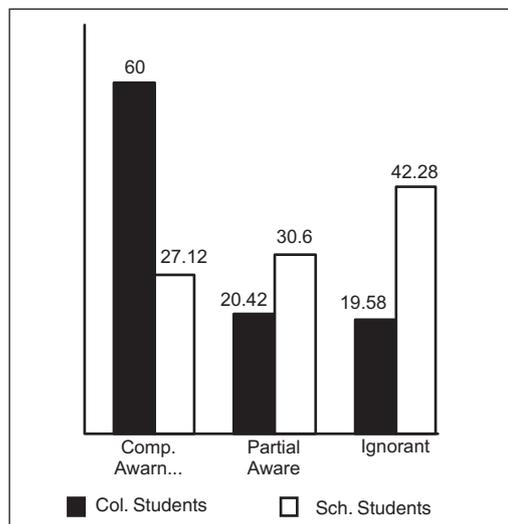
of non-biodegradable materials and lastly, the role of students in solving different environmental problems.

## Results and Discussion

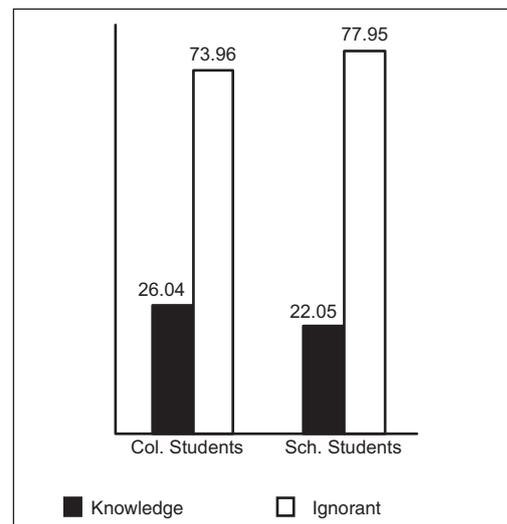
### A. Response from students

#### A-1. Awareness of environmental issues

Comparing the awareness of environmental issues among the studied population with reference to higher education students, 60 per cent of the total population is completely aware of the environment, 20.42 per cent of the population is partially aware while rest of the studied population, i.e., 19.58 per cent are ignorant as shown in Fig.1 about the environment or related issues. Comparing this with the data of secondary school students, only 27.12 per cent of the total population had complete awareness regarding environmental issues as shown in fig.1. Partial awareness was



**Figure 1 :** Comparison of awareness in school education group and higher education

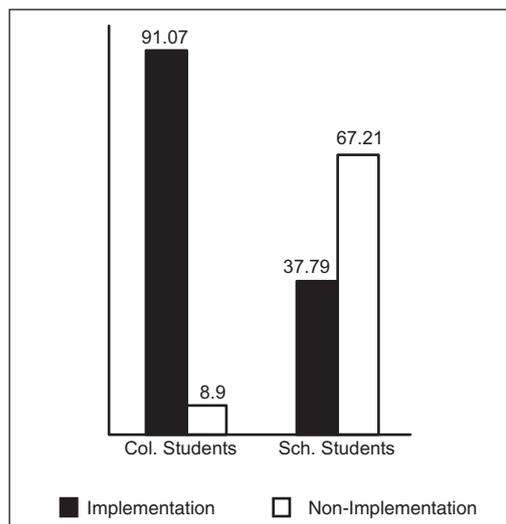


**Figure 2 :** Comparison of knowledge in secondary and college level students

shown by 30.60 per cent while as 42.28 per cent were completely ignorant.

#### A-2. State-level Environmental knowledge

The results with reference to state-level environmental knowledge showed alarming percentage of population, i.e., 73.96 per cent, with no knowledge, as shown in Fig. 2 regarding the environment of Jammu and Kashmir state. Only a mere 26.04 per cent of the sample with higher education has knowledge about the same. Similar types of results were shown by school education students with 77.95 per cent as shown in fig. having no knowledge regarding the environment of Jammu and Kashmir State. Only a mere 22.05 per cent of the sample with higher education has knowledge about the same.



**Figure 3 :** Comparison of implementation between college and school students

#### A-3. Implementation of Knowledge in Conserving Environment

Out of all the studied population, among the higher education masses 91.07 per cent implement their awareness and knowledge about environment in their day to day life. Rest 8.9 per cent of the sample does not implement their awareness and knowledge in order to save the environment as shown in fig.3. Comparing these results with secondary school students, only 32.79 per cent implement their awareness and knowledge in order to save environment, while 67.21 per cent were unable to implement the same.

### B. Overall Interpretation of Data

#### B-1. Awareness about environmental issues

Out of 100 students constituting our sample, 63.56 per cent students are completely aware, 30.81 per cent students are partially aware, and 5.63 students are ignorant about the environment.

#### B-2. State-level environmental knowledge

Out of 100 students, only 24.05 per cent students possess knowledge about the environment of J&K.

#### B-3. Implementation of knowledge in conserving environment

Out of 100 students, 78.33 per cent of the total sample implements their awareness and knowledge in order to save the environment.

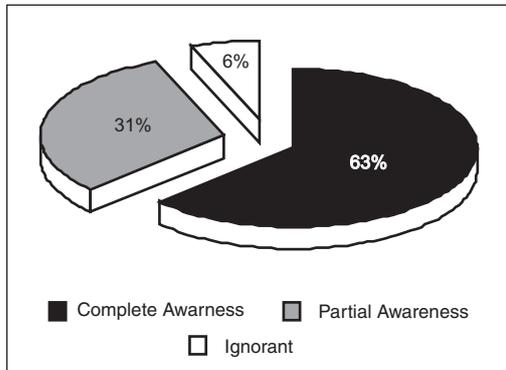


Figure 4 : Overall awareness

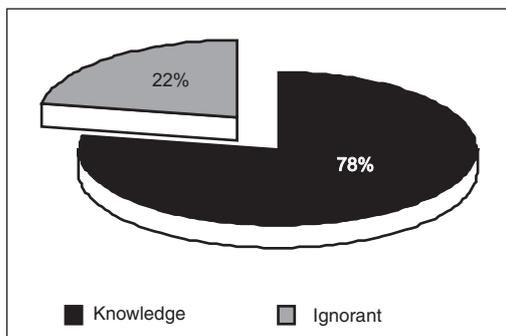


Figure 5 : Knowledge among all masses

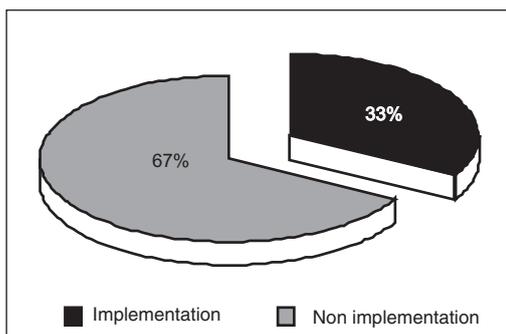


Figure 6 : Overall implementation

**Discussion**

The following points can be made by evaluating responses of the subject.

These points also foreground key themes in environmental education investigation in the current study and thus provide a living status of affairs in the field of environmental education.

**Comparison between the responses generated during the study**

**Part A of the Questionnaire**

This part contains questions related to environmental degradation, air pollution, deforestation, soil erosion, acid rain, ozone depletion, ecology, etc.

More than half of the sample strongly opposed the environment degradation and meant to protect our environment. Very few students either agree to this point or are neutral in their answer. Most of the students constituting our sample strongly believe that deforestation created ecological disequilibrium. Very few percentage from our sample are neutral and oppose this view.

Maximum population constituting our sample is of the view that CO2 in any concentration (more or less) creates air pollution. But as far as this point of view is concerned, they should have disagreed to this point which has been done by less than 50 per cent of our sample.

Very few students from our sample believe that deforestation decreases chances of soil erosion. Most of the students from the sample believe that deforestation increases the chances of soil erosion.

More than 70 per cent of the population of our sample strongly opposes the point that acid rain can be useful to man. Very few students are ignorant of the fact that acid rain

is harmful to man as well as all living beings and it cannot be made useful in any way.

Almost cent percent students are aware and strongly believe in the fact that ozone layer is destroyed by CFCs.

More than half of our sample agrees to the point that emission of smoke directly or indirectly causes pollution of water. Very less number of students are ignorant about this fact and very few disagree to this point of view.

Industrial wastes dumped into rivers cause serious threat to aquatic life. Maximum number of students have agreed to this view.

Biotic and Abiotic are the two components of environment. This fact has been agreed by at least 85 per cent of the sample.

Green plants do not form the third tropic level. But most of the students forming our sample disagree to this point. Very less number of students believe this fact.

Out of 100 students, 3 students strongly agree on this question; 13 students agree on this question; 38 students are neutral in their answer; 20 students disagree on this question; and 26 students strongly disagree on this question.

Components of the environment never remain the same and this is what at least half of the population comprising our sample has agreed. Half of the sample is either neutral or opposes this view point.

Polythene is not a biodegradable substance. Very few students believe that polythene is a biodegradable substance but most of the students agree that it is not so.

Chemical fertilisers do not always improve the quality of soil because every time its concentration needs to be increased. But maximum number of students have opposed to this view point as they believe that chemical fertilisers always improve soil quality.

There should be a planned use of natural resources on the earth and maximum numbers of students have agreed to this fact. Very few students oppose this point.

Most of the students believe in the fact that the interaction between living organisms and their environment is called ecosystem. Very few are there who are ignorant of this fact.

#### ***Part-B of the Questionnaire***

One-fourth of the population has correctly answered the total length of river Jhelum.

Only 15 per cent of our sample has correctly answered the source origin of the Chenab River and the river of which Krishanganga is an important tributary.

Just a few students replied to the question about the mightiest river of the state of J&K. One-fourth of our sample has given the total length of Chenab river. One-sixth of the population constituting our sample has answered the question about the division of J&K in which black necked crane is found.

One-fourth of the sample correctly answered the name of Sweet Water Lake of Kashmir. One-fourth of our sample gave the correct answer to the question on total forest cover of J&K. Half of the population correctly replied to the name of the beautiful town of

Baramulla district which is called 'Port of Wullar'. Forty per cent students from our sample correctly responded to the question about the name of the Lake which the Kashmir valley was in the ancient times.

### ***Part-C of the Questionnaire***

The emission from industries cause air, water and soil pollution which directly or indirectly affects the health of the people. But on the other hand, industries are the most important factor for economic development of the nation. To minimise the effects of industrial emissions, half of the students from our sample suggest that industries should be planted away from residential areas to minimise their direct effect on human beings. The remaining half suggest the use of biodegradable chemicals, proper environmental education, the installment of tall chimneys, more and more plantation of trees, and the recycling of waste products.

It is not only the duty of Lakes and Waterways Development Authority (LAWDA) and other governmental bodies to save and protect the water bodies of Kashmir valley. It is rather the concern of every individual to develop conscience in him/her to save the water bodies in particular and environment in general. Individual citizens can do a lot on his/her part to perform this duty. Half percentage of our sample suggest the use of chemicals and weedicides in water bodies. Besides they have recommended to educate the people properly. Rest of the students suggest proper disposal of solid and liquid wastes.

Certain plant and animal species have become extinct and many are on the brink of extinction. In order to save and protect these species, most of the students from our sample discourage hunting and encourage afforestation. Some students also suggest the saving of natural habitat of wild animals. Few students also encourage the protection of forest areas by the government.

The conflict between man and animal has increased to a great extent since the last two decades. This is because wild animals are deprived of their dwelling places. In order to tackle this problem, most of the students from our sample suggest that we should try to rebuild the dwelling places of these wild animals. Some students are also of the opinion that more plants should be planted and deforestation should be discouraged.

Polythene has become a part and parcel of our daily life in spite of its ban. All kinds of eatables are packed in polythene wrappers. Maximum number of students are of the opinion that we should use paper and jute bags in place of polythene bags.

People concerned with the department of forestry are themselves involved in smuggling of timber. In the opinion of most of the students, in order to check this problem special investigation teams should be appointed by the government. The views of students about what they can do on their part to save their environment and teach the ignorant people about the hazards of environmental pollution reveal that these people should be educated properly through rallies and seminars. Besides, some students also

suggest planting of more and more trees and usage of biodegradable or renewable substances.

### Conclusion

The main objectives of our study were to examine the level of awareness, knowledge and implementation among adolescents and higher education students and to compare the two. As far as these objectives are concerned, we have reached to a conclusion that the overall awareness among adolescents is far below the expectations. Besides they possess very little knowledge of the environment and its implementation is far below the satisfactory level. In comparison to this, the students at higher education level are aware of environment and related problems. Also the knowledge possessed by them is satisfactory. And as far as the implementation is concerned, maximum number of students from higher education level implement their knowledge and awareness in order to do something on their part to save the environment.

It can be concluded that the adolescent students do not consider

environmental education as a process and are not skilled enough for solving environmental problems. This is because their awareness about the environment is very poor and they do not have positive attitude towards environment. Besides, their knowledge and implementation of it is also too weak to tackle the environmental problems.

In comparison to this, the students at higher education level possess some skill for solving environmental problems and consider environmental education as a process. They possess enough awareness and knowledge about their environment and they implement this knowledge in order to protect the environment. Also their attitude towards the environment and its related problems is positive, which is of utmost importance in order to tackle the environmental issues. Their commitment, i.e., responsibility towards the environment, is very satisfactory in comparison to adolescents. In order to enhance and modify their skill, proper environmental education should be provided to them through different modes including media.

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# Middle School Students' Ideas about Energy and Its Flow through Organisms

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## Abstract

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*The conceptual pre-requisites for teaching about the environment are embedded in several existing school subjects. However, the teaching of subjects like Science and Social Studies does not address all the linkages needed for environmental education. Topics related to current environmental concerns that are inadequately addressed in classrooms include energy, its flow through organisms, especially in relation to human life. We developed a short course on energy and environment, in which students of Class VIII engaged in a large variety of activities designed to explore their understanding of energy and its flow through life forms, with special emphasis on the link between humans, energy and the environment. This paper reports some of our insights gained through a variety of interactions with students and their implications for teaching.*

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## Introduction

Any solution to the environmental crisis will need environmental awareness and understanding to be deeply rooted in the education of all people at all levels (Tbilisi, 1977). In fact, Environmental Education (EE) has been an important issue at the global level for close to four decades. Several aspects of EE have already been studied and published

by researchers and thinkers from across the globe: broad and long-term goals of EE (Hungerford and Peyton, 1976; UNESCO, 1980); guidelines of EE (NGO Forum at the Earth Summit 1992; Gigliotti, 1990); principles of EE (CEE, 1999; Ballantyne et al. 1996); and pedagogic strategies for EE (Shome and Natarajan, 2007). The role of the teacher in EE has been

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recognised to be pivotal by all and has been specifically researched by some (Volk, 2003; Wilson, 1993; Kastenholz et al. 1994). Environmental study has been made a school subject in India by a policy initiative following Supreme Court directive (NCERT, 1981).

A model of EE, that has potential to address the bio-geographical, linguistic and other socio-cultural diversities of the country, recommends a large variety of pedagogic strategies aimed at immersing students in environmental thinking in the classroom and outside (Shome and Natarajan, 2007). The model also suggests that environmental aspects should also be integrated with school subjects. The rich possibilities of integrating environmental ideas in Science in the Indian context have been inadequately explored. Energy and photosynthesis are two of the topics in Science that invite such integration. At the global level, there have been research reports on students' alternative conceptions on energy (Watts, 1983; Trumper, 1997), ecosystem (Grotzer and Baska, 2003), photosynthesis, and respiration (Barman et. al 2006). The current study probed Indian middle school students' understanding of the concept of energy, photosynthesis and the link between humans and environment.

### **Methodology**

The study involved developing a course for middle school students on energy and environment, selection of participants, collection of data, and drawing preliminary inferences about students' ideas based on semi-quantitative and qualitative analysis of multiple kinds of data.

### **Objectives of the Study**

The broad aim of the study was to develop a course on Energy and Environment for middle school students, to explore their understanding of energy and its flow through life forms, with special emphasis on the link between humans, environment and energy. Participants: A purposive and convenient sampling was used. Forty students (30 Boys, 10 Girls) of Class VIII (mean age 13 years) from three nearby English medium schools affiliated to the CBSE system voluntarily participated in the course.

### **Framework of the Course**

According to Carlsson (2002), an understanding of photosynthesis, cycling of matter, the flow of energy and the connections between them are prerequisites for developing an insight into ecology. We have adapted a model proposed by him for the study of ecological understanding among students after omitting 'ways of thinking about recycling'.

### **Course Structure**

The course, which was conducted over eight days, was repeated in two sessions for the two batches of students – one each in the morning and evening. Students were given opportunities to articulate, defend and explain their ideas within the social context of the classroom (Solomon, 1991; Prain and Hand, 1996). Open-ended questions, creative writing, explanations and classroom dialogue helped students refine their understanding (Glasson and Lalik, 1993 as in Prain and Hand 1996). The sessions included lectures, experiments, surveys, audits, and other activities. Activities relevant for

the current paper are summarised below.

#### *Activity Sheets*

Students responded to three activity sheets, one each on environment, energy, and photosynthesis. The questions in the sheets were based on a literature survey of related topics, our experiences of teaching students and an analysis of the science textbooks up to Class VIII (NCERT). The questions were in a variety of formats: multiple choice, true/false, and those requiring either one word or open ended short answers, or diagrams.

#### *Lectures and Discussions*

There were structured lectures and several opportunities were provided for discussions in the whole class and in groups, which served to explore students' ideas, discuss students' responses to activity sheets, prepare students for activities and enrich content knowledge. Drawing (context map, posters): After being initiated, groups of students worked collaboratively drawing a context map on 'Human and the Environment'. The groups also made posters on the imagined energy scenario of 'Human Civilization 500 Years from Now.'

#### *Writing (Science Fiction)*

Individual students wrote on 'A world without energy'. The writing task was followed by consolidated presentation by each group.

#### **Role Play**

Research on role play in teaching-learning (Simonneaux, 2002; Proulx,

2004) suggests that it is an effective tool in bringing social context into the classrooms. We used role, play as a strategy to introduce students to democratic informed decision making.

#### **Data Collection**

Data was collected in the form of students' responses to questionnaires, other writings, drawings and posters, through audio-visual recordings of discussions and structured presentations, as well as researcher's observations and notes.

#### **Results and Discussion**

The results are discussed here under two themes, energy and environment. The environment theme focused on concepts like photosynthesis, food (energy) dependence of organisms, and the links students make between humans, energy and the environment. The energy theme involved the qualitative study of students' responses as they engaged in a variety of activities and expressed themselves in oral or written forms. The specific activities within the two themes, and a brief discussion of students' responses are given below, first for the environment theme followed by energy.

#### **Environment**

Several activities were organised with an aim to understand students' ideas about energy flow through organisms. Students' responses to Activity Sheets on (a) Photosynthesis and (b) Food webs in the environment, and the Context maps that groups of students drew on Humans and Environment, are discussed below.

### ***Photosynthesis, Food Webs and Energy Flow***

Besides asking about the parts of plants involved in photosynthesis, the time when it occurred and its inputs and outputs, the activity sheet on photosynthesis also aimed to see whether students thought of it as a step in the energy flow through organisms. Most students were aware that photosynthesis takes place in all green parts of plants. Some students even mentioned that plants that have leaves with colours other than green possess the green chlorophyll. However, close to half of the students thought that insectivorous and parasitic plants were incapable of photosynthesis. Perhaps they drew analogy between such plants and animals, and they mentioned this during discussions. One of the students wrote, "The plants needs carbon dioxide and photosynthesis helps to release energy only with oxygen." The response suggests that students think of photosynthesis as releasing energy. The drawings show that students do not connect photosynthesis with the flow of energy.

Three fourth of the students knew that carbon dioxide and water were involved in photosynthesis and were essential for plant survival, but they were unaware of their specific roles in the process. Most students incorrectly thought that the oxygen released in photosynthesis came from the carbon dioxide that it used up.

Most students knew about food chains. However, they did not appreciate the nature of dependencies of the organisms in food webs. Most students focused on parts of a chain

and failed to see how changes in one population could affect the entire web. More than two thirds of the students thought that plants respired only at night.

Photosynthesis dominates textbook discussion on the physiological processes in plants. Perhaps, this diverted the students from recognising other important physiological processes like respiration and transport. Though students had been taught about photosynthesis and food chains, they were not exposed to photosynthesis as a process aiding energy flow in nature. This is reflected in their drawings, where students considered photosynthesis in terms of the input and output materials and sunlight merely as a process of food preparation.

### ***Context Map on 'Humans and Environment'***

Each group of three to four students drew a context map (total 12 maps). Most students were aware of the constituents of the environment and human environment relationships. Some mentioned the scarcity of fossil fuels and the energy crisis. However, the role of plants as energy stores was not explicitly recognised.

All the context maps had terms like biotic, abiotic, pollution, industry, globalisation, deforestation, etc. While most context maps had both pictorial presentations and verbal descriptions, some had more of one and less of the other. Thanks to the emphasis in classrooms and the media, over half the context maps referred to negative consequences of human interventions

in the environment: pollution, global warming, globalisation, mining, deforestation, etc. However, most students did not make connections between these terms, either because of their unfamiliarity with such maps, or their limited understanding of the complex issues. In fact, discussions revealed that students had not grasped the meanings of the words they had used.

### **Energy**

Energy was addressed through several activities. Of these students' responses to Activity Sheet on energy, Essay on 'A world without energy', Poster on 'Human civilization; 500 years from now', and role play on energy options for a small village will be discussed here.

### ***Students' Ideas about Energy***

During a semi-structured discussion, students spontaneously used terms like 'power' and 'force' as synonyms of 'energy', but they were unable to define the term power. Some had the incorrect idea that power was 'ability to perform work'. Students ascribed scientifically incorrect everyday meanings to force power, and energy. On the other hand, students were able to correctly define potential and kinetic energy, but were unable to give examples or use them in contexts.

Students were confused between forms of energy and sources of energy. About 26 forms of energy were mentioned by students. Besides referring to sound, light, electrical energy, etc., students also used incorrect, but interesting terms like

static, physical, repulsive, frictional, freeze, ubiquitous, and genetic energy. Essays on 'A world without energy' written by groups of students, revealed that students considered a world without energy as impossible. However, they largely referred to anthropocentric aspects of energy.

### ***Humans and Energy Use***

In response to a question in the activity sheet, most students agreed that change of individual life styles can reduce energy demands. However, third of the students also felt that the society which uses more energy is more developed. While depicting the future energy scenario in a poster, students emphasised energy production, but ignored issues of distribution. Students predominantly drew transportation, which too in private vehicles, not recognising that public transportation could be more environment friendly.

None of the posters referred to reducing energy demand in daily activities or use of biomass as an energy source. The non-conventional energy source shown was mostly solar energy. They also predominantly depicted high rise buildings, transportation, and robotic systems, but no trees, forest or animals other than humans. The humans were never located in a village. Students' responses to questions, writings and drawings on energy suggest that students did not connect energy flow in nature with human energy use.

### ***Role-play – Power Plant for Shaktipur***

In a given scenario, Shaktipur, a newly industrialising town needs electrical energy. To arrive at a consensus on

the kind of power plant for Shaktipur, the State Chief Minister has called a meeting of relevant ministers, scientists, environmental groups, representatives of world bodies and local educational institutions. Students had to conduct the meeting, each student taking on one of the roles, each of which was characterised for them. They were provided with reading materials on energy sources, and their advantages and disadvantages. Students largely chose between six energy sources for the power plant: solar, wind, biomass, nuclear, hydroelectric and coal. In one of the sessions most participants chose solar energy with one other renewable source for the power plant. Only three chose a nuclear power plant, that too along with a biomass plant. The participants in the other session chose from only three options and largely focused on nuclear energy.

### **Educational Implications**

The first task for effective teaching-learning is diagnosis of students' existing ideas. We have developed a course that provides scope for bringing together teachers with different academic backgrounds to achieve overlapping subject goals and at the same time deepen environmental awareness. The course that was developed included a variety of activities—

lectures, discussions, experiments, writing, drawing, presenting, drama—on environment, energy and their relationship to everyday living. Some of the activities were specifically designed to highlight and resolve conceptual conflicts between students' existing understandings.

In order to structure a similar course in formal classroom settings, it is necessary for teachers of different subjects – Science, Languages, Art and Craft and Social Studies – to collaboratively plan the content and sequence of activities to suit the level (Class) content. They also need to arrive at a consensus on the common course structure, content as well as their environmental priorities. It is essential for teachers to structure activities where students can recognise and resolve conflicts in their understanding by discussing with their peers and teachers. Special attention needs to be paid to respect the differential abilities among students. Encouraging multiple modes of expression will contribute towards innovative thinking and co-operative creativity.

Such courses offer rich possibilities for EE. They help diagnose students' ideas and understanding in school subjects and integrate their knowledge and skills from different school subjects towards a deeper environmental understanding.

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