

Social Science Projects:

An interdisciplinary approach to learning about humans and their environments

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This presentation is a sharing and reflection on the experience of social science classes in the middle school. By social science, I mean an exploratory study of societies and their environments over time and space. Conventionally, such a study is interdisciplinary, including history, geography and civics up to the middle school and then adding economics and sociology in high school. In the project approach, these so-called "subject boundaries" are less rigid, and classes may include a combination of subjects. Social Science Projects may also embrace a spectrum of learning areas such as music, art, literature and drama.

The social sciences provide a forum where students can encounter many worlds. Students have an opportunity to examine their own immediate circumstances as well as those of people in the wider world. One intention of social science classes is to nurture a sensitivity to and appreciation of our own society as well as of other societies. Students are exposed to many ways of life. The class may also provide a space to discuss our own and others' prejudices. The class is a space where the spirit of questioning and joint exploration develops.

Here, I will focus on the project approach to social science, which combines many elements in an investigative approach to learning.

Before I describe the aspects of a particular social science project, I will describe a framework for an approach to a project. This framework includes:

Overall planning, classroom sessions, outdoor sessions and assimilation/communication.

Overall planning

In the initial planning stages, one may outline themes and topics to cover during the course of the term. It is important to leave room to follow topics that may emerge as the course proceeds. Along with the outline of the themes, thought is given to the process of enquiry. A key intention is that of participative learning. Students don't simply receive information. Students and teachers learn and question together. Students express and explore ideas and perceptions as well as pose questions that guide the class.

Classroom sessions

Classroom sessions have a participatory approach. Several processes may occur within the classroom. These include a combination of brainstorming, classifying ideas and impressions, reading, comprehending, questioning, discussing and researching.

Brainstorming is a process which may occur as a topic is introduced. It involves asking a question in class which each student responds to. Such a question may be "What five words come to your mind when you think of "Indian history"? Each child jots down her/his words and then reads them out. In one class, some of the words the children presented were: war, Gandhiji, Fatehpur Sikri, forts, Mughals, stone-age tools, caste system. The words were written on a large piece of paper. We decided which words should be clustered together in a group. The groups that were formed reflected themes in Indian history: people, places, objects, events and culture/ customs. Thus we arrived at a collective understanding of themes in Indian history.

Outdoor sessions

Learning sessions may occur outside the classroom. These may include visits to historical places, interviews with key informants and encounters with places and neighbourhoods that bring students in touch with the surrounding world.

Assimilation and communication

This embraces both classroom and outdoor sessions. It involves questioning, understanding and presentation. Understanding may include comprehension of written material as well as of information gathered otherwise. Communication may be through writing, drama, art and oral presentations.

Oral presentations and dramas may occur within the class or in a larger school setting. Communication may also include responding to reading/comprehension exercises as well as imaginative writing, reference work and interviews.

What follows is an account of a social science project which highlights aspects of the approach described above.

The Bangalore project

At CFL, children between 10 and 12 years of age do this project over a term. Below is a description of how one such project went.

We explored and learned about various aspects of Bangalore city. The intention of this project was to expose and engage children in a variety of modes of learning which included oral exercises (interviews), reading and discussion, site visits, library research and presentation (oral reports, drama and a visual display).

Topics in the initial outline included: exploring evidence, village/city comparisons, mapping, a history of Bangalore (reading/discussion/writing, visits), communities.

Amongst the skills we planned to address and develop were skills in reading and comprehension, imaginative writing based on factual information, accessing information, written presentation, oral presentation, interviewing/note-taking, participating in discussion, working in small groups.

The project began with a look at different kinds of evidence. We had a brain-storming exercise in which students described how they would find out about their great grandparents' lives. The forms of evidence they expressed (photographs, letters, objects, stories from grandparents) fitted neatly into the following categories: oral, written and archaeological material. Along the way the children made a large poster of the places on a visit to historical sites, wrote and enacted a drama on the history of Bangalore, conducted interviews with old time Bangaloreans and wrote oral histories of selected individuals.

Marjorie Reeves, author of the book "Why History?" proposes that "History cannot be taught, it can be experienced." She further describes two ways in which historical experience can happen. The first she describes as "standing in one's own shoes" and the other as "standing in other people's shoes." Our Bangalore project closely follows these two processes.

Standing in one's own shoes

This involves understanding one's own and one's family situation. It also involves looking at one's immediate environment and communities.

At the beginning of the project, students looked at their own family histories and found out when and why their parents/grandparents had come to Bangalore. We tabulated the information they gathered in the form of a bar chart which depicted reasons for coming to the city. We also compared semi-rural life and city life, listing differences and commonalities.

A look at family histories was followed by a mapping exercise. Students drew a map of the route from their homes to the school bus stop, filling in landmarks and names of roads, based on memory. On a large blank sheet of paper, we marked out children's neighbourhoods, using a printed map as a reference. We then laid the children's maps onto the large template. The composite map provided a context for the children to learn about different areas of the city as well as to clarify directions. We noticed that the part of the map that was entirely blank was the City Market area, where our subsequent study of Bangalore's history began.

Standing in other people's shoes

Marjorie Reeves writes:

A piece of remote history can indeed be taught in such a way as to be quite meaningless because no attempt is made to establish any relatedness, but the same topic can be the wonderfully enriching when a relationship is created which opens up a new world. History as the experience of standing in other people's shoes...is relevant in the sense that it provides experiences which, because they are or can become enjoyable, are taken into the imagination and enrich the whole personality.

So how does one go about this process? We adopted a combination of approaches, as mentioned earlier, both within and without the classroom.

Class-based

In class, we read a series of historical accounts. These spanned the period from 1537, when the walled city was built by Kempe Gowda, to the early 1900s. These sessions included both reading and discussion. The reading material was put together from historical sources. Students became familiar with historical figures and events, and gained a sense of common people's lives in particular periods.

Visits

Our readings were interspersed with visits to the city. The first of these was to the Old City, which was established in 1537. We visited the City Market, Jama Masjid, Tipu Sultan's Palace, the fort remains, Gavigangadhareshwar temple, the Bull Temple and Lalbagh. Students made a large illustrated poster which depicted the places visited.

The second visit was to the Shivaji Nagar/Cantonment area which was first settled in the early 1800s. We visited Richard's Square, Old Poorhouse Road, St. Mary's Basilica, St. Mark's Cathedral and M.G. Road. We met with and talked to four old-time Bangaloreans on M.G. Road. Each child wrote up the details of a conversation with one of the people we

met. One of the people they talked to was Mr.Sharma, who runs Phoenix Watch Works on M.G. Road. From him, the students learned various things:

During the war years (1939-45), the streets were full of soldiers. The barracks were right in front, opposite Utility Building. Nearby there were three theatres and department stores. During this period, all goods were rationed: food, cloth, notebooks, Ovaltine. Petrol was 10 annas/gallon.

Drama

The students scripted and enacted a play on the history of Bangalore which depicted scenes and events from the time of Kempe Gowda to the defeat of Tipu Sultan.

Broadening

Before looking at communities in Bangalore, students did library research and oral presentations on five major world religions. We followed this with a discussion on 'community'. We looked at what we mean by community and which communities we are familiar with. A brainstorming session on which communities we are familiar with generated a list of groups of people. We made a diagram in which we placed all of these groups. We ended up creating quite a complex Venn diagram! We had a discussion on the advantages and disadvantages of communities.

Oral history

As a final exercise, students experienced another form of gathering and presenting information. Each student interviewed a person of their choice and wrote an account of the person's life in Bangalore. This process involved framing questions, listening, note-taking and presenting a story in an organized fashion. During the last week of the class, the students responded to an "open book" set of review questions. The questions included ones which required using one's imagination, accessing information and simple analysis. While compiling the reading material for this class, we referred to the following material:

Bangalore through the centuries by M. Fazlul Hasan
Bangalore, the story of a city by Maya Jaypal
Bangalore, the life of a metropolis by Janaki Nair
Bengaluru to Bangalore by V. Annaswamy
The City Beautiful by P.T. Issar
Monkey Tops: Old Buildings in Bangalore Cantonment by Elizabeth Staley
Karnataka State Gazetteer, Bangalore District 1990
Newspaper clippings

Examples of imaginative writing assignments

Imagine you are one of the following characters:

1. A weaver who has just come to trade in the newly set up town of Bangalore during Kempe Gowda's time.
2. The child of a temple priest in the bull temple at Basavangudi, just after the temple has been constructed during Kempe Gowda's reign.
3. A Mughal officer in Bangalore during Kasim Khan's rule in 1687.
4. A factory-worker in one of Tipu Sultan's gun-manufacturing units in Taramandalpet.
5. A young child living in Bengaluru Pettah just before the Pettah is stormed by Lord Cornwallis in the Third Mysore War.

Write an account of a day in your life in your personal diary. Remember to describe your surroundings and mention any happening on the day you are writing about.

Student responses:

An account by a weaver who has been invited to Bangalore by Kempe Gowda:

I have just come to this city. I came here because at home in my village, people are used to what I sell and there is only one temple. I live quite far away but since news spreads fast, I heard about it (the new city). Suddenly yesterday morning I heard knocking at my door. I opened the door and I saw a well dressed up man. He said, "I'm a messenger from the king. He (has) invited you to come to the court. I jumped up, changed my changed my clothes and taking a set of clothes and all the money I had, rushed onto the cart. We reached around afternoon and the messenger told me to get off at the palace. I have been asked to stay as a worker at the palace.

Next day.

I have just finished half a sari. This morning I found my best handkerchief missing, along with a newly plucked cotton pod. When I asked a friend of mine, he said it could be the blacksmith's doing.

Imagine you are a child in the Blackpally area (Shivajinagar) in the mid-1800's. The British troops have already been in Bangalore for around forty years. You go for a walk from your home near Old Poor House Road to the South Parade area. Describe what you see in detail.

Student responses

1. *Hooray! I'm so happy. I'm... Wait a second. I'd better explain first. I'm the son of a tailor and we live in Blackpally. I'm twelve. My father is fantastic. He designed a new embroidery patter, mixed it with some luck and created or fortune. Lady Bowring and some relatives were riding through our street when she saw our shop. Basically, they left us fifty rupees and departed with our stock of dresses embroidered with the new design. My father was so happy that he gave me 1 anna FOR MYSELF! There is a very nice ball on a shop on South Parade. I'm going there to buy it. I started walking through the crowded streets of Blackpally. Hundreds of people jostled me. Until I turned onto Brigade Road I could see only a mass of people. On Brigade Road I saw some policemen on horse-back. It was a bit quieter here and I could move much faster. I could hear horses clip-clopping on Parade ground. The grim barracks surrounded me. Ha! There's the shop. I started running. Horses, people, horse-carriages, shops, barracks and my feet, all became a blur."*
2. *I'm Arjun Singh. My father is a tailor. This morning I am going to M.G. Road. I'm walking along Old Poor House Road. I can hear the Mullah calling out for people to go do their namaaz. I watch the various sellers on Poor House Road in their various shops selling their various items. As I walk on the granite slab pavement I watch some men repairing green slats that buildings usually have at the end of their tiled sloping roofs. I never knew what they were for and badly wanted to know. I seized my chance and asked. 'They're meant for the monkeys. Monkeys can't climb on the roofs because of the slats,' said one. I kept on walking until I reached M.G. Road. I saw people going by in rickshaws, bicycles and occasionally cars. I walk past a bar and hear shouting and the faint tinkle of glass breaking. 'Oh God,' I think. 'There's another fight between soldiers.' I run out of the area quickly and go farther up the road. There's the Bangalore Riding club on their horses going on the horse-riding track around the track on the other side of the road. There, in the middle of the road, is a troop of British soldiers marching briskly. I pass through a small crowd of people so that I can catch a glimpse of the leading officer's face. I see him, with his large Enfield rifle and his brown topi. I see his medals all dangling from his shirt. Wow, I think. How brave this fellow must have been to get them. I wonder if Bangalore will still be ruled by the British in my grandchildren's lives. I hope not."*

Skills and sensibilities

Having looked at an approach to a social science project in the context of a particular class, I share some of the skills and sensibilities such an approach may nurture. These include:

Imagination

This involves "re-enacting in mind and imagination thoughts and feelings of folk in the past". Such a process involves becoming a character in the past and narrating aspects of one's life. The account students write is based on historical material that they refer to.

Questioning/Discussing

This entails encouraging students' questions and incorporating these questions into the learning process. The process also includes participation in a learning forum where we all learn from one another, from one another's ideas and experiences.

Reading/comprehension

This may share many areas with language-learning.

Reference work

This would include the skills of accessing, understanding and writing.

Communication/exploration

This could occur through many media such as through art, music, writing and drama. This also includes the skill of participating in class discussions, which incorporates both listening and responding.

Interviewing/note-taking

Working co-operatively in a small group

Sensibilities

I have already described some of the sensibilities that may develop in a child during the course of such a project. One of the key objectives of a social science project is to broaden a child's view, kindle curiosity and interest in the unfamiliar and develop a spirit of questioning and exploration.

Creative Writing: Old Words for New Jane Sahi

Every attempt

Is wholly a new start, and a different kind of failure

And so each new venture

Is a new beginning, a raid on the inarticulate...

T.S. Eliot - East Coker

A friend of mine, who is an experienced potter, was at a clay workshop with a group of people who were unfamiliar with such artistic activity. She described her effort to resist doing something that was familiar, something that she knew she could do, which would be appreciated for its skill. She wanted to begin again by responding playfully to a mound of clay as though for the first time and to bring together what she knew and what was unknown.

It may feel like that at this workshop. We all know a vast number of words. We may know many stories and poems, possibly in a number of languages, and yet whether we are old or young, teacher or student, we all have to be ready to begin again. We have to be ready for surprises and maybe even shocks. So this workshop is not about how to teach children to write creatively but actually to come closer to understanding what it means for us to use language in both playful and serious ways.

The terms creative writing or writing for self expression can be misleading because we are certainly not creating something out of nothing. We share a whole treasury of words and images and without that store, which has been growing since human beings first gave shapes and meanings to sounds, we would not be able to begin. Further we need each other and a cultural context to make that process meaningful.

Anyone who has been close to a young child will know the sense of waiting and expectancy to hear the child utter the first word - a recognizable sound that can be shared and understood. A child's first experimenting with words may take many forms - sometimes a single word may include a multitude of meanings, sometimes it may be a fragment of a word and sometimes it may be an entirely new sound that becomes a word by usage. Where do these words come from? Behind each word lies a history of listening, watching, gesture and movement and, most important, a delight in experimenting with sound and a strong motive to make meaning. One striking thing is that any kind of formal teaching of language to a small child is ineffective.

James Britton relates how a mother, who was a psychologist, tried to teach her twenty-one month old daughter. The mother writes:

Tried to get her to say 'coffee'. Several times she responded with 'fofee', the third time with some signs of annoyance. Then to my next reply of 'No! Coffee', she suddenly and emphatically cried, 'Tea!'

(Language and Learning)

It seems children are reluctant to use any word unless they themselves fit it into their experience and see a sense of purpose, whether in play or for a function. Yet we as adults often use words in a purely imitative and empty or mechanical way and often expect students to write in abstract and generalized ways with little sense of involvement or understanding.

We have often lost the creative power of words that are intuited in some myths: for example in the creation story of the Egyptians, we read about Ra bringing things into being through naming them.

Words can also have limitations and can sometimes be a distraction or a cover up. There is a Zen story that illustrates this well.

One day a young monk and his teacher were on a long walk up Mount Fuji. Although the monk had seen the great snow mountain many times before, he truly perceived it now for the first time. And all the way up, he kept exclaiming over the harmony and colours of the wild flowers, the flight of birds, the morning light, and the fresh evergreens, the sacred white pine combs: "See how it is made. This stone - it's soso stone. Isn't it wonderful? Do you hear the nightingale? It's a miracle!"

Muttering a little, the old master hobbled onward, until finally his student noticed his long silence, and cried out: "Isn't it so? Aren't these mountains, rivers, and great earth, miraculous? Isn't it beautiful? The old man turned on him "Yes!" he said forcefully. But what a pity to say so!"

It is interesting to note in a study of the Western Apache community in Arizona that the silence that was typical of that group is not out of an 'impoverished language', lack of human sympathy or underdeveloped emotional sentiments but is actually related to an extreme sensitivity (K.H. Basso 'To Give up on Words' in *Language and Social Context*, 1972).

At times of uncertainty or transition- such as periods of mourning, departure or reunions or even times of anger- the community observed silence as a token of respect to a person in a time of stress. Silence was more respectful and attentive to the person's real needs than talking in pious platitudes or well meaning but oft-repeated phrases.

Words come alive from silence and space. The language of silence and the language of using words sensitively are closely linked, so it is important to give time and space to make words live. Emily Dickinson, who herself is so economical with words, writes how words can crystallize experience:

*A word is dead
When it is said
Some say*

*I say it just
Begins to live
That day.*

Italo Calvino in his book *Six Memos for the Next Millenium* writes about several of the characteristics of good writing: lightness, exactitude, quickness and clarity or visibility. Another aspect would be freshness. The opposite of freshness might be stale, faded,

mechanical or jaded. Poems, images, descriptions or stories are usually memorable because they have surprised us and are expressed through words used strongly and simply. An example of a poem that is simple and forceful is one written by the poet Elizabeth Jennings when she was a child.

The Dead Bird

*I held it in my hand
With its little hanging head.
It was soft and warm and whole,
But it was dead.*

In contrast and written in a very different context is this description of an apricot tree by the Russian writer Aleksandr Solzhenitsyn. It is taken from his book *Cancer Ward* that is both autobiographical and an allegorical novel.

Nearly at the end of the book the protagonist goes out after a long period of being in hospital close to death. He sees the world as though for the first time and the apricot tree becomes for him like a miracle of creation. He writes:

It was the first day of his new life. Everything was new and had to be understood afresh... He sat down by the balcony rail. It was a good point from which to observe the street. It was coming to life now... he decided to adopt the changeless, unhurried manner of those about him. He didn't get up or set off in search of something to eat, but stayed sitting... And from the tea house balcony he saw above the walled courtyard next door something pink and transparent. It looked like a puff dandelion, only it was six metres in diameter, a rosy, weightless balloon. He'd never seen anything so pink and so huge.

Could it be the apricot tree?

Oleg had learnt a lesson. This was his reward for not hurrying. The lesson was—never rush on without looking around first.

He walked up to the railings and from on high and gazed through this pink miracle. It was his present to himself—his creation-day present... Oleg examined it—pinkness, that was his general impression. The tree had buds like candles. On the point of opening the petals were pink in colour, but once open they were pure white... The result was an incredible, tender pink. Oleg was trying to absorb it all into his eyes. He wanted to remember it for a long time... he'd planned on finding a miracle and he'd found one. There were many other joys for him in store today in this newly born world...

(A. Solzhenitsyn, *Cancer Ward*, Vintage Classics 2003)

Here are a few exercises that were done at the workshop at CFL.

The first exercise was to ask each one to think of one particular word that was significant for them. The words given were very varied and included 'change,' 'dance,' 'growth,' 'tree,' 'listen,' 'ripeness' and 'treasure'. These words were then played with and spoken in relation to each other. The participants were invited to repeat their word when they felt some connection to hearing another's word. The result was often surprising and fresh because words took on new meanings and associations when heard together.

The next exercise was to ask each of the participants to hold and respond to a clay bowl. It was suggested that each one should select a word or a phrase that seemed to sum up the strongest and most immediate impression before passing it on to the next person. This was the beginning of a description of something as we see it - from our particular experience - and yet also listening to the accumulated impressions of all the participants.

The following three exercises used a group of twenty very different objects which included an origami bird, a cloth doll, a small purse, an earring and a wooden egg. Each one was asked to choose one object and then write a very detailed and accurate description. It was recommended that we should try to concentrate on a physical, objective description and not write our own impressions, memories or associations.

About ten minutes of quietness was given until everyone felt that they had finished. The participants were then asked to share their writing if they wished. The listening to each other was as important as the writing itself. The task proved more challenging than maybe was expected and many of the descriptions were lengthy, detailed and accurate, while others were short, economical but precise.

The objects were returned to the middle of the circle and then the group was asked again to choose an object and to write a letter to it as though to a person. Some chose the same object and found it interesting to look at the same object from a very different point of view. Again ten to fifteen minutes was given for everyone to write and then each one passed one letter to their neighbour and a reply was written in silence. The letter and the reply were then shared aloud with the group.

It was refreshing for the group as a whole to share and listen to each other's varied and honest responses to the same exercise. There seemed to be a sense of respect and enjoyment that we had discovered together a way of sharing words in a way that brought us closer to each other and to a part of ourselves that had hitherto been hidden.

*The Moon's the same old moon,
The flowers exactly as they were
Yet I've become the thingness,
Of all things I see.*

17th century Japanese Zen poet, Bunan

Additional exercises

1. Write a definition or the special characteristics of one of the following—

A poem is

A moment is

A sigh is

A clown is

A mask is

2. We can build up an imaginary description of a place with anyone adding a sentence to fill in the vivid details. Try to make them sharp and particular.

3. Sometimes a writer takes us by surprise and writes of something that we recognize, linger over but which is nevertheless given a totally unexpected twist and which opens up another way of looking and understanding.

Sometimes something totally out of the ordinary happens. In *Harry Potter* there is a passage:

It was on the corner of the street that he first noticed something peculiar: a cat reading a map.

For a second, Mr Dursley didn't realize what he had seen. Then he jerked his head around to look again. There was a tabby cat standing on the corner of Privet Drive, but there wasn't a map in sight. What could he have been thinking of?

Sometimes the element of surprise is when two images are put side by side.

William Carlos Williams the American poet writes:

Spring and All

*so much depends
upon*

a red wheel

*barrow
glazed with rain
water*

beside the white chickens

The two things may be quite different and yet something brings them together.

How might a rose and a tiger be thought to be similar? Can you think of one word that might make a link between them?

Creative writing is not only about something imaginative and fantastic, though it may include that, but is about a mixture of coming together of things outside us and things inside us that is particular to our way of thinking, feeling and seeing. There are many different ways, for example, of writing about a tree-- it might be a very close observation, or the story of a magical tree, it might be the way we imagine the tree looks at the world or it might be our relationship to the tree.

Often these different aspects cannot be compartmentalised and they are interwoven but today I suggest that we will each take a particular way of looking at, say, a door. These are all different possibilities and all valid in their own way.

4 Write a letter to the door beginning:

Dear Door.....

If you have time you can write a reply.

Write about the door as though you are the voice of the door and tell of your experiences and feelings as the door.

You can begin:

I am a door.....

Write a description of the door to someone who has never seen a door—maybe someone from another planet.

Write about the door as a magic door and what happens when you go through the door. What happens to you? What is on the other side of the door?

5. Try and bring some of these ideas together by writing something called a cinquain - this gives a structure of a poem but what you do and how you do it is up to you; rhyme, alliteration may be included but not necessarily.

The poem has 5 lines:

1. The name of something as the title of the poem
(you may choose an object, a mood, an animal or person)
2. Two adjectives that describe it
3. Three verbs that state the actions or movement
4. A sentence that gives a thought
5. One final word that relates to the subject of the page

Authentic Assessment
Viable alternatives for younger classes
Keerthi L. Mukunda

Assessment is authentic when it corresponds to and mirrors good classroom instruction. When students participate in authentic assessment, neither they nor an observer in the classroom should be able to tell any difference between the assessment and other interesting and engaging instructional activities. The assessment is also authentic when the results can be used to improve instruction based on accurate knowledge of student progress. This is essential in making assessment authentic because both you and your students should find assessment to be important for improving teaching and learning.

Authentic implies that tasks used in assessment are valued in the real world by students.

J Michael O'Malley
(Office of Assessment and Evaluation, Virginia, USA)

Conventional and alternative assessment

The early childhood stage, until the age of 6-8 years, is the most critical period when the foundations are laid for life-long development and the realization of full potential; research shows that there are 'critical periods' at this stage for full development of the brain's potential.

National Curriculum Framework, 2005

Earlier ideas of learning:

- knowledge is made of separate facts/parts to be transferred from a teacher who has the knowledge, to a child who does not
- a child's understanding is shown by recalling the facts/knowledge learned, in the form in which they were learned
- speed and accuracy means understanding and mastery
- the product, final answer, final test performance is more important than process of thinking, path used to find a solution, steps followed to reach an end
- a 'mistake' shows lack of understanding and shows how one is 'wrong'
- quantitative scores can accurately assess a child's understanding in a subject (numbers, grades)
- only a teacher can assess performance

There are various types of assessments with this model in mind: multiple-choice tests, end-of-study-unit tests, single answer questions, all written or oral tests, timed tests and completely silent (exam conditions).

Present ideas of learning:

- understanding is constructed by children based on new information gained, real experience, interaction with people and the world, and active mental processes
- a child's understanding can express itself in many different forms because of many learning styles (working with hands, drawing, speaking, writing, using the body, collaborating with peers)
- speed in answering and word-for-word accuracy is not the only indicator of understanding

- the process of thinking, use of higher-order thinking skills (not just recalling information) and ability to make creative meanings out of what is learned, are important indicators of understanding
- a 'mistake' or an inaccurate representation of content learned in the fact-based subjects can be useful indicators of a child's way of thinking and can inform teachers on how instruction needs to change to help a child understand a concept
- written, oral, and numerical forms can be used to assess a child's understanding
- both the teacher and the student should assess so that there is more honesty about the process and it empowers a student, helping her/him invest in the learning process actively

Again, there are different types of assessments with this model in mind: problem solving creative questions, presentations, laboratory experiments, quizzes, interviews of students, regular and noted observations, research papers, projects with drawings and models, portfolios of work over time.

Developmental stages and assessment

At Centre for Learning, we see education as falling into stages that go alongside developmental stages rather than year-to-year classes. These developmental stages include growth in physical, psychological, social and academic areas. Our assessment of the children continues over a longer stretch of time, years spent in the school, rather than only from year to year. The assessment takes on more informal shades since the numbers of students in each group are so small and the teacher-student interaction in many areas is so high. There is a lot of observation, collection of students' ongoing work and frequent sharing with parents, students themselves, and other teachers since we have so much social contact. However, for many years now we have been writing formal reports every year for students, where we share detailed observations and assessments in the form of fairly long written essays! These are given the end of the year for parents and students to read. It is soon followed by a parent teacher dialogue and meeting. From the age of 12 years, students join for part of that follow-up meeting. Below are some ideas of appropriate assessments for the early years of education:

Early childhood age (until the age of 6)

Learning in the early years must be directed by the child's interests and priorities, and should be contextualised by her experiences rather than being structured formally... (an environment where) children can explore, experiment and freely express themselves, and one that is embedded in social relations that give them a sense of warmth, security and trust. Playing, music, rhyming, and other activities using local materials, along with opportunities for speaking, listening, and expressing themselves... NCF, 2005

Assessment at this stage: observations, any art or project work

Early school age (6-8 years)

This stage at CFL is seen with the spirit of the above sentiments but with added components of getting ready for school life and staying on campus. There is emphasis on working habits in academics, community work and living on campus. The instruction is based on concrete experiences and includes hands-on activities. There is a lot of

integration between subjects; science and social studies are termed 'projects'. There is a lot of interaction with the actual world and learning is based on real experience. Language is used to create, think and communicate with others.

Assessment at this stage: recorded observations, collected art work, craft work, project work (posters, book making), informal interviews, observation of work habits, written qualitative reports.

Junior school age and early middle school age (8-12 years)

This period marks the beginning of more formal subjects (science, social studies—history and geography), more abstract concepts, more responsibility in working habits and taking care of oneself, and learning practical life skills.

"A variety of activities at this stage of schooling should be made available, including organizing events, continuing to participate in cultural and school events, travelling to places outside school, providing experiences to develop socially and emotionally into creative and confident individuals sensitive to others, and capable of taking initiative and responsibility." NCF, 2005

Assessment at this stage: recorded observations, oral interviews, project work collected, formal presentations, observations of students in discussions or while conducting experiments, written work in essays, journals, logs, skill sheets in math or quizzes for vocabulary, formal end-of-unit reviews with open book options and not always timed, collections of art, craft and self-initiated projects, self assessments.

Purposes of assessment

- To measure progress and understanding in knowledge, skills, and concepts
- To encourage students to value the learning process and be accountable for what they learn
- To evaluate a particular lesson or instructional program-feedback for the teacher or feedback for a district
- To communicate progress and status of students to parents, students themselves, and other interested individuals
- To make decisions about temporary small groups in class so as to teach a particular skill. It would be inappropriate for a group to stay together at all times and in all instructional activities.

"The purpose of evaluation is not to motivate children to study under threat, to identify or label children as 'slow learners' or 'bright students', or 'problem children' or to identify children who need remediation (this need not wait for formal assessment)" NCF, 2005

"Assessment is not a means of encouraging competition; if one is looking for quality in education, then segregating and ranking children and injecting them with feelings of inferiority cannot do it." NCF, 2005

The importance of self-assessment

"Asking children to self-report on their learning can also provide teachers with insight into children's educational progress and give them feedback on improving curriculum and pedagogy." NCF, 2005

"Asking children about why they answered what they did assists teachers in going beyond the written answer to engage with their thinking." NCF 2005

"Even very young children are able to give correct assessments of what they can or cannot do well. The role of teaching is to provide an opportunity to each child to learn to the best of his/her ability." NCF, 2005

Just as there are multiple forms of assessments, there are multiple forms of self-assessments.

Students can:

- write qualitative reflections on their collected works in a subject
- use checklists on skills used
- fill out rubrics with several criteria provided the language in the rubric is child-friendly and easy for the students to use over and over again
- orally share their thoughts about their work or final projects
- score themselves on a presentation done or performance task
- reflect in writing on their progress in a particular subject/concept
- write out a self-report for the end of the year that goes alongside the teacher's report

Cycle of planning assessments

1. Planning Assessments:

- going over purposes
- making a timeline for collecting and interpreting information
- choosing lesson activities
- setting performance levels, modifying or selecting rubrics, rating scales to use with the assessments building in self-assessment

2. Collecting and recording information:

- * using journals, logs, written pieces
- talking with students
- using performance tasks
- using formal reviews, quizzes
- observing students and taking notes

3. Making sense of the information (interpreting information)

- applying rubrics, rating scales to the information collected
- judging performances using scales
- looking at progress over time and commenting on it
- writing reports on portfolio work over time

4. Using the information for reporting and decision making

- changing instruction
 - sharing student growth over time with students, parents and interested individuals
- deciding specific instruction for specific skills to those who need it

Final thoughts to keep in mind

- Instruction and assessment are closely connected. Good teachers constantly assess students informally

- Students must be part of goal setting and self-assessment should happen alongside instruction
- Formal assessments are stronger if they are closely connected to the content and form of the classroom instruction

It is important to document the assessments.

Suggestions for creating a rubric to assess a presentation or product

- Identify the skills in the subject that are to be looked at (finding a strategy to solve a math problem, communicating the strategy and solution using words, for example)
 - Determine the qualities of an acceptable piece and then identify 'anchors' for each level of performance on the task (emerging, developing, proficient and advanced)
 - Create the rating scale/matrix using clear words to describe each skill level in each trait (communicating the math strategy used in an emerging student, for example)
 - Describe in very clear language the differences between skill levels. This makes it easier for teachers/students to rate easily
 - Use positive language even to describe beginning or emerging performance levels. This models to students ways to think about themselves and their work positively
 - Consider using local/district curriculum guidelines to inform the criteria and skill levels of the rating scale
- Create the rubric in such a way that it can be applied in a few other tasks so that one does not have to create a new rubric for each and every task that students perform (see attached examples of writing and math rubrics)

TYPES OF AUTHENTIC ASSESSMENTS

<u>ASSESSMENT</u>	<u>DESCRIPTION</u>	<u>ADVANTAGES</u>
Oral Interviews	Teacher asks student questions about personal background, activities, readings, and interests	<ul style="list-style-type: none"> • Informal, relaxed context • Conducted over successive days with each student • Record observations on an interview guide
Story/Text Retelling	Students retell main ideas or selected details of text experienced through listening or reading	<ul style="list-style-type: none"> • Student produces oral report • Can be scored on content or language components • Scored with rubric or rating scale • Can determine reading comprehension, reading strategies, and language development
Writing Samples	Students generate narrative, expository, persuasive, or reference paper	<ul style="list-style-type: none"> • Can be scored on content or language components with rubric or rating scale • Can determine writing processes
Project/Exhibits	Students complete project in content area working individually or in pairs	<ul style="list-style-type: none"> • Students make formal presentation, or written report • Can observe oral, written and thinking skills • Scored with rubric
Experiment/ Demonstration	Students complete experiment or demonstrate use of materials	<ul style="list-style-type: none"> • Students make oral presentation or written reports • Can observe oral, written and thinking skills • Scored with rubric
Teacher Observations	Teacher observes student attention, responses to materials or interaction with others	<ul style="list-style-type: none"> • Setting is classroom • Takes little time • Record observations with anecdotal notes
Portfolios	Focussed collection of student work to show progress over time	<ul style="list-style-type: none"> • Integrates information from many sources • Calls for student self-assessment

TYPES OF ASSESSMENTS

OBSERVER OF PROCESS

Anecdotal records
Observation checklists
Documentation of reading and writing process
Interviews/conferencing with students
Observation of cooperative learning groups
Responses to reading (retelling, reconstruction)

OBSERVER OF PRODUCT

Portfolios
Notebooks/journals
Audio/Videotapes
Collection of written products
Science logs

CONTEXT-BASED MEASURES

Content-specific activities (demonstrations based on classroom work and resembling classroom format)
Informal reading inventories
Writing samples
Tests based on class instruction

DECONTEXTUALIZED MEASURES

Norm referenced tests
District level tests
State level tests

of work over time

PORTFOLIO ASSESSMENT

of any subject

A portfolio can contain :

- writing pieces/samples
- examples of daily work
- reflections of the students
- drawings, maps, charts...
- ways of planning/thinking/brainstorming/problem solving
- collaborative work/group work
- self-initiated project work
- teacher observation notes

SAMPLE SHEET (side 1)

What my portfolio shows :

Areas of strength

Areas of weakness

Areas in which I have improved:

Goals for next term/year:

(side 2)

My teacher's comments:

My parents' thoughts (optional):

Date: _____

A portfolio of work over time, can capture processes of thinking and working, and show growth and maturity in certain skill areas. It can be a collection conducted by the teacher alone or can be a collaborative process with the student, depending on the age of the student.

WRITING RUBRIC (ANALYTICAL)

N.B.: E=Extensively; F=Frequently; S=Sometimes; R=Rarely

	E	F	S	R
1. Purpose Does the piece have a clear focus? Are the ideas developed in depth? Does the piece show an awareness of audience?				
2. Organization Does the organization of the piece make sense? Does it have effective transitions? Is it cohesive (does it "hang together" well)?				
3. Details Are the details well-chosen? Do they support what the piece is trying to say? Is the degree of detail appropriate to the piece (too many/too few)?				
4. Voice Does a voice come through effectively in this piece? Does the tone work well for this piece? Is the voice/tone consistent throughout?				
5. Usage, Grammar, Mechanics Are grammar, spelling, punctuation correct? Is sentence structure clear and interesting? Is usage correct?				

Student Scoring Guide For Problem Solving

	Level One	Level Two	Level Three	Level Four
Understanding	I did not understand the problem. If there is an answer it does not fit the problem. I had many mistakes leading me to a wrong answer.	I understood parts of the problem. I got started but could not finish. Most or some of my math was correct, but my answer is wrong.	I understood the problem and have an answer. I dealt with all parts of the problem. All of my math was correct and I got the right answer.	I understood the problem and I knew which math ideas were important and used them correctly to solve the problem. All of my math was correct and I used another way to show that my work is correct.
Number Work				
My Plan	I could not get started. I did not know how to begin.	I got started and was able to show some of my work, but I could not finish.	I used a plan to solve the problem and my plan seemed to work.	My plan used all parts of the problem. I was able to show my answer in more than one way.
Explanation	I wrote very little about how I solved the problem. I hardly used any graphs, tables or pictures.	I explained some of what I did. I tried to use pictures, tables, graphs and numbers to explain how I solved the problem.	I explained <u>what</u> I did to solve the problem step-by-step, but did not explain <u>why</u> . I used some helpful tables, graphs or pictures.	I clearly explained how I solved the problem. Anyone could understand my thinking. I wrote about what the numbers mean and how I used them to get my answer. My pictures and words were neat and organized.

Teacher Scoring Guide:

	Level One	Level Two	Level Three	Level Four
Conceptual Understanding	The solution exhibits little or no understanding of the situation.	The solution exhibits limited understanding of the situation.	The solution exhibits good understanding of the situation.	The solution exhibits thorough understanding of the situation.
Mathematical Accuracy	Serious computational errors, leading to erroneous conclusions.	Some computational errors, leading to a reasonable but inaccurate conclusions.	Computations performed accurately and the answer is correct.	Computations performed accurately, using a sophisticated approach.
Approach	Random and disorganized; no systematic approach.	Some system apparent in the approach; however, it is difficult to follow.	Systematic and organized approach.	Highly systematic and organized approach.
Explanation	Little or no explanation, or impossible to follow.	Explanation attempted, but difficult to understand.	Explanation fairly clear, but thinking process not always easy to follow.	Explanation very clear. Thinking process easy to follow and well presented.

SOCIAL STUDIES RUBRIC

Teacher and Student Assessment
of final review
(A CFL sample)

<p>interpreting passage and displayed understand</p>	✓		
<p>proven the accuracy of writing imagine writing</p>	✓		
<p>described features</p>	✓	✓	
<p>inferred information</p>		✓	
<p>provides information</p>	✓		
	<p>answered question completely and accurately</p>	<p>50% accuracy of answer</p>	<p>was unsure of the answer but attempted a part</p>

Suggestion for reading assessment: teacher-student one-on-one

The usefulness of these assessments lies in the ease with which they can be constructed, the source of their content (material taken directly from the curriculum), the opportunity they provide to assess reading in a context that is identical to that of the classroom task, and the information they provide regarding students' reading behaviours.

-Fradd and McGee

- Get a fiction/non-fiction book that could be of interest to the students OR choose a textbook currently in use. Randomly select three 100-200 word passages. These passages should be from the beginning and end of the books
- Prepare 6-10 comprehension questions about the passages and which address both factual information from the passages or inferential ('read between the lines')
- Request the student to read the passages silently
- Request the student to read orally. Record any reading miscues/errors on a photocopied sheet of the passages
- Read passages to student to assess listening comprehension
- Ask the questions and record the responses to them
- Analyze oral reading and comprehension responses as below

Level	Definition
Independent	That reading level at which students are able to read on their own and have no to minimal difficulty with word identification, comprehension and memory for the content of a passage.
Instructional	That reading level at which students have some difficulty with word identification, comprehension and memory for the content of a passage. Difficulties can be overcome with further instruction.
Frustration	That reading level at which students are unable to identify words or comprehend passages. The demands of the text exceed the skills of the reader.

Literature Discussion Group: Teacher Observation

Book/story Discussed	Author			
Theme/Focus (optional)				
Names of Students:				
<u>Preparation</u>				
Brought book and other materials				
Read assigned pages				
Made notes to share				
<u>Participation</u>				
Contributed to discussion				
Used higher-level thinking				
Used text to support points				
Elicited responses from others				
Listened to other viewpoints				
Made inferences from text				
Referred to story elements (plot, characters, conflict, theme)				

Examples of students' notes

When students are in small book groups, reading fiction or non-fiction, they take notes of their questions, predictions, disagreements or feelings about the reading and then meet with the teacher or an adult to discuss the notes and hear from each other.

The focus is on the ability to speak clearly, share thoughts about the reading, listen to others, and build on each others' comments. Sometimes at some weekly meetings, teachers can write what the students are saying for later reference and for an assessment of how they did in the discussions and what they said.

"It is exciting and sad that the shark is pulling the penguin into the ocean!!"

"I can't wait to read the whole book!"

"Why did the Khmer Rouge start the war?"

"I hope Sarun gets more rice to eat!"

"Why do all the soldiers have to be so unkind to the people?"

"I am feeling hungry just reading about the food."

"Is the marble a secret of theirs?"

"I think hope was the only thing that drove people on."

"I liked the descriptions."

"I think Cusi will find his own people at the end."

"I wish I were there in the time this story was set."

"I like the name of this grass: yehu."

In addition to these notes, the teacher can look at answers to comprehension questions and vocabulary exercises that are done in the context of the story they are reading. All of these sources give information on how students are doing in speaking, listening, reading, writing in the context of a book they like and are reading with interest.

Suggestions for recording observations of students

Indicate the date, time, and setting of the observation

- Specify the behaviors of the student and relevant others
- Include factors that appear to affect the behaviors
- Document verbal and non-verbal behaviors
- Remember that the purpose is description not judgement of the behaviors as they are occurring.

Name of Student: Writing Skills							
Writes a personal narrative							
Writes in a clear organized way							
Uses a wide and varied vocabulary							
Uses descriptive language							
Uses writing mechanics - punctuation, capitalization, etc.							
Recognizes spelling mistakes							
Uses the writing process effectively							

ANECDOTAL NOTES OVER TIME

ANECDOTAL NOTES OVER TIME

Name of Student:
Science & S. Studies

Understands
concepts

Shows habits
of mind

Completes projects
and assignments

Science: Habits of Mind

Curiosity
Open Mindedness + Skepticism
Care
Respect for evidence
Persistence

Social Studies: Habits of Mind

Dialogue
Listen attentively
Work collaboratively

ANECDOTAL NOTES OVER TIME

Name of Student

Speaking & Listening Skills

Chooses words
with precision

Includes relevant
details

Reads aloud and
recites with care

Describes events
and experiences

Answers questions
about details of
a story

Follows announce-
ments and task
directions

Comprehends a
simple non-fiction
passage

Listens attentively
to detailed explana-
tions/presentations

Example of a social studies review

Ancient India: End of Term Review

At the end of a twelve-week term, the students (aged 12 to 13) responded to a partially open-book review. Among the questions included were:

Question 1

Imagine you have to make a short presentation on a particular aspect of the Indus Valley civilization. Write out five main points that you would talk about during your presentation.

Students were assigned one of the following topics, which they had already studied during the course of the class:

Agriculture/subsistence, craft production, seals/crafts, trade.

Question 2

Read the passage you have been given which describes one aspect of the Indus Valley civilization. Answer the questions at the end of the passage.

Students were given one of the following excerpts from Irfan Habib's "The Indus Valley civilization" along with accompanying questions.

Agriculture/subsistence (p.27-28)

What do we know about which animals existed during Harappan times? What role do you think animals played in people's lives?

Craft production (p.28-33)

What developments took place in the manufacturing of objects during Harappan times? What were copper and wood used for? Who do you think made and used the things that were manufactured?

Seals and crafts (p.35-37)

Describe the crafts which required more skilled craftsmanship. What do you think the seals were used for? Who used them?

Trade (p.45-47)

Describe the evidence for two kinds of trade during Harappan times.

1. Local village-town trade
2. Long distance trade

Who do you think benefited from trade?

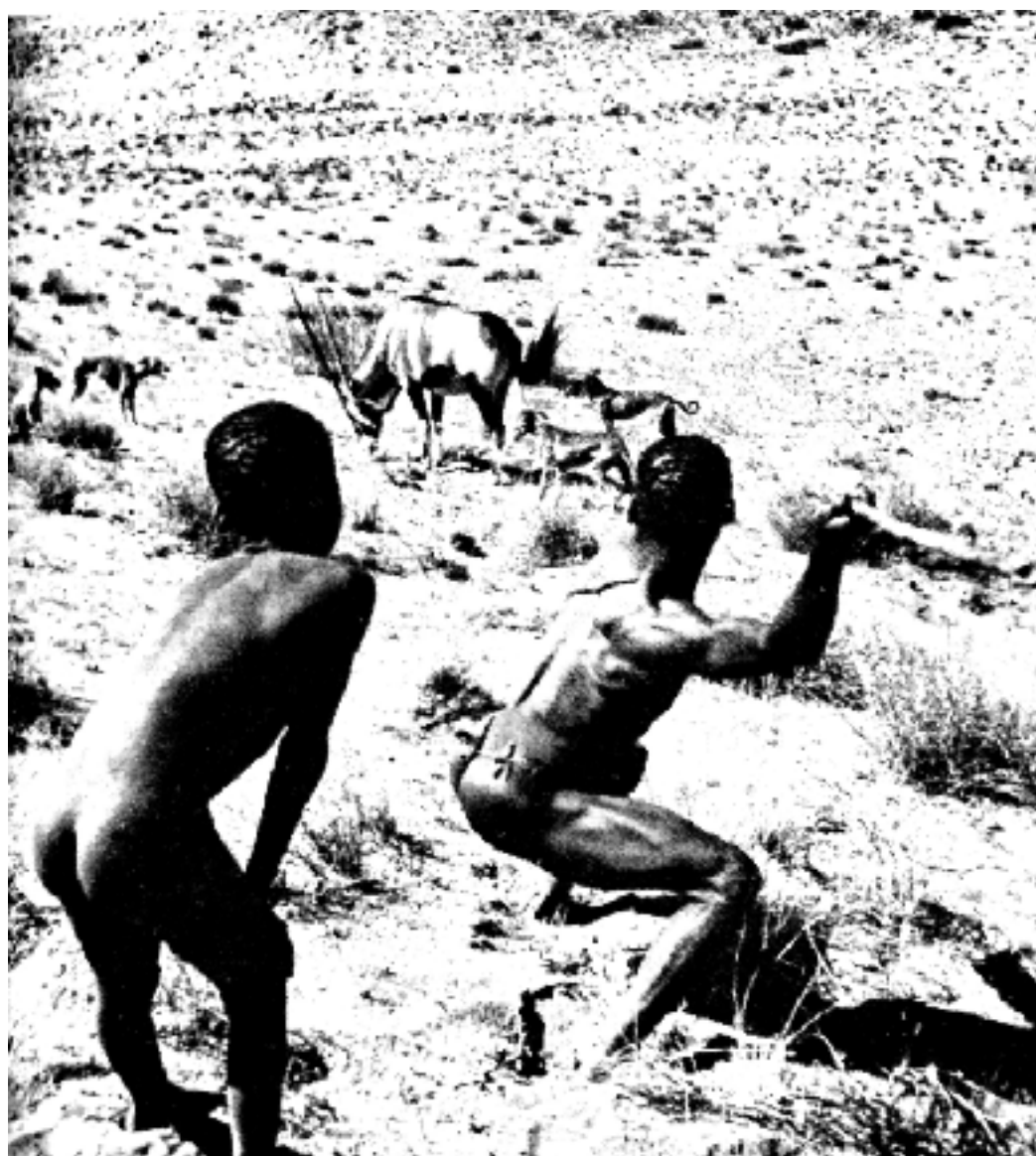
Long distance trade (p.48-50)

What evidence of trade between the Indus valley and Mesopotamia do we find in Ur (Southern Iraq)? What evidence do we have of Mesopotamians being present in the Indus valley?

Question 3

Look at the two attached pictures closely. One represents human beings in a complex society and one represents human beings in a simple society. Thinking about work, technology, social groups and food, list five clear features of each society (based on what you see).





TYPES OF QUESTIONS (MATHEMATICS)

Assessment begins in asking the right questions of the students. Questions that allow for open-ended, creative responses, informs teachers of much more than if the student "got the right answer". Here are just a few examples of such questions:

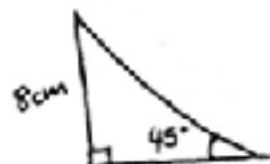
You want to teach your little cousin how to subtract two-digit numbers. Write out what you will say, and give examples of problems.

Here is a list of discount coupons. Your calculator is broken. Describe at least two ways to find the total amount you can save:
65¢, 88¢, 23¢, 42¢, 77¢, 35¢, 99¢, 2¢

With your group, design an activity that will help the class understand how large 1 million is.

The bill for Rosalie and Quan's dinner is \$18.40. They want to leave a 15 percent tip. How would you suggest they figure out how much tip to leave and the total amount they will have paid?

list everything you know or can figure out about this triangle:



John bought 6 double albums and 12 single albums for \$210. The double albums all cost the same and each single album costs \$9. What was the cost of one double album?



Explain, in words, how you would go about solving the problem above. Solve the problem following your own directions to be sure you have included every step necessary.

Science: An experimental approach in the classroom

Middle and senior school

Yasmin Jayathirtha

There are many reasons why a science teacher might feel apprehensive about an experimental approach to the teaching of science. Experiments are expensive, disruptive in the classroom, potentially dangerous and they simply take too much time! However, there are obvious and compelling reasons for bringing in an experimental approach to our curricula. The fact is that much of school science is potentially experimental in nature, and acquiring the knowledge required is easier through such an approach. It is simpler to show that sodium is a silvery white metal which reacts violently in water than to read out the statement- and, of course, this dramatic demonstration is easier to remember.

More importantly, when we teach school science through experiments, the students learn several important skills.

At the mundane level, they learn the skills of working with their hands, of observation and deductions. At a deeper level, they learn that thinking about the process and bringing it to fruition can be two very different things. This will help them gain a realistic perspective on and respect for those people who work with their hands for living.

At a social level, there is both a fascination with and a horror of science and technology. Both these extremes come about because very few of us know how things work. Any experimental work done by us gives us a better understanding of the processes that underpin technology. We can also perhaps better appreciate and respond to issues that confront us in the world today.

At the deepest level, using experiments to build a picture of the physical world reminds us that we are ultimately having the pictures and models that work but which should be changed when they are no longer appropriate. To me, the most important part of learning science is model building to model breaking.

Perhaps this will help us realise that the pictures that we build in our emotional world are also merely pictures: useful when they work, to be discarded when they don't.

Microscale Hoffman apparatus

Taken from *Microscale Chemistry*, published by the Royal Society of Chemistry, 1997

Teachers Guide:

Topic: Electrolysis

Level: Pre-16 and Post- 16

Timing: 20 mins

Description:

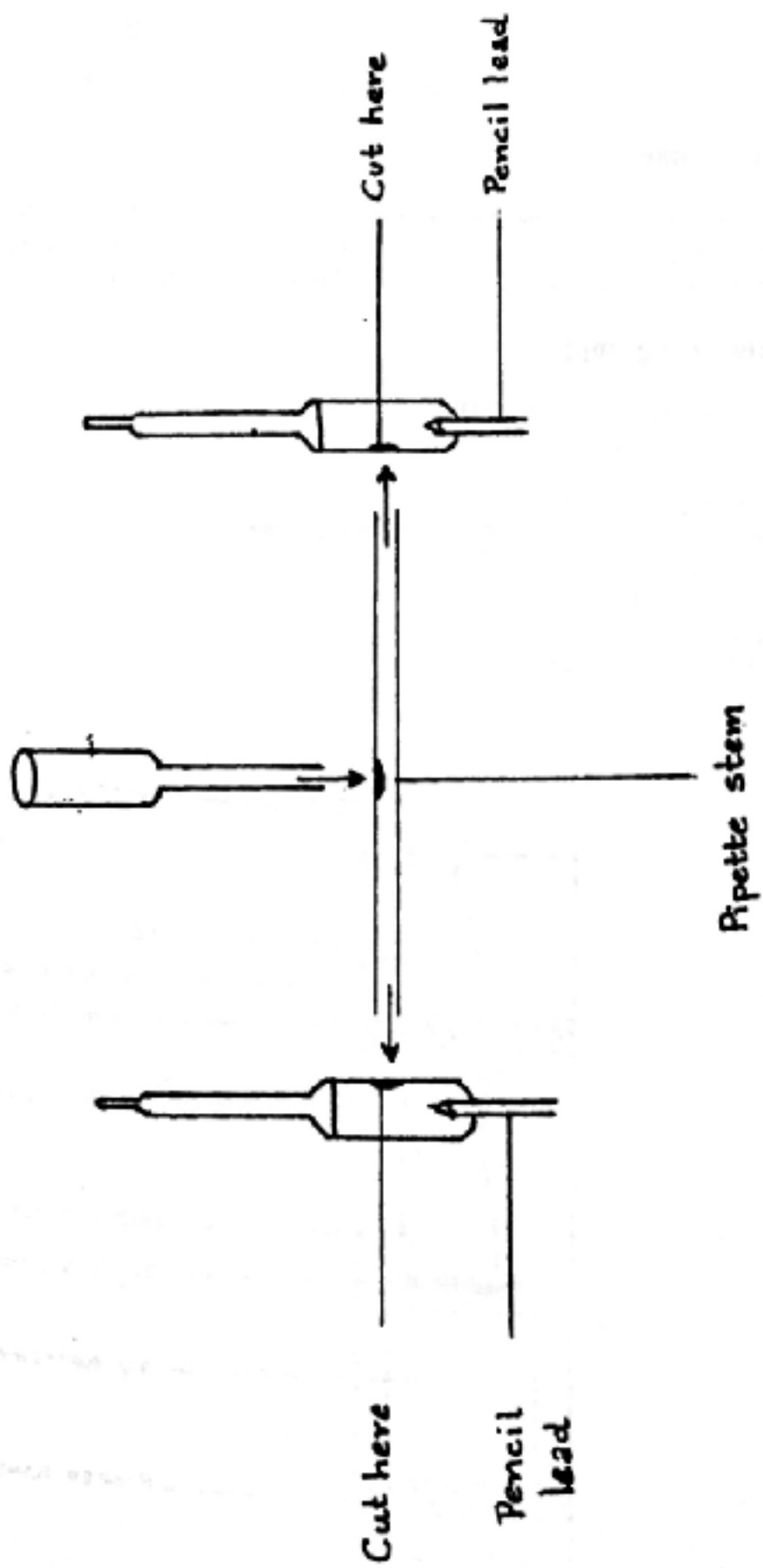
In this experiment, students make a microscale Hoffman apparatus from plastic pipettes and use it to investigate aspects of electrolysis. Instructions are given here for the construction of the apparatus.

Apparatus:

- ◆ For plastic pipettes
- ◆ Scissors
- ◆ A pin
- ◆ Pencil leads (HB 0.9mm)
- ◆ Adhesive (Araldite or superglue)

Construction:

1. Using the scissors cut two holes in the two of the pipettes as indicated in the diagram.
2. Cut off the stem from a third pipette and insert it in the first two pipettes to join them.
3. Cut off the tip and the end of the bulb of the fourth pipettes and insert the tip end into a hole in the middle of the stem joining the first two pipettes.
4. With the pin make a hole in the bottom of the two bulbs and carefully insert a pencil lead into each.
5. Apply adhesive to each joint and leave to dry.



Construction of a conductivity meter

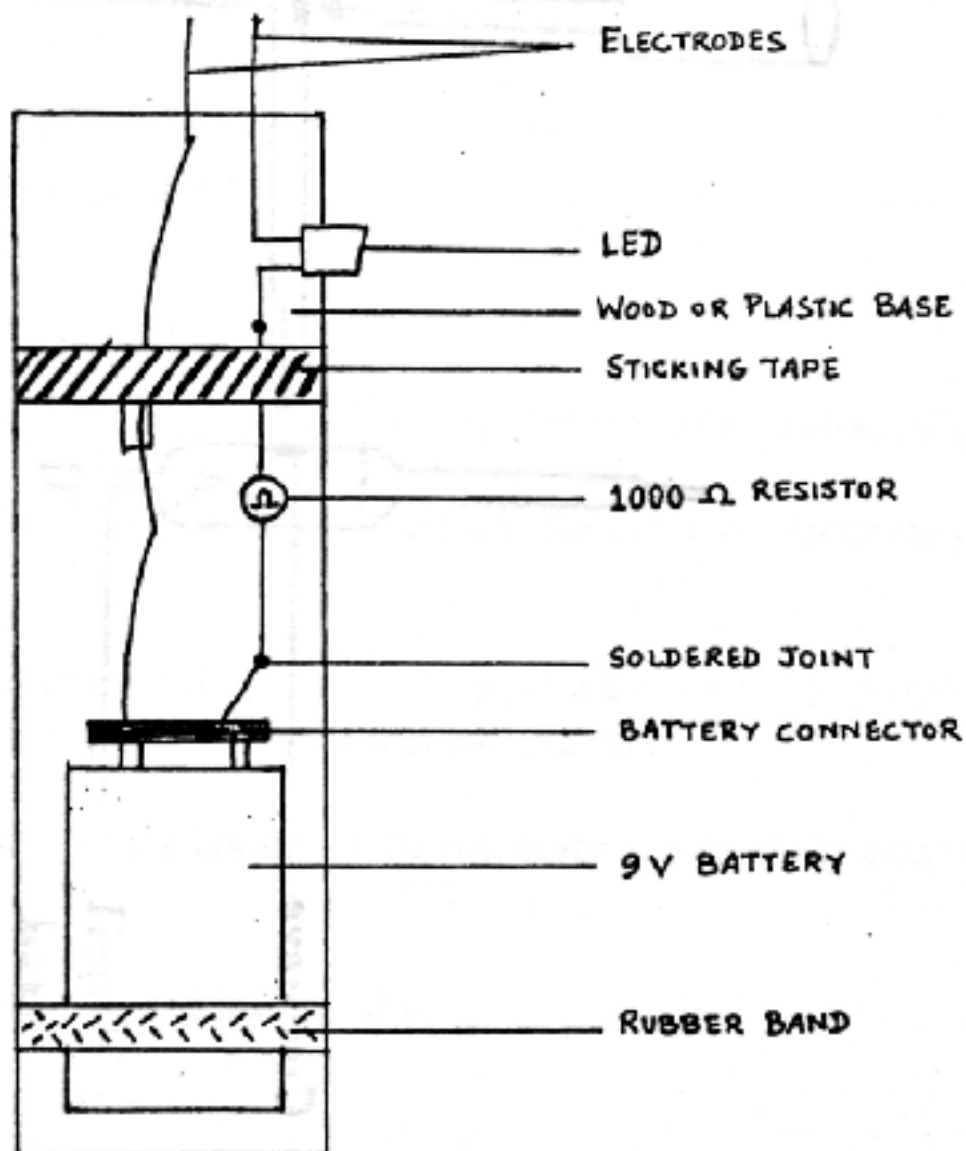
Taken from *Microscale Chemistry*, published by the Royal Society of Chemistry, 1997

Teacher's Guide:

This procedure gives instructions for constructing a conductivity meter that can be used for testing conductivity of solutions or solids. It is possible for students to make the apparatus themselves. Alternatively students could be given the instruments.

Apparatus (per group):

- ◆ One light emitting diode (LED)
- ◆ One 1000 ohm resistor
- ◆ One 9V battery
- ◆ One battery connector
- ◆ One piece of thin wood or plastic - 150 X 25 mm
- ◆ Solder wire or tape
- ◆ Soldering iron
- ◆ Sticking tape
- ◆ One thick rubber band.



The Chemistry of Everyday Life

Yasmin Jayathirtha

These are a series of experiments done over a term in the 7th and 8th classes. They show a connection between everyday life and the laboratory, familiarize the students with the apparatus and techniques used in the lab, and expose them to the terminology before the start of a formal chemistry course.

1. Acids, Bases and Indicators

This experiment gives an idea of how chemicals are classified. Tell the students that one of the ways is to classify them as acids, bases and neutral substances. Demonstrate the changes they bring about in indicators.

Make your own indicator: Collect flowers of a particular kind (you could try flowers of different colours like hibiscus, vinca plumbago, jacaranda or marigolds), crush them with a little water and extract the juice.

Divide the extract into two parts. Add lemon juice or vinegar to the first part, and chuna water to the second. Observe the colour changes if any.

Having found the flower extract that gives the best changes, make a large quantity of the indicator and ask students to bring in things to be tested. Suggested test materials are milk, curd, orange juice, soap, washing powder, shampoo, oil, tea, coffee and so on.

One class discovered that acids are sour and bases are bitter. They further extended the experiment to find out if sour substances are acidic and bitter substances are basic.

Talking Points:

- Everything is a chemical, not only things we consider 'bad'!
- Acids are not 'bad' for you.
- Classification is the basis of the scientific method.
- Scientific observation begins with seeing patterns.

This article is taken from Journal of the Krishanmurti Schools No. 8, 2004

2. Making Soap

Discuss the need for soap—since water and oil do not mix, soap should have the property that it can mix with both oil and water. Use coconut oil and sodium hydroxide solution. For every 100 grams of oil, add a solution of 9 grams of NaOH. Take the mixture in a steel or glass vessel and boil while stirring, till the foaming stops. The mixture will become thick (if you over-boil you will get soap powder). Rinse out the soap with water and give some amount to each student to mould and shape. The basic soap is cream coloured and has a mild 'soap' smell. You can discuss how to add colour and scent using food colours and essences. The soap can be used for washing hands.

Talking Points:

- Why do we use ash for cleaning?
- How was soap discovered?
- How do natural cleaners like *shikakai* and *reetha* work?



3. Making Toothpaste

Toothpaste is a mild abrasive, with foaming agents, taste, colour and scents added. A precipitate of calcium carbonate makes a good toothpaste.

Make a concentrated solution of washing soda. Add lime water from the lab (or chuna water) till no more precipitate forms. About 50 grams per student gives an adequate amount of toothpaste. Filter the precipitate, dry it and add glycerin to make a paste. Add colours and flavours. This can be really used!



Talking points:

- Why teeth need cleaning!
- What role do the particles of precipitate play in cleaning?
- What is the role of colour and flavour?
- Discuss advertisements for toothpaste.

4. Model for Photography

This experiment gives the essentials of photography and acts as a good introduction to chemical reactions. Best results are obtained by using cloth, but paper can also be used. Take the laboratory reagent silver nitrate solution and dip a small cloth or paper sheets in it. Dry them in the dark between sheets of newspaper. Give each student one or two sheets of the treated cloth or paper for them to expose to sunlight, to demonstrate the effect of light on silver nitrate. They can arrange objects like nuts, springs, leaves, etc., to make a picture on the sheet, and then expose to the sun. After the background darkens (it takes about 10 to 15 minutes), lift off the objects. Discuss how to 'fix' the 'photo'—this can be done by washing off the unreacted silver nitrate. Some very beautiful prints result, and students usually want to try different compositions.

Talking point:

- The history of photography

5. Gunpowder

Around Deepavali, make gunpowder in the lab and make fireworks! You need an oxidant (potassium nitrate or potassium perchlorate), charcoal and sulphur. Discuss combustion and explosions. Point out that fireworks don't have air inside and so need a source of oxygen (oxidant). Grind charcoal and sulphur very fine and sieve them through a cloth. Mix the powders in the ratio 1:1.5 and store. Grind the oxidant, sieve and STORE SEPARATELY (important!). When needed, mix the powders in the ratio 3 of oxidant to 1 of the charcoal-sulphur mix. Add salts, iron and magnesium filings for colour and sparkles (barium gives green,



lithium and calcium give red, copper gives green-blue). Fuses are made by soaking thread or cotton wicks in a concentrated solution of the oxidant and drying. 'Flower pots' are the easiest to construct. Make a clay pot, fill with gunpowder, put in a wick. Students have attempted to make Vishnu chakras and sparklers (using gum). No bombs!!

Talking points:

- Rates of reaction.
- History of gunpowder.
- Social issues during Deepavali like noise pollution, child labour, money burnt, fun had and so on.
- Techniques of packing gunpowder for different effects.

