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Rendezvous with an Eighth Grader: Insights for Design and Technology Education

Abstract

This article presents some insights gained through an interview with a middle school student. The interview reported here focused on this student's likes and dislikes in connection with school, ideas about science, technology, and society etc. Further, the article outlines the key ideas and themes that emerge from a preliminary analysis of this interview. Though one cannot generalize, the evidence transpiring through this exercise do provide some opportunity to reflect on the way we design activities for children.

Schools are formal institutional spaces for communities of learners, that is students. Designing creative and inclusive spaces for these learners is an important aspect to ponder upon, as also discussed in the National Curriculum Framework of 2005. Over the last couple of years, we have been trying to create an informal workspace in the Design and Technology (D&T) laboratory at the Homi Bhabha Centre for Science Education (HBCSE). The space has been designed with the objective of interacting with children over continuous periods of time, which could possibly assist and improve the methods that we currently employ to design activities for children. The idea is to make the laboratory an attractive and inclusive space, where students can access a wide range of material and resources. The laboratory has several displays of colourful posters, models, activities. Also available are, building kits, basic tools, lego® blocks, science kits etc.

Visiting students can work with any of the materials available in the lab and are encouraged to ask for things they specifically need. Our plan is that these children work towards either creating a product that interests them, or solve design problems that are posed to them by us.

A couple of 8th and 9th graders (girls and boys) visit the laboratory

occasionally as part of an informal after-school programme. But one of them Jatin*, a teenage middle school (Grade 8) boy, has been frequenting the D&T laboratory, more often than his peers. His parents and school have been supportive of his activities and projects here, and encourage him to spend time in the various laboratories at the centre. He is usually accompanied by 2-3 friends who are either his batch mates or seniors. Sometimes they come to the laboratory with a problem and seek our help, at other times, we provide them an activity to do. On other occasions, they just come to the lab and read books, browse for science videos online, dabble with the virtual drawing board or collect information for their project work from the internet.

In order to better understand Jatin's motivations to visit the laboratory, understand his thoughts on school, school science, I on several occasions, struck long conversations with him. I was hoping that the insights we gain from these interactions could enhance our understanding of how to design activities for children.

Some background information about Jatin: He is 13 years old, in grade 8, studies in a private aided school in Mumbai, which follows the Maharashtra State Board curriculum. He has been in the same school since nursery. In the lab, he is seen- working with clay to make models to use in stop-motion animation projects; using 3-D pen to make cubes and cuboids, using Lego® blocks to build models of houses and cars, or dabbling with ready made science kits. He also spends time in making drawings on the digital board (LCD tablet), and at times, searches for youtube® videos on space-technology, big bang theory and astronomy. On several occasions, he used the internet to get information for his school projects.

Following are some excerpts from our multiple conversations. Overall, I have maintained text verbatim while reporting what Jatin spoke, and sought clarifications from him when I was unsure of what he meant. However, there are a few instances where language and grammar has been corrected.

Hi, so you have been coming here often and I know that you have also been working on your school projects here... I was just curious to know more about your school, what you like and dislike in school and about your favourite subjects. Would you be willing to share your thoughts with us?

Sure. I do not mind.

What subjects do you study in school?

In school, I have Hindi, English, Maths, Science, Social Studies, Marathi, Drawing, PT, Computer class and Science lab.

What is your favourite subject? Why do you like it?

I like Science and Hindi. Hindi, my teacher, she teaches so well, so I like it .. the same for Science.

What is the most fun thing about school?

Mauka milta hai sabit karne ke liye.. [you get opportunity to prove]. I also enjoy the science practicals, especially if its something to do with chemicals. I also like the cultural events, sports day and annual day. But there is nothing nice on an every day basis.

What is the most boring thing about school?

Marathi period.... and I don't like the teacher also...

So, what are your least favourite subjects?

Marathi and Civics

Do you like all sciences, or some sciences?

I like biology most... actually I like all.. I like doing experiments.. I like to do research... I like chemistry experiments... I have medium liking for physics... So I like biology first, then chemistry, then EVS [environmental studies] and then physics.

Do you think Geography is also part of science? And what about history?

Hmm.. It is also like science... I mean... yes, it is a science .. *science nahi hota toh geography nahi hota*, like satellites and all [If science was not there, geography wouldn't be there] History... it is not like science ... it just tells us about past .. In science they tell us about what was the past research and all... but history... not sure.

Do you think it is important to learn science? Why/why not?

Yes.. its important, it should be compulsory in school.. so that they can know about science, what happens in science. We have EVS, so we know environment *hamare haat mein hai.. hum log kya kar sakte hai.. agar environment safe hai toh hum log safe hai* [we know that environment is in our hands...we know what all we can do... if environment is safe, then we are safe]. We get to know about air and water pollution... we get to know about Alzheimer's *disease... So I celebrated* Diwali little bit only ... and in chemistry, you can touch chemicals... we learn about good and bad chemicals... we get to know what happens when you mix two chemicals... we learn what to touch and not to touch...

Can you give an example of how learning science was useful for you outside of school?

In EVS, we study about pollution... now every time I come here from station (railway)... we have to close our nose...because it is so dirty because of pollution... now I am noticing more... because we read, we notice more...

Do you think science is useful in any other area of your life or in your family's life?

No

Do you use internet for any of your school work?

Yes, in school, we have a computer lab and internet... I use it for my projects, not for homework or exam preparations.

Do you like working online?

Yes, because you are open to world wide... you can talk to anyone.. you can get education related information for work...

In your projects and school work, do you like to work alone or in groups?

Usually teachers give us group work ... but I prefer working alone... because then I can peacefully work on it, can concentrate more.... In group, you can get confused with others. But then in groups, *meri baat sahi uski galat; ya uski baat sahi hai, mera galat* [my point is right, his/her point is wrong; or his/her point is right, I am wrong]... that we can find out.

Have you visited the Museum and science centre in Mumbai? Do you learn science there?

I have visited and I liked both ... the science centre was ok, but planetarium was fun. I learnt about how the universe works.

Can you think of a famous scientist?

Homi Bhabha but I don't know much about him.... some people here also....

Can you think of any famous women scientists?

Hai kya? [are there any?]... *Zyada females...science mein nahi jate* [many women don't go into science]... oh I take that back, I have seen many women

here at your office.. I don't think there are any in my text book though ...

Have you heard of Madam Curie?

No... oh.. wait, I know Sunita Williams and Kalpana Chawla!

When you grow up, what kind of job do you want to do?

I want to become a biology scientist... because I am interested in biology.. I like to know about biology... about what is the importance of organisms in daily life... what organisms dirty our water?

Have you always wanted to be a Biology Scientist?

No... I mean first I wanted to be a singer in 5th standard... then in 7th standard, I liked science.. so it changed. If I don't do well in science, I may consider singing... I go for classes, Carnatic music classes.

Suppose I said, complete the sentence, "I would like to be a scientist because..." how would you continue?

To know how organisms help us.. it is process of questioning. [And on another occasion]. I want to be scientist as there are many benefits... one gets good money, one can travel outside the country to attend talks and conferences, everything is near by and lot of perks are there.

We all get sick from time to time. Let's imagine you had a bad stomach-ache, what would you do?

I would go to doctor.. *ghar me ilaj hua toh theek hai* [if I am cured by home remedies, then its fine] ...mom knows quite a bit... we used to live in a village, we know about Ayurveda ...

Let's consider a quite different question. Suppose you had a friend who said that their religious holy book explained the beginning of the earth and of human life very differently from what scientists said, and so your friend thought the scientists were wrong? What would you say to your friend?

I would say science is correct ... I will say that because science says things for a reason .... I will prefer science.

If you had the power to change 5 things in your school today to make it more enjoyable, what would you do?

I would increase playing time... it keeps us healthy also.. so there will be PT period everyday. Teaching should be good... some teachers only do easy questions in class and give the tough questions for homework... that should not happen. Library should be open for all and all the time... and some books like encyclopedia are not allowed for us – its only allowed for 10th standard... so all books should be allowed for all.... Even *Mahabharata* is not allowed now for us to read.... I think this 'no failing' till 8th standard rule.. that pass till 8th standard should discontinue. Because in class, the less interested people disturb good performing students... and there should be separate division... in 10th standard, we have separate special teachers who can concentrate on the weaker students more..... There should be different kinds of food available in the recess- *roz khichadi rehta hai* [Everyday, there is *Khichadi* – a rice lentil dish]

You visit the design and technology laboratory often. Why is it so? What makes you come back here?

It's because of creativity

What do you mean by creativity?

Different different things...

Ok, but I am still confused, how does that make you want to come to the laboratory?

The things we see here... so many of the things I have seen here for the first time... and we get a lot of help for our

projects here, if we have doubt and all. We like coming here…

But many times you don't complete the projects we give you. Why is that?

Time was less, you can give us now – we will do it and finish it. We had work from the other lab also. That is why we did not finish it.

But you had time later, right? Then too, you did not finish it. You can tell us if its boring. It helps us to plan our activities better.

Actually, when we are doing one activity, and we see another one, we move to that because you feel that one is more interesting. So that keeps happening. But it will help if you give us short projects, means that gets over in one hour or so… we can then quickly complete it and go…

Is that fun for you? If you already know the answer to something and you solve it and go, then….

(Jatin completes my sentence): We don't actually learn anything new…

***

Reflections from the conversation/s

Outdoor engagement

It is not surprising to see that Jatin as well as a few others (not mentioned in this interview), express their need for extended outdoor (Physical Training/ PT) sessions, when asked what is the one thing they would like to change in school. Children today are spending less time outdoors and studies have suggested ways in which outdoor component can be integrated with subjects like environmental studies (Bhide & Chunawala, 2017). Converting PT periods (which are usually 1 or 2 in a week) to a subject period in an attempt to "complete syllabus" is not uncommon. And children often are left with even lesser time outdoors. As Muñoz (2009) suggests, outdoor educational contexts can stimulate development of a wide range of communication, social, and learning skills including creativity.

Relevance of science and image of science

Many students, like Jatin find that science has restricted relevance in their daily lives, yet have a liking for it owing to good teachers or their interest in specific topics. Jatin seems to view science as a mere giver of information and facts. He, as well as a few others I spoke to, have a very positive attitude towards science, thinks that science can solve many of society's problems, they like "doing" experiments, and they frequently are on the side of science without questioning it further. His positive impression of science can be attributed to the general prestige of science in Indian society, that one can get 'good' jobs in science or it could just be that he felt that was the 'appropriate' thing to say in a science centre. Interestingly, Jatin had forwarded a whatsapp® message to a group which made a fallacious claim about an astronomical event, apparently backed by NASA. When I asked him how he believed this message was true, he mentioned that because NASA is trustworthy and a renowned name in the scientific world. An inability to critically evaluate information is observed in such instances. Such trends have been observed in other parts of the world as well. Recently a Standford University study that surveyed around 7800 students reported that over 80% of middle-schoolers couldn't distinguish between an ad labeled "sponsored content" and a real news story on a website (Wineburg et al., 2016). Research has indicated that incorporating elements of nature of science, methods of science and

socio-scientific issues in the science curriculum could perhaps be one way for students to get a more holistic understanding of science (Ledermen, 1992).

Technology in hand

Using technology was the "in-thing" for Jatin and his friends. They find the idea of working with computers and internet fascinating, the thought of having information at your finger tips seems to empower them. However, I worry about the repercussions of indiscriminate internet use. For example, for his projects, I have seen Jatin copy information 'word for word' (whether relevant or not) from the internet on a particular topic in Geography. I tried asking him what is the information he needed and his replies were often *"my teacher told me to get all information about this 'topic' and stick pictures*". In the context of using technology, NCF 2005 says that "*technological use that turns teachers and children into mere consumers and technology operators needs to be reviewed and discouraged*" (p.121). The projects that Jatin and his friends get assigned in school are restricted to "collecting information" about a person, place or concept. Such projects have little scope for inquiry, let alone allowing for student's curiosity, creativity and imagination.

Collaboration and group work

Research has over the years provided ample evidence of the benefits of working in collaboration (Baker et al., 1999; Haller et al., 2000; Mehrotra, 2008). On the contrary, Jatin personally does not seem to consider collaboration to have much value, in fact he thinks it hinders his work. My observations of his group work aligns with what he says, that is, whenever he is given a task to do with his peers, he tends to wander off after 10 minutes. Either he prefers working alone, or the activity could not provide for effective constructive collaboration or he did not feel challenged enough by his peers. It is possible that his attitude towards collaboration are also linked with his ideas of inclusion, which are discussed in the subsequent section.

Views on inclusion

On two occasions, Jatin expressed his disinterest in sharing space with peers who are unlike him: "*...in class, the less interested people disturb good performing students... and there should be separate division... in 10th standard"* and *"Usually teachers give us group work ... but I prefer working alone... because then I can peacefully work on it, can concentrate more.... In group, you can get confused with others".* Though in the latter statement, he did further mention that there is value in differing opinions, his stance to distance himself from those who are different from him is a concern for us as educators, especially when the education system is in transition from exclusion to integration to inclusion (Sharma, Chari & Chunawala, 2017). Instilling values of empathy, tolerance and peace amongst the younger generation is an important educational and life goal, which forms the bedrock of a humanistic society. However, an interesting juncture to explore is how and why students develop this idea of "separating" self from peers who are unlike them. Jatin also mentions that school is fun because "*Mauka milta hai sabit karne ke liye* [you get an opportunity to prove]". Whether this kind of competition is healthy or not, we cannot say at this point, but a strong sense to win or prove oneself may be linked to wanting to work with people who will increase your chances of winning or proving one self.

Gender and science

Lack of exposure to works of women scientists leads Jatin to feel there

are no women scientists around. But he was fast to change his stance when he reminded himself about the women scientists he met at the centre during his visits. I later showed him the booklet "*Gender and Science*" (Chunawala, 2003), which showcases work by women scientists from across the globe. Jatin was completely in awe and went around showing the booklet to his friends later saying- *did you know about them*? Lack of women scientists in Indian science textbooks has been documented (Chunawala, Vinisha & Patel, 2009) and these can not only affect girl's choices in science careers but also boy's perceptions of women in science. Ensuring that activities are designed in ways that are sensitive to gender issues is a way to sensitize and bring about awareness among students on issues related to gender and science (SAS Project, 1994, p.71; SED Project 2010-13).

Involvement in unguided tasks

When given a D&T task [for example, exploring an unfamiliar artefact, an initial surge in curiosity made Jatin and his friends deeply engage with the task; they discussed with each other, made hypothesis, handled artefacts and raised questions (Ara, 2009). But within say, ten minutes, they would lose interest and move on to other tasks. It seems the initial excitement to solve the problem is short-lived and does not sustain for them to continue with the task. Though they mention limited time, and the other laboratory responsibilities as reasons for this short-lived motivation, I am inclined to think the real reason for their short-lived motivation lies in Jatin's last response, "*...but it will help if you give us short projects, meaning that get over in one hour or so... we can then complete it and go*". Perhaps, Jatin feels that completing or solving the problem successfully was more important, and to some extent, that influenced the amount of time they spent on the problem. But this needs further probing.

Take aways

Our interactions with Jatin and his classmates have given us some interesting insights. They are curious, eager to learn new things, they like science and enjoy the freedom to dabble with new artefacts without restrictions. However, their interests are often short-lived and they tend to move from one activity to the other hurriedly. They don't 'complete' any one project on their own (unguided) unless and until we intervene and push them to achieve their final goal. Why they lose interest is not clear to us, but this is something we need to examine in depth. Developing activities that engage children in a sustained fashion with scope for tapping students' creativity and imagination is our aim. Initial student motivation fueled by guided collaboration and explicit instructions for the D&T tasks may help in this regard (See Khunyakari, 2008; Mehrotra, 2008; Ara, 2013). Further, our interactions also indicate the need to emphasis the fostering of values of empathy, social justice and cooperation. Activities that explicitly touch upon issues of gender, inclusion, nature of science would be a step towards introducing students to a more holistic and humanistic understanding of the world around them. Hopefully, our continued interactions with these children will both, provide more insights and help us design appropriate and interesting activities.

*(*Name changed to maintain confidentiality)*

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