The hole in the wall: self organising systems in education

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This text transcript is at http://repository.alt.ac.uk/855/ [82 kB PDF]. A one hour video of the talk is on the ALT-C 2010 web site at http://www.alt.ac.uk/altc2010/ and on the ALT YouTube channel at http://youtube.com/ClipsFromALT/. Alongside this there will be an experimental version of the video that includes the #altc2010 twitter stream at the time of Sugata's talk.

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Q: Thanks very much. One of the, you know, one of the things that's taught in business schools, in marketing courses, is not to raise expectations of the customer. Because after that you can only go steadily downwards. Well I've sort of optimistically called this talk the future of learning – perhaps it should have been called a future of learning. But it's one of the futures which I think in the last eleven years or so I have encountered in many different ways, and that's the story I want to tell you. Firstly a little breakdown of children on our planet. It's a sort of a personal number – these are difficult numbers to get; you get different numbers from different sources. But I would think that there are about fifty million children on the planet who have more than everything that they need. For their lives, for their education, everything. Then there are another about two hundred million below that who have adequate resources. And below that there are seven hundred and fifty million who do not have adequate resources. So this is the situation that we're looking at. Here in Britain I would think that we are dealing with the first two blocks, and maybe the top slice of that seven hundred and fifty million. That's the impression I get by going around the country. Here are some sentences that I heard here in various cities at various times from various age groups. "When I need to know something, at the time when I need to know it, I can find out in five minutes." "My father is an engineer but doesn't have a job." "Why should I work hard to be a professor like you when I can earn as much as you by driving a bus?" So we need some answers to these questions, you know, they're important questions for children. And we don't actually have too many convincing answers. We can give them the academic answer about, you know, knowledge and deep understanding and so on and so forth, but these are specific questions – we have to give specific answers. "On the other side of the world, we can't use the computer room when we want, it's not allowed." That's from India. "The internet is down because the school didn't pay." So that's the other side of the world. So then if you put the problems together, you have the problems of relevance and aspiration in the top part of the triangle, and you have the problems of resources at the bottom. So I will start from eleven years ago with this sentence that "There are places on earth in every country where good schools can't be built, good teachers either will

not go or cannot go." You know when you first see this, it reminds you of the developing world, first of all – Africa, India, China. But think of any country that you know, think of the map and think that you have an imaginary pencil, could you not mark out places where you'd say good teachers would not go there? So it is not a developing country problem, it's a global problem. Unfortunately it's an ironic global problem because those places where the good teachers won't go are just the ones where they're needed the most. So we're stuck in a bind. I will show you some figures here. North Eastern India, as you go further and further away from Delhi, on the x axis to two hundred and fifty kilometres away from Delhi, leaving all the urban areas behind, the primary school scores drop sharply. Why? Because the teachers two hundred and fifty kilometres away, if you ask them and ask them this question, "Would you like to be somewhere else?" And the answers changed from "Not really" to "Absolutely". By the time you hit three hundred kilometres, they say "You know, if only I could get a job in Delhi, there's better healthcare, better entertainment, more shopping etc." Then I came to England and I thought to myself "Now I will not find this problem because it's much more uniformly developed." So then I should expect to see a flat distribution of primary school results. When I looked at the numbers, that was not the case – there were schools doing very badly and there were schools doing very well. So I started looking for relationships and very quickly found one in North Eastern England. The density of council housing correlates with the primary school results, the GCSE results in this case. So the more the density of council housing, the worse the results seem to be. And this is pretty significant as you can see from that line. It's not a spurious thing, it's pretty sharply correlated. So I went into those, you know, highly dense government housing areas and I went to the schools, and surprisingly I heard the same thing that I heard in India. I asked the teachers "Would you, would you consider working in another school?" And as soon as you go into the high density council areas "It's very dangerous here you know, it's not a nice area, the children are very rough. I wouldn't mind." There are a few teachers who say "No. That's my challenge – I want to be here." But not all. So you do have that problem. The remoteness in India was geographic; the remoteness here was socio-economic. So back to 1999. 1999 in New Delhi, the rich children all have computers. It's a new toy. Their parents have spent a lot of money, upward of a thousand pounds to buy them computers. They're all very good with the computers. All their parents say their children are geniuses because they are so good with the computers. Down in the slums, the children haven't heard of a computer. They don't even know what it is, and they're not going to make it because no computer teacher is ever going to go into a slum to teach. So back in 1999, I tried an experiment. I made a ATM like structure into the wall of a slum which eventually got called the Hole in the Wall and put on the English internet and left it there. And very quickly saw that the children were beginning to teach themselves how to use the computer. This happened everywhere, including the deserts of Rajasthan. Here's a desert where of all things in four hours the children were using the sound recorder to sing into the computer and listen to themselves sing by themselves. Down in South India they were downloading games from Disney.com. This game is to assemble a camera and then take a photograph. Something that urban children would do all the time, but remember these children have seen a computer only a few days ago, or a few months ago. They don't know any English. They've taught themselves whatever English they needed to do, to be able to do all this. So I started to document this whole process and to measure on a computer literacy scale what happens to groups of children if you just leave a computer with them. And the numbers were interesting – it was a straight upward curve, reaching

about forty-two on that scale, which is what an office secretary can do. If you gave that test today to an office secretary here, she would get about forty-two, forty-five per cent. So they were reaching that on their own in nine months. This was the conclusion from that section of the work, that groups of children can learn to use computers and the internet on their own, irrespective of who or where they are. So it didn't matter what language they spoke in, it didn't matter how rich or poor they were. And I tried this in India in hundreds and hundreds of villages. I tried it in Cambodia, I tried it in Africa, and everywhere we got the same result. So in those days this was an important result about computer literacy not having to be taught. So I could then say with some amount of confidence that it doesn't matter if your school doesn't have an excellent computer teacher; you can still achieve the same results by simply allowing the children access. But around this time, something different started to happen. In the schools where these computers had been placed, in the schools in India, many of them started to report improvements in English and Mathematics scores. I couldn't quite understand... Actually English, Science and Mathematics scores. I couldn't quite understand what was the reason for that, because as far as I could tell, the children were continuously playing games all the time. But then I wasn't there to watch all the while. So I started doing a set of experiments to see what could be the reasons why these scores were going up. The first experiment was in Hyderabad. It's a big sprawling South Indian city. Hyderabad has hundreds of little private schools – not for rich people, but for poor people. And the reason why these really ramshackle private schools make money is that they promise to teach English. And for that segment of Hyderabad society, learning English makes a huge difference to the kind of lives that these children will live later on. So the parents, the poor parents pay their whatever, usually around five pounds, three to five pounds a month to send their children to these private schools. The schools try to do their best to teach English, but the problem that I spoke about prevents them. Good native language English school teachers are not going to go and teach in the slums of Hyderabad. So they don't get native language speakers. The children begin to copy the accents of the local Telugu speaking... Telugu is the language there... Telugu speaking teachers. Telugu accents are extremely hard to understand. So when the children come out of school, they know a reasonable amount of English, their spelling is good, their handwriting is good, their grammar is good, but when they go for a job interview, the interviewer says “Your English may be good, but I don't understand what you're saying.” So they don't get the job. So here was a problem that could not be solved by human teachers, because human teachers were not available. So I had to use technology. I looked at what's available and I must say I wasn't very happy with it. I looked at all sorts of programs that attempt to teach English. In those days, 2002, there were none that specifically talked about pronunciation. So what I did finally was I got a PC and I loaded a speech to text software on it. You know, the kind that you can get for free now with Windows. What that does is that you take a microphone, you plug it into the PC, you speak into the microphone and the PC will type out whatever you're saying. Provided it understands you. The system needs to be trained in the voice that it is expected to understand. What I did was I bought this computer, I put in the software, I trained it in a neutral English accent. And then I blocked out the training function and I gave it to a group of children in a private school in Hyderabad. And they spoke into it, and the computer started to type out complete nonsense. So the children laughed and said “It doesn't understand anything what we are saying.” So I said to them “Well I'll leave this with you for two months. You have to make yourself understood to the computer.” Now this is where the new method started forming in my mind, because

the children then asked “How do we do that?” and I said to them with great honesty “I don't know. And anyway, I'm leaving.” So I left them, I left them. What they did was incredible. They downloaded pieces of software, they downloaded films, they downloaded the speaking Oxford dictionary, which I didn't know existed. And they started to practise in groups. In other words, not only were they teaching themselves, they had invented the pedagogy by which to teach themselves, because I hadn't told them anything. And the results were remarkable to say the least.

(video playing)

A: (speaker on film) Yes he's my cousin.

A2: (voice from computer) Yes he's my cousin.

A: (speaker on film) Yes he's my cousin.

(video stopped)

Q: Clear, flat English accents. And I don't have the video here of her speaking before the experiment, and she was barely understandable. So they had changed their accents. I published the work. And at that time I began to realise that children perhaps would achieve educational objectives on their own if they had a reason to. Which will bring us to the west in a little while, because in the west the problem is they don't seem to have a reason why they should do these things. Well some surprises in that period from 2002 to 2006 was to start with I got a message from Sir Arthur C. Clarke, who was living in Colombo in those days and he had heard of my original experiment, he was interested and you know he was in a wheelchair. So I went to Colombo to meet him. And he said two very interesting things. The first thing he said was that a teacher that can be replaced by a machine should be. Okay, that's a double edged, you know... So a teacher that can be replaced by a machine should be. The second thing he said was that if children are interested, then education happens. I then started to put in different educational objectives in a way that I'll describe in a moment, into India, into Cambodia and into Africa, to see what else would happen after the children had taught themselves to use a computer. Here's Sir Arthur to start with:

(video playing)

A3: (Sir Arthur C. Clarke) … because children very quickly learn to navigate the web and find things which interest them, and when you've got interest, then you have education.

A4: (voice of child on film) … I play games, like animals and I listen music. I am fifteen years old.

A: (voice of computer on film) (…) with three in each roll. How many goodies do I have altogether (…).

(video stopped)

Q: And here is the kind of multiplication game that a child will not touch at home, but on the pavements they show off with each other. And back on the streets of Delhi, I discovered what was happening. The children had found Google, and they were googling their homework. So the teachers, the teachers were then saying to each other and to me “Something has happened to these children. Their English has improved dramatically and you know, they're writing really good analytical stuff.” And these were slum schools. So I thought to myself “What have I done? This is... what's this now?” So I decided to follow up on this with this hypothesis – that groups of children can navigate the internet to achieve educational objectives on their own. The question is how many objectives when, where, how and so on. Around this time a large amount of research funding came into Newcastle University and the funding, it was over a million pounds, was for the improvement of schooling in poor areas of India. Newcastle called me and said that “You've got experience in this area. Will you help us with this?” So I said “Yes, I'll be most interested. I'm in Delhi, which is only two hours away from Hyderabad.” So they said “No, no, no. That's not how it works. You can't spend one and a half million pounds of university money sitting in Delhi. You have to come to Newcastle.” So in 2006 I bought myself an overcoat. And after forty years in Delhi, I moved to Newcastle to a most adventurous four years, which you'll hear about shortly. In Newcastle the first of our staff meetings was in 2006 and it was a bit critical. It said, my colleagues said “Look, it's fantastic what you've shown so far. But to take a hypothesis like the last one, where you're saying practically that children can take care of their own schooling, now that's too much.” So I said “Well maybe. In which case why don't we design an experiment? This time it will be an experiment to show that there are things that children cannot teach themselves.” So we put the matter to rest then. I chose a village called Kalikuppum in Pondicherry in Southern India. Kuppum had been hit by the Asian tsunami in 2004 and school was destroyed. Many of the parents were dead. So the children were sort of left alone there. And I had built a hole in the wall computer, two of them actually, for them to play with. Because I thought it would be, you know, good for their psychological health if they had something to play with. So they were pretty adept with these computers. So the assumption I made there in Kuppum was that groups of Tamil speaking children in a tsunami hit Indian village cannot teach themselves the biotechnology of DNA replication by themselves. And I thought “This is going to be a cinch. You know, I'm going to put in a pre-test, they'll get a zero. I'll put in a post-test, they'll get a zero. That's the end of the matter – you need a teacher for that sort of thing.” I loaded biotechnology material into the computers in Kuppum. And I called the children. I said “I've put in some material here which is very difficult. You may not understand it but it's very important and very interesting.” The children said “What is it about?” And I said “I don't quite know.” And I left them with that. I came back in, but watch this bit here:

(video playing – children's voices)

(video –
A: Where is it? Where is it, neuron?

A: Neuron (…).

(video stopped)

Q: Well the first hint was from that girl, very strong Tamil accent, but when I asked her where was the neuron, what she was saying Tamil and English combination was neurons are in the head, and they are for communication. So that's when I first began to get an odd feeling about what was happening in Kalikuppum. I called these twenty-six children to a classroom after three months and I asked them “So, did you understand anything?” And they were absolutely quiet, and they said “Nothing.” So I said “Nothing at all?” And they said “No. it's in English, it's big chemistry words. We didn't understand anything at all.” So I said to them “How long did it take you to figure out that you can't understand anything?” So they said “But we look at it every day.” So I got a little puzzled there, I said “You don't understand this at all and you look at it every day. What do you do there?” So this girl then, the girl second from the left, she raised a hand and she said to me, in Tamil and English, “Apart from the fact that improper replication of the DNA molecule causes genetic disease, we've understood nothing else.” So, so big important, a huge important lesson for all of us, that the children can set bars for themselves that are far higher than the bars we set for them. So when a child says “I haven't understood anything”, well don't take him at face value. You never know what he's understood. So I pre and post tested them. It had gone to this... this is educational absurdity, right? Tamil speaking ten year, twelve year olds in an Indian village doing biotechnology on their own, going from zero in the pre-test to thirty per cent in two months. They had done it using a mixture of, you know, different children had become teachers of different aspects of the subject. They had invented their own pedagogies, they had done their own searching, they had found their own sites. And they had gotten up to thirty per cent. But I still couldn't go back to Newcastle with these results, because thirty per cent is a fail. So what do I do to make them pass? I can't get a biotechnology teacher to come to Kuppum to teach. So I looked around and I found that the children had a friend, a twenty-two year old girl, she's an accountant and they sort of play football with her and they're great friends. So I called this girl and I said “Can you teach them more biotechnology so that they can pass?” So she said “How do I do that? I have no idea about the subject.” So I said “No, you use the method of the grandmother.” So she said “What's that?” And I said “Well you stand behind the children when they're working on this, and you admire them. And you say to them 'Oh fantastic. What was that diagram, can you just show me, show it to me again? What does it say there? How does that work? My goodness, I couldn't have possibly understood this on my own.” So she did this for two more months. The results went up to fifty per cent. Which was the same as my control school, which is a posh, private school in New Delhi with a trained biotechnology teacher. So by then I thought “Here is something definitely new.” And I went back to England. So having done experiments in all these very, very remote areas for so many years, I went to the remotest area that I had ever been to. So, five thousand miles from New Delhi, across the river Tyne is the little town of Gateshead. In Gateshead I took a group of thirty-two ten year olds in a school and I said to them... you know every one of them had a computer in the school. So I said to them “Make yourselves into groups of four.” Eight groups of four. “Now here are some rules. Each group of four can use one computer and not four computers.” Remember that's from the hole in the wall, the ideal magic number was four or five children clustered around one screen. So we did that. And I said “Rule number two if you don't like your group, you can change and go across to another group. If you like someone else in another group, you can try and get them to come and join your group. Rule number three you can go across from one group to another, and of course you can talk to each other all the time. You can go across from one group to another, peer over their

shoulders to see what they're doing, come back to your own group and claim it as your own work." The children said "You mean cheating?" I said "Yes, cheating." And I also explained to them that I come from a university and a lot of scientific research is done in this fashion. So... (laughter) So having set the scene, then I gave them six GCSE questions. Remember they are ten year olds, so they will encounter these questions six years from now. Six GCSE questions, and I said "Use the group method and tell me if you can find the answers." My hardest problem was getting the teacher out of the classroom. She said "In the UK it's not allowed to leave the children alone." So I said "For heaven's sake, can't we watch from the window or something like that?" So I got her out. So... I'm going to stop that. So the children, the best group got everything right in twenty minutes. The worst in forty-five. GCSE questions. But I was expecting this. I knew that if it can happen in Kalikuppum, it's going to happen in Gateshead and it did. The teachers said "Is this learning?" So I said "Well I don't know, I don't know if it's learning. But what I can do is, I can come back in two months time, which I did. And I said "I'll give them the same six questions. This time in the examination format. Paper questions, paper answers, you sit, you don't look at each other, you don't talk to each other, and let's see what they get." Well, I was lucky. When I'd finished the experiment the first time around, their average group score was seventy-six per cent. When I did it after two months, the average score, believe it or not, was seventy-six per cent. The children had photographic recall of what they had looked at on the computer. And they could reproduce it exactly. So then I said "Well, why is that?" Because I am from the traditional system where, once you've heard a lecture, you spend the rest of your life forgetting it. So you know, if you are tested on that lecture, then year on year your scores should go down. These fellows had retained it straight up. Not only that, one very recent result which I don't have on the slide here, I gave the children a topic, I gave them a topic called fractals, to nine year olds, fractal geometry. And they were very, very interested. They did this for an hour in their group mode. We tested them and I wanted to check by coming back after two months. After two months when I tested them, the scores had gone up. So I said "This is anomalous. This is not supposed to happen." The teacher explained to me. The teacher said "You know, we finished the session, the children went back with long faces, and all they would talk about for the next few weeks were fractals." So their scores were actually going up. Now this is anomalous learning, this is the opposite of what actually happens. In the meanwhile, I needed to use my grandmother approach with the children in India, because they don't have teachers, good teachers. I put out a call in the Guardian newspaper asking British grandmothers who have broadband access at home to give me one hour of their time per week. And you know, British grandmothers are very vigorous lot. So I got two hundred. I got two hundred. We did trial sessions and all sorts of things, and we boiled it down to a group of forty women, some of them with thirty years of primary school teaching experience, who have retired, who are sitting in some little village somewhere with nothing to do. It is an absolute win/win situation. They've done, these forty women between themselves in the last one and a half years, have done more than five hundred hours of interaction with children in India. The children in India love it – they can't believe that this is happening to them. And as one of the grandmothers told me when I called her to thank her, she said "You know, after many years, my house is full of children's voices." Because they use Skype and they project it on the wall and this is sort of what it looks like. I'll just play this from the beginning for you.

(video playing)

A: You can't catch me. You say it – You can't catch me.

(children's voices) You can't catch me.

A: I'm the gingerbread man.

(children's voices) I'm the gingerbread man.

A: Well done. Very good. So again...

Q: Back in Gateshead.

(video playing)

Q: A little girl taught me more about Hinduism than I'd ever learned in India.

(children's voices)

(video stopped)

Q: These two boys wanted to be footballers. After watching eight (…) talks, he wants to be Leonardo da Vinci. This is an Indian mediator from Maharashtra beaming herself into Newcastle into what we call a self-organised learning environment. They're basically big screen computers, broadband, and a little bit of furniture which helps children to cluster around a computer. So the question is how far can we go with this? We know now that if you do this group sort of thing, if you give them a computer, if you can step back, they will achieve impossible results. But how does it happen, why does it happen, and how far can we go with it? Well I'll show you an example. Okay, let me give you an intro to this. I went to Turin, Italy and in a similar talk, there were school teachers there. And I said “Will you please let me come to one of your schools and actually show you how it works? So they took me to a school, and I had a group of about thirty, forty ten year old Italian speaking children. I asked the teachers to leave. I said “You can watch from the outside, but you shouldn't be in the classroom.” So they said “How can that work?” you know, Italian teachers are very traditional. So they said “How can this work? You can't speak Italian. They don't speak any English.” So I said “Well, we'll see.” So I sent them all out and I started writing questions on the blackboard in English. And then I, with gestures, told them to make groups of four. Sometimes physically making it for them. They made their groups of four, then I wrote the question, then I said “Answer it.” So they stared at me completely blankly. So I said “Well, do we get the madams back?” And they said “No.” What they did instead was one child typed the English question into Google translate, translated it into Italian, wrote down the Italian question on the board, and then they got to work. You can watch that happen.

(video playing)

Q: So this was the first question.

(children's voices)

Q: Twenty minutes and they got it. Next question “Where is Calcutta?” This one they took only ten minutes to do.

(children's voices)

Q: Then I became ambitious, and wrote down this one “Who was Pythagoras and what did he do?” This time there was silence. After a while one little girl came to me and said “You've spelled it wrong.”

(children's voices)

Q: And twenty minutes later, the right angled triangle started to appear. So you know that boy, that last boy you saw with the crinkly hair, he was actually headed towards the Theory of Relativity. He was writing down those equations. So well, Melbourne in August. “What is lightning?” This time it's a mixed group of aborigine children, migrant children and white children.

(video playing)

(children's voices)

A: … electrical discharge produced during a thunderstorm. The electric current is very hot and causes the air around it to expand (…).

A: … types of lightning – ball lightning, positive lightning (…) lightning, sheet lightning (…) lightning...

A: When an electrical field (…) discharge the ball of lightning (…)

A: … sixty thousand MS (…) thousand miles per hour.

(video stopped)

Q: You know, a lot of stuff which is all curricula, all being reproduced and he's not just reading it – you could take the paper away from him, he'll tell you the same thing. One last bit. A hard one this time - “What are ions?”

(video playing)

(children's voices)

Q: You can see how the groups sort of interact, always walking around.

(children's voices)

A: … number of electrons is not equal to the number of protons, giving it a net positive or negative electrical charge. The net charge of an ion is equal to the number of protons in the ion, minus the number of electrons.

Q: (on video) What do you think of this method of learning?

A: It's very, more fun and with computers and using (…) instead of thinking and if you don't (…).

Q: Okay.

A: (…)

(video stopped)

Q: So what do we know now? Well I think there are two absolutely essential skills in primary education which kind of encapsulates everything else – information search and analysis skills and reading comprehension. Both are extremely important. In India my problem is with reading comprehension, because it's not their native language. Here in the UK that is not a problem, so the children go really fast over here. The information search and analysis skills, surprisingly the good news is nine year olds actually learn within a year, they teach themselves how to analyse, how to write the right key words into Google. To start with they will type the whole sentence. By the end of the year, I've just completed working with a school in Gateshead, they are absolutely as good I would think as a masters student at locating things off a search engine, at determining which one is right, which one is wrong and so on. But only in groups. I must emphasize again and again, all of this doesn't work if it's one child to one computer. So what does it all mean? What's the theory then? Why is it happening this way? Well I have a suspicion, and I'm just going to leave it as a thought with you. Self-organising systems. A self-organising system is one where the structure of the system appears without intervention from the outside. A number of educationalists have said this in many different ways. (Hayek?) used to call it “spontaneous order”. People have called it “learning comes from the inside”. But I think it is the terminology of physics that will explain it. That the system structure, when you allow a system to self-organise, the structure appears without explicit intervention from the outside. The other thing which happens in self-organising systems is emergence. The appearance of a property that's previously not observed as a functional characteristic of the system. Which is why we find a lot of things very surprising. We say “How could this have happened?” Because emergent systems are always astonishing. An example of a physical emergent system for example is a dust devil. You're sitting around, and there's a breeze and all of that and suddenly like a magic, like a miracle, a little dust devil arrives, and it moves around as though it knows where it's going. So that's emergent phenomenon. I have a suspicion that what we have stumbled onto in all of these experiments is a self-organising system in that physical sense. That education, if it is a self-organising system, then learning is its emergent phenomenon, therefore you cannot make it happen. You can set the stage and allow it to come, when it will. It will take I think at least five years of experiments more to actually be able to prove it, but I am going to try, because I think it's worth trying this. Once we suspect that there is a strong physical basis for how this kind of learning is happening. And that to me is the future of learning. Thank you.

(applause)

Q2: I must just tell you that somebody tweeted just now “Where was he when I went

to school in Gateshead?" Who was it? Anybody here? May have been somebody from outside. Okay. Well we have plenty of time for questions and Sugata is happy to do that. Who wants to kick off? Yes. Can we have the mike please?

A: Thank you so much for a very good presentation. I'm from Denmark, from the University of Copenhagen and I would like to ask you the most close question for me – can we do this to adults also? How can we teach adults in university so they can be much more enjoyable and be much more engaged and involved in another way and become innovative and effective in their way of learning?

Q: Well I have not much experience with adults, but I've been asked this question many times before. But I'll make some suggestions of what can go right and what can go wrong. Adults of course are better at analysis because you know their verbal abilities are better. But adults have a problem. The adult problem is of, is of the ego being hurt. So if you have a group of four or five adults, and I'm talking about adults as in thirty, thirty-five, like that, they're not as adventurous as a group of nine year olds. Because nobody wants to make a fool of himself. So they will say "Maybe we should try this. Or on the other hand I may be wrong." Now a nine year old doesn't do that. When it comes to undergrads, they are much more like the nine year olds. So you can use it with the undergraduates, you can use it with the postgraduates. I tried this for two years. I ran a pathway on educational technology and I told the students this whole story. And I said "Look, if you heard this story, how can you not do it yourself?" The result both years was the students said "We will do it, but we don't want to be evaluated on this." Okay. They want a formal examination, not to write their three thousand word essay or whatever it is. I said "Why?" They said "No, because if you evaluate us based on this, then he will try to say that he has learned more than I have learned so therefore it won't work." So this, the adult competitiveness is different. If you can tackle that issue somehow, then you can use it very effectively with young adults. With older adults, particularly adults in their mid forties to mid fifties, my experience is it doesn't work. They will find some excuse to say "I can't come." They won't even join the group. Beyond that, it begins to work again very, very effectively past sixty-five. Okay. This I have tried in India. If you take post sixty-five people, and tell them the story first and then let them work in groups, they are absolutely happy, they have no problems in making a fool of themselves again and again. And if you throw in a few nine year olds into those groups, they will learn anything, absolutely anything. So leaving that forty-two, I don't know, fifty, fifty-five, basically people like me, leave them out, but otherwise it works for everybody else.

Q2: Okay. Liam, could you take a microphone to that gentleman there? And is there anybody else? Because we could get Roxy to take a mike to you. Hang on one sec. Do you mind doing it the other way round then, as he's going to follow on from the previous question. Yeah, over to you.

A: Couldn't it work with adults in a virtual environment where they're anonymous? Where they're not, they can't be blamed, they're not known who they are?

Q: Possibly then yes. Yes, if you anonymise it, then it might.

Q2: Okay.

A: Hi. I'm Andrew Ravenscroft, London Met University. Fascinating results, and I wonder what would happen if you did the same tasks but with a different device, because it seems to me there's something rather magical going on where the affordance of a computer screen naturally lends itself to small groups of four or five children. Which is classic small group psychology for effective learning. So what I'm interested now, what if you went to a smaller device like a mobile phone, or similarly to a white board, would you get similar results? Because for example if the mobile phone was equally effective, then that could be again incredibly powerful in terms of developing countries as well. But I wonder whether that might actually have sort of a negative effect on the learning, I don't know. But I'd be interested, so do you...?

Q: Well again, I don't have personal experience with this, not much, I have a little bit of personal experience. The mobile phone has one problem which is it's very hard to share the screen. So the only way you can share a mobile screen is by bringing up whatever it is you want and then passing the phone on to somebody else. But that's not the same as huddling over... So when it comes to nine, ten year olds, they love the big screens. The thirteen, fourteen, fifteen year olds, they're very much onto the mobiles, because they like the personal, you know, “You can't see what I am doing” kind of thing. But my method itself doesn't lend itself very well to a mobile screen. Onto a projected wall size screen, it works in a different way. Because now the groups can't be groups of four. The entire group of twenty people can see it. So what happens is it becomes a little more disorderly. One child is operating and then there are twenty children who are saying “No, no, try that. And try this” and so on. So I sort of empirically tend to say if you take a twenty-two or nineteen inch screen, high resolution and put groups of four to six children around it, that seems to work the fastest.

Q2: Gentleman here, yeah.

A: Can you just explain how you sort of motivated the kids in the first place to want to find out the results? Was it just that they were competing with each other in some way? Or was there some kind of reward at the end of...?

Q: Well it's an excellent question, it's at the heart of, heart of the matter actually. I'm in the middle of it. I told you I was working with this Gateshead school. I've finished working with one lot of nine year olds for a year. Now the new lot of nine year olds have come in this year. So two days ago was the first session. So when we start, then I first tell them a little bit of this story. I show them pictures of children and you know animals. And I have lots of videos which children love to watch. So I show them a bit of this and say “You know they're children and they're doing things by themselves.” and surprisingly if you ask nine year olds “What do you think will happen if I put a computer in the middle of the jungle in Africa, and all the African children come, and they've never seen a computer before?” Invariably the answer of the nine year old English child is “Oh they'll just click on this and that and figure everything out.” So they know the result. So anyhow, once I explain to them, then the next challenge, is to, once they make their groups of four, they still don't believe that they actually have freedom. So they're still sort of looking over their shoulders. They're trying to figure out what's the catch. You know, they're terrified of the catch, of what's going to happen next. It takes a full day for them to realise that they are indeed free. Once they

do that, once you do that, then the way to frame the question is the art of the teacher. So I must say very clearly this is not a method which eliminates the teacher. This is a method where the teacher's role is not to provide content, but to provide the questions. The internet is full of answers, but the questions are not up there. It's a great art to provide the question. So a typical question, a typical question could be, last year we tried this “In winters, we slip on the road when there is ice. In summer on the same road, we don't slip.” So the way I put the question is “I've often thought why is that. In India you know it doesn't snow, so I've never seen this before. And last year I fell on me bum” and then they start laughing. And say “I wonder why that happens”, you know. Now they want to prove to you that they can figure it out. Now they're ready, because they know they're free, they know the group method. So the work starts, they all start working. Every now and then a child will come up “You slip because you know you your shoe doesn't, it falls on the ice...” some nonsense and you say “I don't know, that doesn't sound very convincing to me.” After about an hour, out comes friction, Newton's third law, and finally electrostatic forces. They say “There are charges that are found when the surfaces are dry you have higher friction” - nine year olds. So after... once you've done that first session, you're home. The next time around you can make it as hard as you want, as easy as you want, you can tell them “This is from curriculum. This is what a sixteen year old will be asked, six years from now. Do you guys want to try it?” Yay, they'll go for it, you know.

A: Because kids have natural curiosity.

Q: (…)

A: It's because kids have natural curiosity.

Q: They have natural curiosity. They have a great urge to be admired by an adult. So you use that...

Q2: Can I stop you. There's just one more question, that's all we have time for.

Q: Okay.

A: Well I wanted to follow on from curiosity. Mark Johnson from the Institute for Educational Cybernetics in Bolton. Are you seeing... you mentioned self-organisation and you've made great emphasis on the remarkable things that kids can do when they're curious about things. Are you then seeing curiosity which is something which is a function of self-organisation? We tend to think of it as an emotion, but you seem to be saying something different.

Q: Okay. Very deep question. You know, any self-organising system has to have what's called an attractor. And I find for children the attractor can be curiosity. And that makes me think, and this is not yet fully formulated, but when we talk about curriculum and we say this is what should be there in a curriculum, we often forget where the curriculum itself came from. Why did we find these things out were all because somebody was curious about why the apples fell and why the germs behave the way they do etc. So why not convert the curriculum back into those fundamental questions which we know historically has triggered off people? And then see if we can trigger children with them. So yes indeed, in order for self-organisation to

produce emergent learning behaviour, you need an attractor. And curiosity, if your question is correctly framed, can be that attractor.

Q2: I think that's a great place to finish, especially given the theme of this conference. Can I just ask you to thank Sugata once more. Thank you.

(applause)

(End of recording)