

Edk12

Evaluating academic perceptions

The Edk12 Team

May 13, 2012

Contents

1	The objectives	3
2	The method	3
3	The audiences	4
4	The questions	4
4.1	The compound interest problem	4
4.1.1	Page 1	5
4.1.2	Page 2	5
4.2	The sequence of learning problem	6
4.3	Analyzing the responses of the first two questions	8
4.4	Quality of education	10
4.4.1	The quality of education	10
4.4.2	The scope for change	10
4.5	The analysis of response	11
5	Conclusions	12

1 The objectives

As part of creating a wider awareness of educational system issues as well as to measure perceptions, we have been giving a presentation on educational reform to various academic groups. In the context of this document our intent is to try to understand estimation abilities of participants involving non-linear change, and also to understand the perception of participants in terms of their understanding of the flow of developing learning relative to our own understanding of it. We also invited responses on the quality of the current education system and on the scope for change.

2 The method

Our presentation contains slides and videos as well as embedded questions which the audience answers using individual proprietary feedback devices. These resemble a keyboard without any display and permit all members of the audience to enter a response, a summary of which is displayed immediately after the responses are completed. There has never been any need to force a time limit on responses. All responses are recorded for later analysis. The video on our page shows a small part of one such presentation where the feedback devices are visible.

3 The audiences

The responses that have been analysed have been from three audiences. The first comprised a group of final year students in a journalism course. The second was a group of teachers in a low resourced local school, and the third comprised teachers and the principal from a well resourced international school. The total number of respondents was 47.

4 The questions

There are four questions which we will try to analyze here.

4.1 The compound interest problem

Not all change is linear. For instance, human perception of change of intensity of light or sound is a logarithmic function, and the growth of populations whether human or viral constitute compounded growth phenomena. As most people understand compounded growth in terms of interest on money deposits, we decided to pose a compound interest problem to understand how well students, teachers and principals estimate compounded growth.

The pages below depict how the questions are posed.

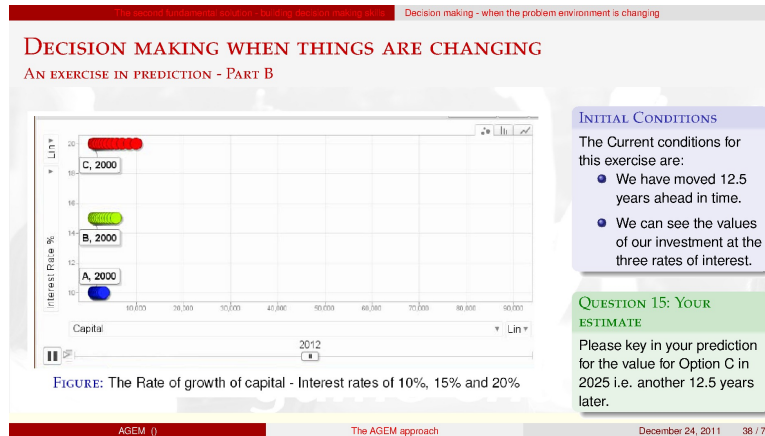
4.1.1 Page 1

Here the problem is explained to add to the written explanation of the task.



4.1.2 Page 2

In order to make the task a little easier we show the growth of capital over the first 12.5 years i.e. in the middle of 2012. We then ask the participants to key in their estimate only for Option C for 2025 i.e. after another period of the same duration.



The responses have been tabulated in a Parallel Coordinates diagram later in this article along with the responses to the second question.

4.2 The sequence of learning problem

In this case we put 4 terms in alphabetical order, and the audience is invited to indicate their perceived order of linkage. The slides displayed are as shown.

The terms we need to understand for meaningful education

SOME TERMS THAT RELATE TO MEANINGFUL EDUCATION

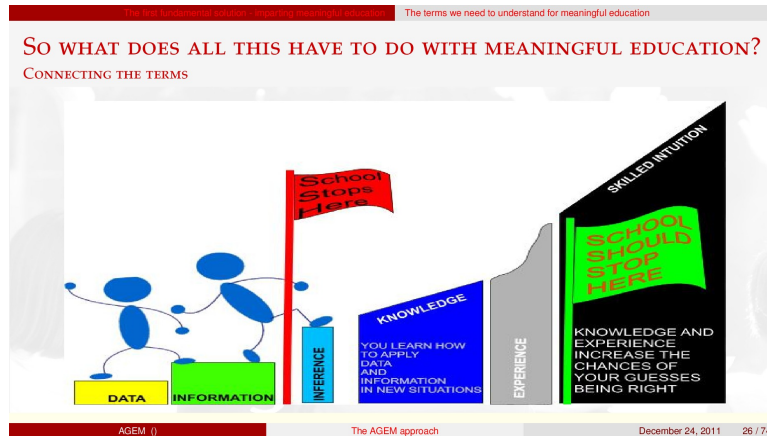
- 1 Data
- 2 Experience
- 3 Inference
- 4 Information
- 5 Knowledge
- 6 Skilled Intuition

QUESTION 9: PLEASE PUT THE ABOVE TERMS IN A SEQUENCE RELEVANT TO LEARNING

The above terms are shown in alphabetical order. If you can see a pattern relevant to learning or growth of learning capacity, please type out the sequence using the numbers assigned e.g. 653142. Do NOT leave a space between the numbers.

AGEM (1) The AGEM approach December 24, 2011 25 / 74

The audience is later shown the following slide

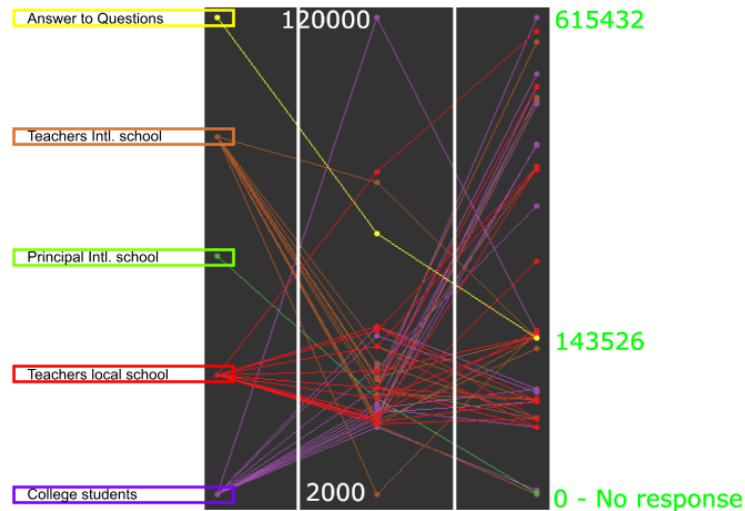


In Indian schools the examination system lays focus on the link between data and information so students tend to memorize sequences of data/information. Part of this leads to the popularity of quiz competitions which basically means remembering unstructured items of discrete information.

4.3 Analyzing the responses of the first two questions

This analysis uses Parallel Coordinate Display representation which is useful for seeing the connection between items of information and the type of respondent. In the figure below the middle

column represents the respondents estimates in Indian Rupees and the last column represents the pattern of relationships seen which was the second question.



The principal observations here are that:

- the range of estimates for the compounded value are generally in a narrow band regardless of the type of respondent. This is consistent with expectations as there is an inbuilt human preference for linear estimation.

- only one respondent - a teacher from a low resourced school - identified with the preferred pattern of relationship. There appears to be no intuitive understanding of the flow of learning in terms of that described above. Indeed our experience is that when we display the relationships based on the responses, every relationship entered is unique and but for one, does not correspond with the relationship whose validity we explain. No questions have been raised on the validity of that relationship at any of the presentations.

4.4 Quality of education

In the next two questions we solicit the perception of respondents on the quality of the education system and on the scope for change.

4.4.1 The quality of education

QUESTION 5: YOUR OPINION ON THE EDUCATIONAL SYSTEM IN OUR COUNTRY?

On a scale of 1 (very poor) to 5 (very good), please rate our education system. Type out a figure between 1 and 5 which indicates the rating that you have chosen.

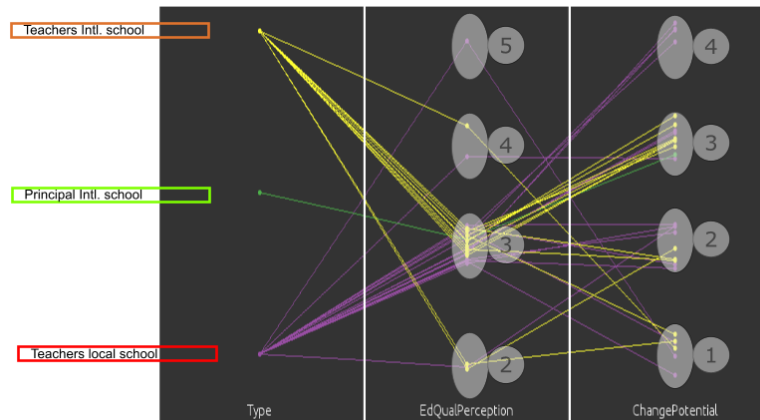
4.4.2 The scope for change

QUESTION 6: YOUR OPINION ON THE POTENTIAL FOR CHANGING THE EDUCATIONAL SYSTEM IN OUR COUNTRY?

On a scale of 1 (very difficult to change) to 5 (very easy to change), please rate the potential for changing the educational system for the better. Type out a figure between 1 and 5 which indicates the rating that you have chosen.

4.5 The analysis of response

In the Parallel Coordinates display below we show the three categories of respondents in the first column, the response on the issue of educational quality on a 1 to 5 scale in the second column, and the response to the issue of the scope for change in the third column. The values have been jittered vertically in columns 2 and 3 to allow a clearer understanding of the distribution.



Our analysis indicates that:

- the focus of teachers is generally toward giving a value of 3 to the issue of education quality and giving a 2 to 4 rating for the scope for change. It does appear teachers in the local school are more hopeful for the potential for change.

- There are few takers for the view that the quality is high and the scope for change is also high.

5 Conclusions

The general tendency to assume linear change even in a commonly understood phenomenon such as compound interest which is dealt with quite universally in schools raises issues of whether such questions can only be understood by teachers in terms of calculation and not estimation. The failure to estimate may indicate that these topics are not studied in the context of their sensitivity to the various factors that impact them. One could argue that the ability to estimate is vital in real life problems.

Similarly for academic audiences to be unable to see a sequence in the terms describing the growth of learning raises questions about the ability of teachers to interpret and apply their experience to the teaching environment. Of greater significance was the fact that coherence was very low due to the spread of permutations. The low incidence of “Data” being at the beginning or the end, and “Skilled Intuition” being at the other end, is something that is difficult to understand. On only one occasion did a teacher ask what was meant by skilled intuition.

It is of course heartening that teachers and the odd principal see the system to be average or less than average but also see an average or slightly better than average scope for change.

In terms of the project we wish to undertake this has several implications. From a positive standpoint, the existence of a void that our product can fill is heartening. From a negative standpoint, the absence of awareness is a vital factor in perceiving the need for the product.

The creation of awareness is therefore vital. In the three schools that we have given presentations

at, the immediate response has been positive. However, over time this seems to dilute. It is also difficult to get circumstances where we are able to get an invitation to make the presentation. It is easier to get an invitation to an elite group at Microsoft Research than in a poorly resourced school. The problem of awareness is all consuming.

Edk12!

Testing the value proposition

The AGEM Team

May 12, 2012

Contents

1. What do we propose to do	2
1.1. The principal problems	2
1.1.1. Visible problem - The disconnect between education and the needs of employers/tertiary education	2
1.1.2. The invisible problem - In a world that is changing rapidly - is there a requirement to ensure that we are preparing our children for a future where the only constant will be change.	2
1.2. The principal solutions	2
1.2.1. Imparting meaningful education	2
1.2.2. Inculcating decision making skills	2
1.2.3. Inculcating participative decision processes	3
2. What is the value proposition	3
2.1. the gap between school education and the needs of the workplace and tertiary education	3
2.1.1. The Hirsch Index	3
2.1.2. The World Bank Report	3
2.2. the gap between current educational outcomes and the needs of the future.	3
3. Testing the value proposition	3
3.1. Perception of educational quality	4
3.2. Perception whether it is possible to effect change	4
3.2.1. The role of the AGEM initiative	4
4. The outcomes of a pilot study to test the value proposition	5
4.1. Profile of students	5
4.2. Performance in AGEM tests	6
4.3. Performance of the group per topic plan	6
4.4. Performance in school end of term examinations	6
5. Market Size	7
6. Conclusions	7
A. Responses of Principals and Administrative Heads	7

1. What do we propose to do

Indian education is stuck in an 18th century factory model rut at a time when society at large is beginning to see the connection between education and prosperity. The federal government has responded by bringing in the right to education and has introduced controversial mechanisms to ensure public private partnership in implementing it.

Within this context we propose a mechanism that will recognize the key problems in terms of the outcomes of the current education system and provide solutions that are scalable, affordable, measurable and effective.

1.1. The principal problems

There are two principal problems as we see them:

1.1.1. Visible problem - The disconnect between education and the needs of employers/tertiary education

Expressed with elegant brevity by the CEO of one of India's largest employers which is also a training company, Manish Sabharwal says:

MANISH SABHARWAL - TEAM LEASE

As a staffing firm, TeamLease sadly doesn't hire 95% of the youngsters who come to it for a job. As a training firm, it estimates that 40% of these job-interview rejects need more than a year of "repair" or "preparation" to make them truly job-ready.

1.1.2. The invisible problem - In a world that is changing rapidly - is there a requirement to ensure that we are preparing our children for a future where the only constant will be change.

The issue is that in a country that is developing at 6 to 8 percent can we truly say that our children are not being prepared for change.

The evidence lies in the first problem. Our children are not being prepared for the present, let alone the future.

1.2. The principal solutions

We see this as requiring three principal measures and try to present the rationale for these measures in the following paragraphs.

1.2.1. Imparting meaningful education

Currently there is a vicious cycle created by the examination boards which have to provide mechanisms for consistent marking across the length and breadth of a very diverse country. This focuses the examination system and thereby the school system into discrete data/info relationships rather than grey area issues. In other words, there is always a clear "right" answer even if the rationale behind it is not known by the student and often by the teacher.

We need to move beyond these confines to create in children the capacity for inference i.e. the ability to apply information to new circumstances and through dealing with real world problems being to acquire what Damasio and Yang have termed "skilled intuition"

1.2.2. Inculcating decision making skills

While an infant has all decisions made for it, the adult is supposed to have competent decision making skills. This transition occurs infrequently in the home and more infrequently in the classroom. It is only in the playground, particularly in team games, where children get to make decisions, sometimes have conflicts which they usually resolve harmoniously, and get immediate feedback on the quality of the decision. We need to extend these characteristics at least into the classroom. We have to remember the famous phrase variously attributed to some individual in the British nobility that the battle of Waterloo was won on the playing fields of Harrow and Eton. The mention of classrooms is conspicuously absent. Hence the origin of the problem is not necessarily in the immediate past.

1.2.3. Inculcating participative decision processes

PIDM or participation in decision making has been shown to produce increments in performance in various industries. There are three specific illustrations. Firstly, in the figure below, one can see the relationship between the TIMMSS test and the prosperity in the country concerned. One can see that in the lower right quadrant you have a strange phenomenon that high income correlates with bottom line TIMMSS test scores. These are also countries that are not known for invoking the opinions of their citizens into government decisions.

Similarly, if one looks at the United Nations Human Development Index, the top three countries are Norway, Australia and the Netherlands. None of the 200 people who have sat through the presentation have been able to name any individual or great leader who could have carried these countries to the top of the UN HDI. On the contrary these countries are known for the equality of citizens, participative government, and a focus on education and laws against child abuse. India, leaders exuding from every pore stands at the far end of the spectrum with a position of 134 on the UN HDI.

2. What is the value proposition

Our value proposition is that we would dilute the following two problems.

2.1. the gap between school education and the needs of the workplace and tertiary education

We will endeavour to establish the validity of this problem in two ways. The Hirsch Index is a measure of how India performs against other countries. The World Bank statement is culled from a report which includes initiatives by the Govt. of India and by the World Bank.

2.1.1. The Hirsch Index

The Hirsch index is a function of the number of citations academic papers receive. India ranks 24th on the list ([Country Rankings by Hirsch Index](#)) in spite of having the world's second largest population.

2.1.2. The World Bank Report

“there can be no major expansion or improvement of higher education in India without first improving and expanding the secondary level.”

2.2. the gap between current educational outcomes and the needs of the future.

To address this, we provide an incisive statement from a [World Bank Report](#)

“Finally, India's gross enrollment rate (GER) at the secondary level of 40 percent is far inferior to the GERs of its global competitors in East Asia (average 70 percent) and Latin America (average 82 percent). Even countries such as Vietnam and Bangladesh, which have lower per capita incomes than India, have higher gross enrollment rates. The relative success of these countries suggests that India is underperforming at the secondary level, and has scope for significantly improving access and quality of secondary education given its current (and projected) GDP per capita. It also suggests that India needs to increase public investment in secondary education to remain globally competitive.”

3. Testing the value proposition

We tested the value proposition by running seminars for school teachers and principals. Each individual in the group had our proprietary wireless keyboards and was able to respond to pre-prepared questions in our presentation as they were displayed.

There were two groups. Group 1 comprised 14 members of staff of an International School in Bangalore which included a male Principal, 11 female teachers, and two “others”.

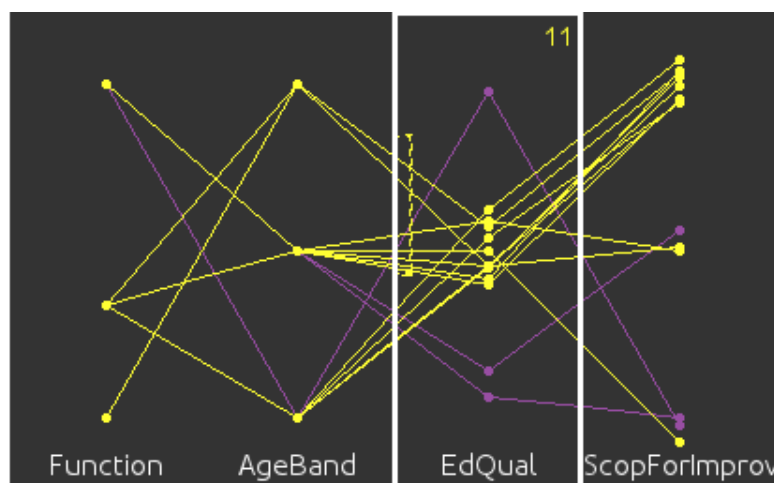
Group 2 comprised 32 members of a Society that runs a group of schools across the country with the highest reputation for academic success. Students are largely the children of scientists which may be a weighted factor in their success.

Identities of both entities are being withheld.

In this experiment, we were trying to assess the impact of a number of issues but in doing so we have to be mindful of Einstein's advice that the mindset that created the problem cannot be the mindset that will solve the problem. Historically, the Religious Institutions, Armed Forces and Education are three types of entities that have been averse to getting management expertise from outside the system. Hence, feedback from within the system has to be absorbed with care for the mindset may be more influential than vested interest or the demands of inertia.

3.1. Perception of educational quality

The responses of those who felt education quality was very low or very high tended to predict low scope for improvement. The rest appeared to tend towards the prediction of a high scope for improvement. The parallel coordinates display shows this outcome. Educational Quality (EdQual) and Scope for Improvement of the educational system (ScopForImprov) are jittered to give a better idea of the relationships between EdQual and ScopForImprov.



3.2. Perception whether it is possible to effect change

This is also addressed above and indicates that the potential for improvement is seen better by those inside the classroom and correlates well with a belief that the system is less effective than it could be.

More specifically this issue was addressed with 32 principals of Group 2 who were given a seminar on the issue of Continuous and Comprehensive Evaluation. CCE represents a mechanism for more holistic evaluation thereby diluting the rationale for rote learning that dominates the current examination system and therefore influences the teaching of students. The pertinent questions put to them and their responses are indicated in Appendix 1.

The findings of these are that teachers are possibly overloaded already and there is a strong feeling that the introduction of CCE may greatly overload teachers.

However, it is in the context of student time that the consensus of opinion is most strongly expressed. This consensus indicates that there will not be enough student time to conduct this evaluation. The questions put by the audience of principals depicts a certain misalignment with the idea of CCE as a productive tool.

3.2.1. The role of the AGEM initiative

Our initiative is characterized by the following:

- each student is provided a feedback device
- all material is pre-prepared for a projected display in the classroom and contains embedded questions designed to yield specific indicators of performance every few minutes.
- the response of the class is analysed and displayed on the projector within seconds of all students having answered.
- all responses are archived for ongoing analysis
- students are provided regular reports on how they can improve their performance
- no homework is provided and no textbooks are needed.

- project work usually with real world data is intrinsic to this method.

The following photograph depicts a classroom with 65 students undertaking a class in mathematics at Grade 6 in a school for disadvantaged children. The feedback devices are visible on their laps. The room was too small for the number of students and large areas at the front and the back were taken up with heavy school bags.



4. The outcomes of a pilot study to test the value proposition

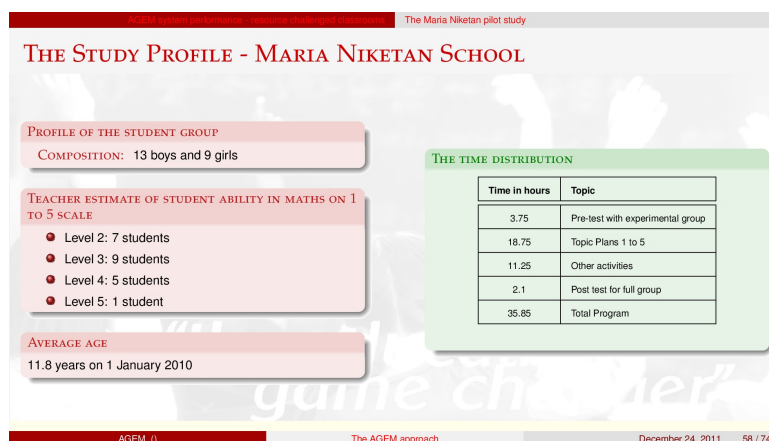
We asked for and received a set of students who were generally weak in mathematics as can be seen from the teacher estimate of student ability in maths in the figure below. We went through 5 topic plans with them of which the first was hopelessly optimistic and had been designed before we could give the children a pre-test. The remaining four assumed that little or no knowledge of mathematics and covered the following areas:

1. The concept of number
2. decimals
3. percentages
4. fractions

During the course of this effort we understood that the group of 22 was derived from a single class of about 75 students. Hence, a pre-test was not possible but all the children took the same post-test. This formed a basis for comparison.

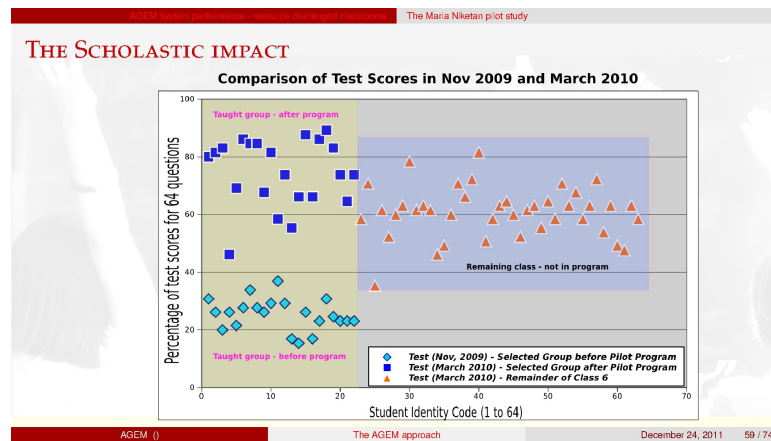
An alternative basis for comparison that was used was the change in performance between the end of term 1 i.e. before we commenced teaching and the end of term 2 when we had concluded teaching. Due to the unusually large difference between pre-test and post-test for our experimental group we decided to see if the changed motivation of children could have impacted not only mathematics but Science and English in the schools own examinations.

4.1. Profile of students



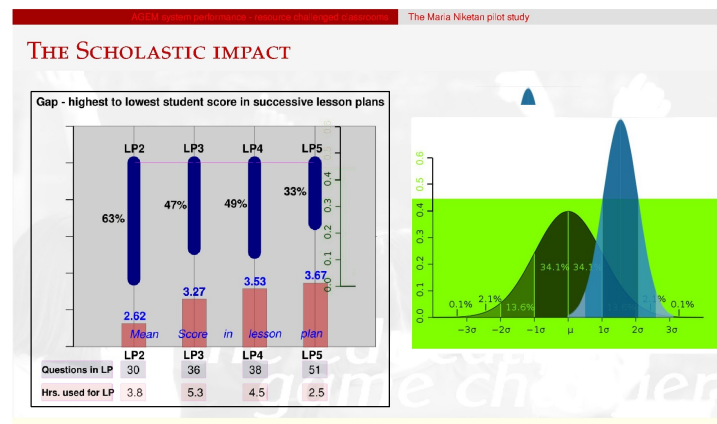
We can see here that the total teaching time for the 5 topic plans was 18.75 hours out of a total class time of less than 36 hours.

4.2. Performance in AGEM tests



From this we observe that the taught group generally averaged less than 25% in the pre-test. As Prof. Hans Rosling of the Karolinska Institute has observed, this does not mean the children did not know, but implies they knew the wrong thing. However the change in performance was surprising

4.3. Performance of the group per topic plan



The results show an improvement by the class in mean score with the topic plan but they also show a compression in performance of the class as a whole. In statistical terms this could be understood as a decrease in the variance as well as an increase in the mean score.

4.4. Performance in school end of term examinations

TERM EXAMS - DIRECT AND PERIPHERAL IMPACT

BASED ON EXAMS CONDUCTED BY SCHOOL INDEPENDENTLY

Scores of children who improved : Term 2 - Term 1

Group Assessed - on basis of school conducted end of term examinations	No. Of Students	DIRECT EFFECT		
		Taught by AGEM		
		Maths	Science	English
Experimental Group - Average % change	22	7.5%	13.8%	9.9%
Control Group - Average % change	53	2.7%	10.3%	9.4%
% of Experimental Group that Improved	22	77%	81%	77%
% of Control Group that Improved	53	51%	70%	64%

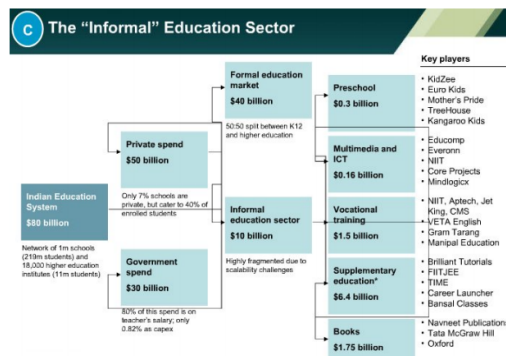
AGEM (I) The AGEM approach December 24, 2011 61 / 74

These results show an enhancement in the school end of term examinations which were in consonance with the school syllabus rather than what we had taught. The enhanced performance in maths continued for Science and English thereby possibly leading to the possibility of an increase in motivation and/or inference.

5. Market Size

THE EDUCATION MARKET - THE SPEND, SCOPE AND HOPE

SOURCE: [HTTP://WWW.SLIDESHARE.NET/KITTUKOLLURI/INVESTING-IN-INDIA-FEB-2010](http://www.slideshare.net/kittukolluri/investing-in-india-feb-2010)



6. Conclusions

This pilot was based on the three solutions posed at the beginning of this article. The results of the pilot seem to give prima facie evidence of the impact of these solutions on student performance.

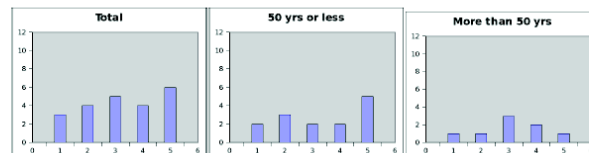
A. Responses of Principals and Administrative Heads

QUESTION 1: ARE TEACHERS ALREADY OVERLOADED?

Please indicate on a score of 1 to 5 where:

- 1 means "Definitely not"
- 5 means "Absolutely yes"

Question 1 Response Histograms



Responses = 22 Responses = 14 Responses = 8

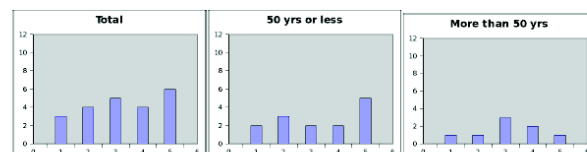
Result: There is a weak consensus that teachers are already overloaded. This perception is stronger among those who are 50 years of age or less.

Q2: WILL TEACHERS BE GREATLY OVERLOADED BY CCE?

Please indicate on a score of 1 to 5 where:

- 1 means "Definitely not"
- 5 means "Absolutely yes"

Question 2 Response Histograms



Responses = 27 Responses = 17 Responses = 10

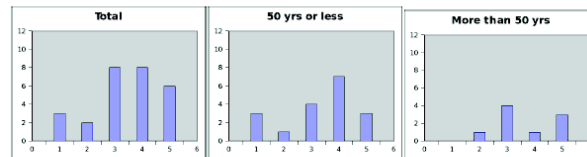
Result: The perception of respondents appears to indicate that the strong perception is that teachers will be greatly overloaded by CCE and this is manifest more in those who are 50 years of age or less.

Q3: WILL TEACHERS BE ABLE TO ACQUIRE THE SKILLS TO CONDUCT THE EVALUATION?

Please indicate on a score of 1 to 5 where:

- 1 means "Definitely not"
- 5 means "Absolutely yes"

Question 3 Response Histograms



Responses = 27 Responses = 18 Responses = 9

Result: The overall feeling is that teachers will be able to acquire the skills to conduct the evaluation but those who are 50 years or less have a wider spread of opinion on this issue.

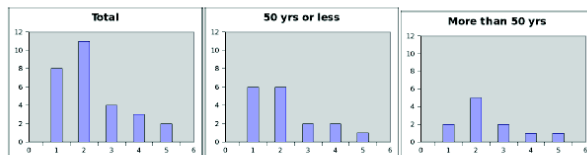
Navigation icons: back, forward, search, etc.

Q4: IS THERE ENOUGH STUDENT TIME TO ALLOW THIS TO BE DONE PROPERLY?

Please indicate on a score of 1 to 5 where:

- 1 means "Definitely not"
- 5 means "Absolutely yes"

Question 4 Response Histograms



Responses = 28 Responses = 17 Responses = 11

Result: There seems to be a clear perception that there will not be enough student time for this work to be done properly. This perception is more acutely reflected in those less than 50 years of age.

Navigation icons: back, forward, search, etc.