

VOCATIONAL EDUCATION IN THE NEW MILLENNIUM

S.S. Kalbag

If India is to meet the challenges of the new millennium, we shall have to overhaul our education system, starting with the vocational education but also covering the school education from primary to high school. We have to increase several folds, the effectiveness in imparting skills, as also the size of the student population covered in a given time frame. We shall also have to change our work culture. To do this, we have no choice but to turn to the new Information Technology (IT). The main concerns to tackle will be: Quality, Finance, and the Coverage.

We shall first see in what form the IT can help us in our task. We shall also see what else will be required to make our vocational education effective. The IT will be used in two ways: a) Speed up communication and to b) give training.

SPEED UP COMMUNICATION

It stands to reason that if we have to have interaction between different schools on the one hand and the supporting groups (resource groups, administrative group, etc.) on the other, we must have fast and clear communication. The present postal system (snail-mail, as it is called, when email becomes common) is too slow and expensive. Where as the postal service cost Rs.3 per packet and takes about 5-10 days and has no acknowledgement. The email costs only one local call (Rs. 1.25) and takes less than 2 minutes to reach anywhere in the world and if not delivered, intimation comes within 20 minutes. Very soon this will be accompanied by Internet Telephony. For such a drastic improvement in service, the cost of a telephone and a computer for the school is the price we shall have to pay. More on this later.

The email and the Internet will be used not only to replace postal mail, but also for online accounts checking, feedback, and approval of funds etc. Obviously, hardware alone cannot improve matters, unless the people in the school and the government bodies change their methods too. The Internet will also be used for group interactions between schools, not for occasional conferences, but almost continuous audio-visual exchanges and chats.

TRAINING/LESSENS

If the communication use of IT will expedite interaction several fold and at a lower cost, the use of the multi-media features of a computer, coupled with Internet or Compact Discs (CDs) can expedite training at a lower cost and with better quality and will be faster in replication.

The multi-media for the first time make possible a new pedagogy to be used for classroom training. The ideal training sessions have a small student to teacher ratio, have personal attention to every student's progress, and allow him to learn at his own pace. The computer CD lessons make economically feasible a ratio of between one and three students to one tutor. Because of the multimedia feature, the computer lessons use audio and video with student interaction for tuition. The computer is the tutor and the human is a facilitator. Besides, it can keep a record of his rate of progress and final status and can make examinations superfluous. In the privacy of the computer tuition, the students are relaxed and enjoy attempting quizzes. The concentration of the students on the lesson is markedly greater.

The computer lesson bring the best of teachers to every student and make an optimum combination of text, sound and visuals including sketches, photographs and videos and animations. What is more they take a shorter time than a classroom lecture, without audio/video.

Let us now answer most of the common doubts.

Can we afford computers?

Yes, multi-media computers are today (Oct.99) cheaper than a primary school teacher on per student-hour basis. The multi-media PC is today Rs. 1 per student hour (3 students at a time, and depreciated over 5 years, working 10 hours a day). The primary school teacher is Rs. 1.75 per student-hour and will become costlier every year, while the PC becomes cheaper.

Who will maintain the computers in the rural schools?

The computer hardware is simpler to maintain than a diesel engine. We already have many of our rural youth trained to even assemble computers. Last May, we had a 3-week course when 15 representatives of rural schools learnt how to use the computer and assembled their own computers and took them home and set up. Many of them are using computers to give us the monthly feedback; (by post because the telephone lines are not connected yet). We are also producing CD lessons on how to assemble multi-media computers, partition and format hard discs, load the software, do fault finding, etc. all through CDs. The lessons will be in 3 languages, Marathi, Hindi, and English.

CD lessons bridge the language gaps!

Not only are the lessons now available in different languages but also the students can, at his choice, go from one language to another by a flick of a button. The rich and the poor, the rural and the urban, the common and the elite will have the same lessons, a kind of equality that we cannot imagine with the present teacher system.

The student can take his lesson at his own convenience, from morning 6 am to 10 pm as he likes. To start with we feel 1 hour per week for the students of the 9th and 10th standards will be enough to prove the benefits of the system. The results of the examinations as also the self-confidence of the students will be the criterion.

The CD lessons are replicable and fast

Once the effectiveness of a lesson is proven, in actual use in some schools, it is easy to replicate it in thousands of schools. And coupled to the telephone through modem and Internet, any doubts could be solved expeditiously.

They remove the gap between the formal and non-formal

The use of CD lessons not in a classroom but in small groups at prescheduled times removes any distinction between formal and non-formal. Thus, even youth working in daytime could take computer lessons to understand the theory and take the final exam if desired.

"How to do" on a CD

The vocational and practical classes of science subjects have a special advantage in using CDs for prepractical instructions. We have a CD lesson on electrical wiring, where the students logs on to the lesson and then drags lamp holders and switches to arrange on the screen, then chooses those tools and the wire gauge and colour and then does all the wiring from terminal to terminal, using the computer mouse. After completing the wiring, he fits in the lamps of any desired wattage. After switching on, the lamps will light up as expected by the circuit used by him. What is more, he can pick up a voltmeter and/or an ammeter and connect it at any point in the circuit, any number of them at the same time and measure the voltage and /or current. He can use this for studying Ohms law, calculating voltages, or currents in series and parallel. Play with resistances in series and parallel and see how they

affect the current or wattage. And all this on the computer screen, with no risk of damage or electric shocks or short circuits. We are also having a program where, one can prepare a solution of a given % strength. We plan to extend this to standard solutions of desired normality and do titration in the computer "chemical" laboratory. These are not to substitute real shop floor experience, but to prepare for it better.

TEACHING COMPLEX CONCEPTS IS EASY ON A CD

Students find it difficult to understand abstract ideas. Computers make it easy by using animation. For example, student, who are learning blood group determination, cannot visualize how the "foreign cells" are recognised by the blood and which groups are (and why?) Universal Acceptors and Universal Donors. Why are the groups A, B, and AB or O? Our animated computer lesson show the template' concept and how the white blood cells recognise the 'foreign' cells and ask for the antibodies to be generated. With frequent quizzes before even the lesson is over the students are able to predict in each quiz whether the blood cell will be accepted or rejected.

Finally, the lesson shows by visuals how the blood sample is taken and reagents are added and how the slide looks where there is coagulation and when there is not. To cap it, the lesson ends with a video showing the whole sequence in real life, including the coagulation of the blood drop with Anti-A reagent in close up view. Such lesson convinces anyone about the value of these computer lessons.

LET US BUILD THE SOFTWARE

We are already in the computer lessons making business. We have 2 CDs under test in 15 schools and two more under preparation. Each CD has a number of lessons. The interesting point about making CD lessons is that where no concept teaching is involved, even our SSC failed students of Rural Technology have made lessons. Such for example are lessons describing preparation of food products etc. Trying to make the lessons (in Power Point) is itself very educative. We have therefore, invited the students of our network schools also to make lessons, which we can show on the Internet.

But where the teaching of concepts is involved, a creative effort is needed. People who understand the subject and also the computer programmes can optimally use the potential of this new technique.

THE NEW PEDAGOGY IN COMPUTER LESSONS

Many of the computer lessons I have seen in USA, UK and India are nothing but normal text lessons put on the computer screen with some colour, pictures, and sound, (music or reading the text). This is followed by usual type questions. This is not our idea of a computer lesson. We have to make use of the computer potential, to implement those ideas in education, which were not practical till now.

1. *Learners should construct their own knowledge.*

Given the proper environment, the learner must exert his observation and thinking skills and build up his knowledge about the subject. For example, in the computer assembly lessons, we present the learner with many parts and ask him to 'guess' which one is a 'floppy drive' for example. He has to learn to observe and remember the distinctive features of the item and identify it in various configurations. This challenging situation, not only hold the learners' attention, but also makes it more satisfying for him. In our Basic Electrical Lab lesson, the child can play with the fittings and find out the rules of wiring by himself; connecting in all ways and finding

when the lamp lights - This is constructing own knowledge; "Learning through Discovery".

2. *Learners should know not only what is right but also what is wrong.*

When presenting choices to the learner, we ask him not only to identify the right choice among many, but also some times the wrong one in many correct choices. This reinforces the concepts from the negative side as also the positive side.

3. When the student makes a wrong choice, we do not say "wrong". But we say try again. Thus, we help to reinforce the student's self-confidence.

4. We present a standard route for the lesson. If the student is very bright, he can skip and go faster. If he is a slow learner, we can give him a still more elaborately explained route. So the learner can chose the route matching his abilities.

5. The learning process is a continuous series of quizzes (choices to be made) by the learner, with some explanation screens in between. The session therefore, provides continuous opportunity for the computer to store the "learning curve" of the individual student, session by session. The teacher can later open the students file in the computer and see how the student is progressing. There is no need for a separate examination, unless one wants it for other reasons.

6. We can combine games with the learning process. We can even give rewards for every success. The potential is unlimited. We have not explored this area fully yet.

THE COSTS

I have already mentioned that computers are cheaper than a primary school teacher is. I have also indicated that IT will not only make communication much faster but also cheaper through use of Internet.

Our computer lessons on CDs can be available for as low as Rs.500 to 750 each. Considering that this will have 5-10 lessons of moderate complexity. This is much less than the training costs of trainers. Thus, the IT will not only boost our education progress, but also save money and time. What is holding back is only the fear of the new. But interestingly, the children not only are attracted more, but also pick up faster.

CONCLUSION

1. We have very little time to catch up with the rest of the world. If we miss the bus we shall forever remain a backward country. If we want to catch up we need to increase our tempo of progress and that means Education.
2. We shall have to adopt the IT in two main directions:
 - a. Connect all schools with Internet for faster communication and interaction.
 - b. Use multi-media computers and produce computer-based lessons. These lessons will not be used in the normal classroom, but students will book their own timings on the computer for taking their session.
 - c. We shall have to concentrate on making lessons that exploit fully the potential of the multi-media computers.
 - d. Wide scale adoption of IT by education system will give a boost to our IT industry & could make things much cheaper.
3. We cannot afford not to use IT in our schools starting immediately Tomorrow may be too late.