Introducing Computers Into Saudi Arabia Secondary School Science Teaching: Some problems and Possible Solutions

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Findings:

General findings:

There is a good computer hardware facilities in SA market, but it hasn't transferred to the schools. Concurrently there is lack in computer software for the schools.

There is some differences in the facilities available in the market between SA cities.

The general understanding for use computers in the schools is just learning about computers. There is no clear idea for learning or teaching with computers, meanwhile the general understanding for teaching about computers is learning about computer programming.

Science Teachers (ST) don't distinguish between using computer in education and using computers in science classroom.

Special findings

Qualifications:

The majority of ST (11 of 17) had BSE, the others had BSc. In addition of that, some of them (6 from 17) had higher degree such as diploma, master.

Although about half of ST (8 from 17) got personal computer, they have no reasonable computer experience. They are use it for gams or typing, but they have no clear idea how can it used for helping teachers in the classroom. The only thing that they know is a few old tutorial programs which produced by MSX computer

company(more details about these programs in the next chapter).

All Computer Teachers (CT) were not educators except a few teachers were qualifyed at King Sauod University in Reyadh where is a new computer department in the college of education.

As all of Teacher Trainers (TT) had got some computer courses and they did some researches or reports, but they have no sufficient experience about CAL.

Characteristics:

ST have no wide knowledge on computers. Some of them (4 from 17) don't know even how the computers turn off or on, while only a few (3 from 17) have awareness of CAL. The main use for computers in science classroom as they think were for:

Computer uses in the classroom, Writing examination questions, Audio-visualised solve mathematical exercise, Alternative for science laboratory, Games, tutorial, Saving lesson orders, Programmed learning, Graphs, Saving curriculum, Nothing (no idea).

The table shows the limitations of ST information about using computers in science teaching as most of them believe that the objective of introducing computers to science classroom is just for simple job like audio-visualised or writing examination questions.

TT have a satisfactory level of knowledge about CAL as it shows in their responses.

ST and TT have no any organized training for using computers in science classroom. Hence all the courses held were by private companies and for training for computer studies and literacy.

Attitudes:

Almost all of ST feel that they need computers to help them in the classroom, but they don't know how it does. Meanwhile, they made absolute believe of its advantage in science teaching and positive attitudes on its role in the society.

Few (2 from 17) ST reading computer articles. In the same time most of them(12 from 17) claimed the shortage of sources.

Sixteen ST would agree to introduce computers into science teaching, but they imagine some problems like (most mentioned first):

Software problems, Difficulties with the pupils, Economic problems, Training problems, Difficulties with the teachers, Machine service problems It doesn't do the experiments, Hardware problem.

TT reported that they included some theoretical lectures about computers in ST training program and they have done some researches or reports about computers in science teaching.

All of TT questioned about their attitudes to CAL showed positive attitudes. Meanwhile both of them would agree to introduce CAL into secondary school science classroom with some conditions like: comprehensive programme for training the people involve in science teaching, orders fully software, recognize the aims and prepare the schools.

Factual information:

In each secondary school (or has to come) there are: one computer room, one CT and 16 computer machine, type MSX 350.

Each secondary school pupil should study 2 or 3 computer courses which are: introduction to the computers, introduction to the programming (BASIC language) and computer programming & introduction to the information systems.

There is no practical meeting between CT and ST. Although some of CT tried to held some courses for the teachers in their schools.

There is lack in computer facilities in schools like: machines, reference books, suitable room and teacher adviser.

The study has shown that although ST had no basic knowledge about computers, but they had strong positive attitudes to use them in their teaching. This is maybe because they had no any computer training, but these attitudes can be use some how in teaching science with computer.

There is a difficulties of teachers training, either cause to the system or to the teachers themselves because all of the ST had no computer training and almost all of CT had no teaching methods training, in the same time the study has not indicated strong positive attitudes for ST to computer training.

The survey has shown the shortage of CAL software correspondingly expand of computer hardware. It might consideration of the language, hence there is lack of establishing Arabic software generally while hardware doesn't request any specific language. So open market like SA with little VAT make it worthwhile for computer companies to import wide and high class of computer hardware.

There is general misunderstanding for CAL and the aims of introducing it into schools as the majority of the sample interviewed don't have clear different between learning about computers and learning with computers. So,

any studying for this sort of sample should make it clear to explain some terms like CAL ,CBL etc. And it should not ignore the weak background about computers in general.

IMPLICATIONS OF THE FINDINGS:

The study has shown that the main object for introducing computers into SA secondary schools was to give the student awareness about computers as part of the Development Secondary School Project (1985). This objective has shifted in the industrial countries to include studying of the subjects through computers, to assist the learning by computers like CAL (CBL).

Unfortunately there is a limited possibility of providing conventional class of CAL in SA schools in the short term due to some problems.

The study has found that the situation in SA secondary school science teaching as the following:

1- Strong positive attitudes with both teachers and educators to introducing computers to science classroom.
2- Insignificant computers background.
3- Shortcomings of computer training; native, extent, numbers.
4- Shortage of CAL software, and wide range of computers hardware in the markets.
5- Limited numbers of computers and computer education specialists in schools.

The following sections describes the two main difficulties in more details. First these difficulties which due to training. Second, these difficulties which due to the software. This followed by some suggestions for possible solutions to the situation in SA secondary school (science) teaching.

Insignificant computers background:

The study has shown the lack of ST computers background, hence there is no acceptable computers knowledge or information in the day of "computers and technology". They had no chance to learn inside their schools because most of the computer courses running outside schools where it is too far from their environment.

There is no doubt about the important of computer knowledge for every one living in today's society, and it is more important for the teachers who suppose to be a source for student knowledge. "It is sadly feeling when some of my students ask me about computers which I don't know" one science teacher has said.

It not reasonable and wiseble to allow a teacher who teach "science" with this absence of any computer literacy during the day of "information technology". For example one teacher don't know what is the word "programming"!, another don't know how he can turn the computer on or off!, While plenty of them doubting whether there is any relationship between computers and science teaching!. This is in a day where farmers, news agent shops are using computers, even children are dealing with computers regularly.

We don't require them to know how the computers does work, or how can they produce programs. Simply they need to know how the computers can be use, as they use the video in their teaching. Exactly like any person drive a car or even plane without knowing how they work.

Restrict of computer education specialists in schools:

Only one CT in each SA secondary school, a very small number from them are qualified as a teacher while the majority qualified as engineers or specialist in computer science. CT reported their need for more teacher to share with them in computer lab while there is shortage of computer specialist in SA, and most of them prefer to carry on in their subject or work in industrials and companies sector rather than teaching at schools.

The only institute training teachers for teaching and for computers is college of education at King Saud University which did that recently. This is very good progress in computer teaching, it is the first college has done like this work so far in the Gulf states and maybe in the whole Arab countries.

The absence of computer teachers training in training colleges and institutes made the ministry of education looking for computer engineers and specialists to teach the computer curriculum temporary exactly like what it did with science teaching few years ago. Will the other colleges flow the experiment of KSU?

TA very good recent news come from Dr/ A Al-Thonyan, the head of Riyadh LEA who tells that it decided to organize training courses for science and mathematic teachers in the next year(1991-92), he said:

"This training courses intended for the need for CT in secondary schools and for introduce the teachers to every new in the world of education and technology" (Al-Riyadh, 1991).

Shortcoming of computer training:

According to the little of ST experience in computers and the need for training them, the questions

are; Who are going to do so, and how can they be trained in the best and cheapest way?. Will they train for how the computer work or they will train for how can they use the computers, ie. what are the aims of the training.

Mandorah (no date) made a training project for train non computer Arab teachers to using computers in their teaching. He suggested that computer colleges and departments could do the training program, and he suggested the following training courses:

1. **Introduction to computer science and programming (1),**
2. **Introduction to computer science and programming (2),**
3. **Computers and learning,**
4. **Processing and microcomputers,**
5. **CAL,**
6. **Microcomputer applications.**

He claimed for four full terms to complete these courses, but he didn't say how much it will cost for both, training fees and teachers whom will stay two years far from their jobs? And who should pay the cost? Will the Ministries of education accept that? Will the teachers accept that?. This project is very nice and extremely comprehensive. Teachers who study these courses could teach computers courses not just subject through the computers!, But simply it is not practical! And this is shows the way which some educators and researchers in SA thinking to introduce computers into subjects teaching, millions of S.Reyals, plus thousands of jobs, plus two years time. All of these for training teachers how can they use computers into classroom while they can get it some how in a couple of hours, inside their schools and during their work times with excellent benefit for students achievement.

The practical training program should be hold inside the schools, with simple and economic way. This will be more acceptable for officials and teachers as well. Also this program should give the teachers what they substantially need. What the teacher could benefit from learning computer science and programming? In which way they can help him in his teaching?

Can CT do some thing according to this matter?. In fact there are some of CT have suggested to train ST how to use computers. Therefore the practical solution to this problem is allowing CT to train their colleagues (ie ST) by holding some training courses inside schools.

CT have already teach like these courses for the student (computer courses 1, 2, 3,), so it is possible to give some extra courses for the teachers, these courses shouldn't be too long as the teachers have no much free

time (20-24 average weekly classes for each ST), a couple of days will be acceptable.

Will CT willing and able to train their colleagues? This study has shown positive signs in some responses, will they allow them to use computers machines and laboratories? If they do, this problem will be easy to solve, but if they don't we might look for some alternatives to train them.

Will computer teachers share with their science colleagues?

In the light of previous discussions, it is clear that there is a lack in teaching methods with CT, in the same time there is absence of computer literacy with ST, so it possible to make sharing between CT and ST, because the sharing could achieve the following objectives for the teachers and the teaching:

- **a) Sharing would make CT train their colleagues into schools. In this case, the training problem would solve in easiest and most economic way.**
- **b) There are many benefits for ST; It will give them reasonable level of computer literacy, and it would allow them to use computers in their teaching.**
- **c) It would save money and place, so ST can use same machine and same laboratory in which their CT colleagues are use.**
- **d) By this way the students could aware about computers, in the same time they could learn science subjects through the computers. e) ST could train their colleagues internally on the teaching, so we don't need to held more external courses for CT about teaching methods as we are not ready to do so in the short term.**

The internal sharing between computer studies and subject studies not new, hence it is already exist in industrial countries schools like UK and USA. Therefore it is worthwhile for the SA secondary schools to do so, for example they could start with internal sharing between computer studies and science subjects; sharing between CT and ST, ie integrating science subjects with computers, then it could follow with the other subjects.

If CT train their ST colleagues, ST could teach science through the computers under the helping and advising of CT, then no need to teach three or even two courses for computer studies because the student can get computer awareness through studying science subjects with computers.

It is leads to concluded that the internal sharing between ST and CT could make large possibility for introducing computers into SA secondary school science teaching.

Limit of machines:

The number of computer machines in each SA secondary school is just 16 PC while there are about 600 students in each school. So if each student studding just one computer hour weekly, we need 600 machine hour/week, and if we have 25 studding hours (5 hours/day . 5 days), then we need 24 machines. That is one machine for each 25 students, ie we got now just two third from what we need. that is why some of CT claimed for more machines.

The schools are lack for common types of machines which cheap and easy for use. That is what the practical need in SA, we don't want to repeat the UK schools crisis with inflexible BBC computers which request special use and uncommon software.

SA teachers are need computers exactly like what the market has, they don't need to train about specific types of computers, otherwise their learning would be limited and narrow, and they will need for a new training program with every change of computer types.

It is clear now that we need more machines to give the student reasonable computer literacy. The cost of computers in SA market is economically, so it is worthwhile for the Ministry of education or even for the schools to buy a new more machines. Will the Ministry of education scheming to do so? Are they going to continue buying the same type of computers? What about the schools which steel up to now whithout computers? What is the role of computer education in the new secondary schools system (1991-92)?.

Shortage of CAL software:

The only CAL software exist in SA markets are few old tutorial programs produced by Al-Alamiah company for different medial school subjects like science, mathematics, geography etc. The programs are just a transferring for the curriculum contains from the books to the computer whithout any sufficient treatment to assist or enhance the user.

These programs explains (by writing in the screen) the curriculum subjects with some pictures which already existed in the book, in the end of each subject they ask the student some questions which also like the book's questions, if the student answer the question correctly, then the computer ask him the next question, but if not, it give him some extra reexplain until he get the correct answer, and In addition of that they are very expensive, hence each program (consist of one curriculum book content) cost about 400 S. Reyal ($100), while the cost of some commercial software like wordprocessor or spreadsheet programs is between 30-200 SR (10-30) This

large difference show the absence of CAL software and the facility of business software in SA markets.

Although few of parents buy these programs for their children, the majority of students have no opportunity to use or even see them, also there is no substantial information about them with ST. While half of them got PC computers and they use them for simple jobs like typing.

Regardless of whether these programs are used or not, there is no valuable aid from using like this kind of software. The early tutorial is old stage of CAL, it is inflexible kind of software hence each program produced for special subject, so it need too much labours and materials to produce, that is why they are always very expensive. Moreover this model of tutorial has just a little interaction between computer and the learner.

Is there alternative existed software can be used? SA market has plenty of various generic business software like numerous of wordprocessor, database, and spreadsheet in different languages including Arabic one. So why we do not get a benefit from these facilities?, Why we don't introduce them to the schools?, Why we don't aware student about them?. Companies, industrials, offices are all using these software, they are the practical need for the student before and after they leave schools, they are the factual software in the pupils environment.

These type of software has an economical price, they are easy to learn, cheap to buy as it shown in the next two chapters. But the question is, can they be use to aid SA science teaching?.

Using generic and commercial software for teaching science and computer education in SA secondary schools:

CAL is excellent use for computers in science classroom, but SA schools are not able to bring particular type of CAL in the short term according to the SA case discused previously and according to CAL cost and characteristics. But generic software is already existed in the markets with an economic price. So it is maybe a good practical alternative.

Computer education researches today has turned towards introducing computer business applications into the classroom corresponding with the theory that there is no doubt of the important role of these applications in tomorrow generations.

Databases, spreadsheet, and wordprocessing are the most popular commercial software using today, and they have already transferred into some industrial nations schools.

Wordprocessing is a very good use in teaching some subjects, especially in languages issues. But unfortunately, it has nothing to do with science up to

now. So it excluded from the thesis theoretical and practical parts.

The objectives of using DP and SS software in science teaching are for enhancing the teaching of science subjects with using computers, and in the same time for give the student computer awareness as part of technology. It is most likely that the DP and SS are good practical use for the computers in science classroom, they could transfer the student outside the classroom.

Langhorne and his colleagues (1989) have claims for three reasons for introducing student to computer commercial (generic) using and designing instruction which makes use of them, they explain databases specifically. First, by teaching student skill of manipulating, they are learning a vital "information age" concept and skill, because today's student are entering into a technology-driven, information-rich society where skill at using technology to access information is essential.

A second reason for using them as they have think is that they provides a means for teaching higher-order thinking skills like classifying, comparing, contrasting, drawing inferences, hypothesizing, generalizing, and using Boolean logic. Using them requires that these same skills be utilized but this time with some content added. The content of the commercial uses can range from vital statistics of animals to demographics of various countries to bibliographic information and reviews of books. The student can be guided to use various higher-order thinking skills.

The third reason that they claims is that the generic software can serve as an instructional vehicle for imparting a specific content. In any given curricular area, in any particular content, the classroom teacher is faced with selecting an appropriate method for putting the content across to the students in the way which will most effectively and efficiently bring the student to attainment of the objectives.

The advantage of using DP and SS in teaching science in SA is that they don't need any specific language because it is already existed with the machine. Therefore it is possible for local companies or schools to produce reasonable programs, it is much easier than the tutorial programs which they have already produced for science teaching in Arabic language. In addition of that there are many Arabic programs in these kind of software; the teachers and student have already started using theme, they are typing by computers, they using computers for some business jobs. "I am using my PC just for typing and for organizing my private house library, they are too easy for me", one S. teacher has claimed.

Another advantage of using of DB, SS, and WP is that they aren't request long run training for teachers, and this is important because this is one of main problems for introducing computers to SA science classroom as the post fieldwork has shown. So in this case we don't need more than a couple of days to train the teachers how to use computers in these approaches. The SA computer teachers maybe do this job because some of them mentioned that they were try to held some training courses in the school for the teachers.

Moreover using these kind of software could achieve many advantages to SA science teaching; it could introduce more interesting science subjects; it could give the students reasonable awareness about computers, so we don't need to teach computer courses; it could also tell SA students about a new information in science and technology.