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Need to Change the Contents of Computer Science at Secondary Level

[1]Nadeem Zahra & [2]Maqsooda Hussain

farris52000@yahoo.com

Abstract

Computer literacy is necessary to understand the power of modern technology and to help the students in preparing them for the future professions or occupations. Pakistan formulated National Information and Communication Technology strategy for Education (NICTE) in 2004-5. To introduce Computer Science subject at secondary level, Punjab IT Lab project was launched by the provincial government of Punjab. Under this Project 4286 computer labs were established in public secondary schools of Punjab in 2009. The purpose of this study was to investigate the problems, found in outdated computer Textbook of grade 9th at secondary level. It wasa review of a text book. The study was quantitative. A survey instrument was designed to collect data through questionnaires. A simple random sampling technique was used to select a sample of Head teachers, computer teachers and students of the secondary schools. The population of the study was high schools of Sargodha Division. Sample of the study was 226 Head teachers, 226 computer teachers and 452 students during the session 2012-2014. Data collected, were analyzed by applying percentage and mean score. The findings revealed that Content standards needed to be upgraded and updated to match the market requirements and internationally competitive in order to better prepare those students who were not going on further studies. Ms Office might be included in part 1 of the Computer Science to make computer education meaningful and relevant to the needs of the students.

Keywords: *Contents, Computer Science, Secondary Level*

Introduction

With the growing demands of Computer Science education in society, the Government of Pakistan (GOP) has taken concrete steps and utilizes all available resources and equipments to improve the education system within the country. During financial year 2004-05, most of the funds were allocated for the targeted Human Resource Development (HRD) and software development programs. Computer Education was introduced in eighty one F.G/Model Colleges and Schools of Islamabad. At the same time six more projects naming IT/Computer Science Teachers, Lab.

[1,2] Preston University, Pakistan

Incharges and Computer Labs project were started, one each in Punjab, Sindh, NWFP, Balochistan, AJK and FATA/FANA and ICT. Keeping in view the growing needs of computer education, Singh, (2005, p. 22), has reported the aims of teaching Computer Science as follows:

I. **Utilitarian aim:** of computer sciences in their day-to-day activities.
II. **Intellectual or mental development aim**: To develop the intellectual or mental abilities of the students.
III. **Disciplinary aim**: To help the students in making their minds and habits disciplined.
IV. **Cultural aim**: To help in the process of preservation, promotion and transmission of culture.
V. **Moral aim**: To help the students in the development of moral values devoid of false notion, superstition and miseries.
VI. **Aesthetic aim**: To help the students in the inculcation of aesthetic sense and artistic values.
VII. **Social aim**: To help in the process of the development of society and inculcate social virtues and ideas among the students.
VIII. **Vocational aim:** To help the students in preparing them for the future professions or occupations.
IX. **Inter Disciplinary aim:** To help the students in utilizing study of computer sciences for the study of other subjects of the school Textbook.
X. **Problem Solving aim:** To help the students to acquire problem solving ability by training them in scientific method or approach.

The significance of ICT in modern world is fully established due to its unlimited access to knowledge. Ministry of Education and Computer Science professionals in Pakistan are also concerned with the goal of increasing awareness of the importance of Computer Science in the job market by improving the quality of education. Government has taken serious steps to equip the future generation with

computer technology. The subject of Computer Science is introduced at Matriculation levels by all Education Boards throughout the country. Computer Science teachers and computer labs have been provided by the Government to meet all the requirement of this new subject.

In the beginning Computer Science was an optional subject for grade IX and X, but now computer education has become a compulsory subject from grade VI to VIII where IT lab exists. Apart from this, Computer Science is also introduced as an optional subject from grade IX to X who have a choice between Science and Humanities. Among all the elective subjects within the groups, Computer Science is the common subject offered to both the groups. *All computer labs in secondary and higher secondary schools are furnished and well-equipped with different parts of computers.*

IT strategy of Punjab province

A project naming "I.T / Computer Science Teachers, Lab In-charge and Computer Labs" was established in Government Secondary and Higher Secondary Schools to introduce Computer Science subject at the grass root level. The project was commenced in July 2004. Main objective of this project stated in Evaluation Report on Project (2008, p. 8), are as under:

I. To recruit 515 properly qualified Computer Science / Information Technology teachers and same No. of Computer Lab In-charge in the selected Government Secondary and Higher Secondary Schools in Punjab for providing quality education of Computer Science / Information Technology for class IX, X XI and XII.

II. To equip 515 selected Government Secondary and Higher Secondary Schools with computer labs.

III. To raise the standard of teaching of Computer Science subject in Government Secondary and Higher Secondary Schools.

IV. To provide employment opportunities to the educated youth in subject relating to Computer Science.

V. To create enabling environment in educational institutions for the teaching of Computer Science at the grass root level. This would offer better opportunities to the nation to select the best talent from

amongst a large population base. Proper investment in the talented individuals will help Pakistan leap forward in IT and other disciplines.

VI. Continuing training to teachers and IT lab in-charges to help them keep abreast with the latest developments in the field.

The project involved Ministry of Information Technology, Pakistan Computer Bureau (PCB) and Punjab Education Department with the aim of building ICTs competency in education department. The government believes that it is necessary to keep abreast with current developments in ICT for education. Hussain,S., Shams, S. and Sarfraz, (n.d. ,p. 12) stated that:

> The Ministry of Education (MoE) in Pakistan, cognizant of the need to integrate ICTs in the educational system, stipulates the use of ICTs creatively to assist teachers and students with a wide range of abilities and from varied socio-economic backgrounds and to strengthen the quality of teaching and educational management in the recent National Education Policy (NEP) of Pakistan.

The Punjab Government has also initiated a consultative process to revise the National IT policy in 2008, for the next five years. By Admin (2009), it is revealed:

> The Punjab IT Labs project was initiated by Government of Punjab last year and is expected to be completed by the end of 2009 covering 4,200 higher secondary schools across Punjab. The Government believes that this project will be the most significant step toward bridging the information and technology divide between public and private sector education.

Computer Science is essential for the national growth of economy. It prepares young people to become active citizens and independent lifelong learners and this is crucial for their employment opportunities. The demand for Computer Science education has become an essential bridge of social, economic and political mobility. The main objectives of Computer Science are to help large number of secondary students to be computer literate. This step is taken in response to the perceived problem that a lack of computer skills is preventing youths from acquiring jobs in the world market.

The existing system does not equip them with necessary conditions to implement the educational policy in its true sense. In order to make computer education more effective and helpful, greater commitment and cooperation is needed from all aspects of society including administration, parents, teaching staff and students. It is necessary to understand that computer technology has not come with merely hardware and software. It has its own teaching-learning style and grammar. There is a need to strengthen, modernize and simplify the existing contents of computer Science subject so that students could not face the following difficulties and problems in the Textbook:

Theoretic and impractical Textbook

Computer Science is an important scientific discipline. It has gained immense importance in Pakistan during the last decade. Computer Science is a means to understand and explore the world around us in computational term. School children need to be introduced to the scientific and engineering principles and concepts of Computer Science to create digital technology and software for themselves. It is necessary for every school-leaver to have an understanding of principles and concepts of Computer Science in a creative and animated way. Content standards for computer science education need to be developed and adopted, parallel to what has occurred in disciplines such as science, mathematics, the arts, etc. Gul, Akhtar, and Asif, (2011) stated, "Curriculum frameworks aligned with these content standards can then be developed for the classroom, in conjunction with the teacher certification standards and the curriculum for teacher preparation programs". Textbook development is a continuous process. It is Textbook, which helps in understanding environment and the work around us. Singh, (2005, p. 133) quotes the views of a renowned educationist Cunningham, "The Textbook is the tool in the hand of the artist (teacher) to mould his material (the pupil) according to his ideals (objectives) in his studio (the school)". It is changed when it loses its consistency with the national goals of education or the standards it set do not match the best in the world. In this respect Ungoed-Thomas, (1997, p. 74) advocates, "The Textbook, as a whole, should provide, in intention and practice, an explicit and balanced treatment of ideas of truth. That is to say, objectives and activities, taken together, should give

due regard, as it has been expressed, to 'the forms of enquiry and justification appropriate to different kinds of knowledge and experience". The present Textbook exhibits following pitfalls: Inadequate for school-leavers In order to prepare students to become more interested in Computer Science, greater innovative solutions are needed. Textual material recommended by the Government is insufficient. Textbook includes such contents that do not provide essential knowledge, as it cannot fulfill the needs of students who leave education incomplete. There is too much in the Textbook, which could not make the students as much educated, as they should be. The students cannot enter into professional field with the inadequate knowledge of hardware. Murphy, Beck, Hodges, and Mcgaughy, (2001, p. 11) investigated, "Although the original function was to prepare students for practical life… under the pressure of diverse needs in a democratic society this function was gradually enlarged to include preparation for college" (Latimer, 1958, p.16). That is why a serious shortage of information technolologists exists in the country. Content standards for Computer Science needs to be changed and adopted. It should become parallel to what has occurred in the advanced countries. Harshitha, (2006 p.26) says: It is no use of using those topics, contents or learning experiences in the computer sciences Textbook for which there is no scope or provision of very little interims of the availability of resources for their proper teaching-learning or the application of what the student have learnt in a particular class. The Textbook recommended, by the government is divided into two parts. Part one is for grade IX and obviously the second part is for grade X. The contents of the part 1 are as under:

Chapter 1. Introduction to Computer

Chapter 2. Computer Components

Chapter 3. Input/ Output Devices

Chapter 4. Storage Devices

Chapter 5. Number Systems

Chapter 6. Boolean Algebra

Chapter 7. Computer Software

Chapter 8. Introduction to Windows

Insufficient for highly intelligent students

Part 1 of the Book deals with the information of computer hardware and rigid solution of algorithms. Addressing such shortcomings Giridhar, (2000, p. 75)says, "(a) memorizing, (b) learning isolated facts and findings (c) using algorithms rigidly or automatically, or (d) answering problems

with solutions already known to them. Such activities do not involve higher order thinking". Most of the students get fed up with the surface knowledge of computer parts, which is a tool of Computer Science. Resultantly their quest for knowledge remains unsatisfied. As asserted by Bennett, (1999, p. 85) Not every child with higher intelligence, of course, is a problem for teachers. Nonetheless, many bright students who conform to the system do not meet their potential because they are a seldom-challenged in ordinary courses. Schools must establish Textbook requirements at a level that most students can reach, but below the capabilities of truly bright students. Their talents lie unused. They suffer, but the nation also suffers.

Need of Internet connectivity

The Textbook, which meets the international standard, is considered the best one. Students of this level want to understand and play an active role in the digital world that surrounds them. McLoughlin, and Taji, (2005, p. 28) say, learning is enhanced by the flexibility of the internet, which allows the learner to control the pace of the learning process by selecting what, how long, and how many times to view educational material. In addition, the learner can select from many possible pathways, exploring different solutions to the problems.

A sound knowledge of computing concepts helps the students to see how to get the best from the systems they use. Ahmad, (2006, p. 198) also supports the ideas and says, "Internet can offer any immense range of information services such as electronic mail, file transfer, data bases and multi-media. It also provides connectivity to mobile receivers. Computer network thus has several advantages over interpersonal communication". Students attain the understanding of solving problems when things go wrong. They do not want to be passive followers of an opaque and mysterious technology. Internet fay is essential for Computer Science teaching if GOP wants to introduce this discipline as a legitimate and important subject at the secondary-school level.

Lack of important software

Computer Science Textbook focuses on teaching how to use software instead of giving insight into how it is made. Some important software like Microsoft words, Excel and PowerPoint are missing in the Textbook. Students' development in this subject is hampered by a lack of challenges.

There is found weakness in developing skill for writing program for computer and databases. Poor coverage of key aspects of the Textbook is another major problem. Giridhar, (2000, p. 102) advocates, "… learning to use the programming language is itself a form of problem solving. Without question, the act of solving programming problem often meets our definition of higher-programming problem often meets our definition of higher-order thinking". However, Leask, (2001, p. 25) says:

> Young people therefore, need not only be taught the skills necessary to make the best use of new technologies in their adult lives and in the 'traditional' work place but also to understand the new possibilities for commercial activity afforded to them by new technologies i.e. electronic commerce (e-commerce), as well as the implications for them both as consumers and service/information providers. They need to become familiar with the working practices characteristics of today's workplace, such as file sharing, group editing and collaborative writing.

Insufficient practical work

The impractical and theoretic contents force the students to rot, which is damaging for the creativity of the students. Students learn more when most of the time is allocated to Textbook related activities. Students require sufficient time and opportunities to practice what they are learning. Singh, (2005, p. 255) stated that:

> Project work also occupies a significant place in helping the teacher and learners for the realization of the stipulated minstructions objectives in teaching of Computer Science. It is a team work that results with the cooperate/group learning and is totally based on the principles and maxims like "learning by living" etc.

The classroom management provides a strong support to the students for maintaining their engagement in classroom activities. Harshitha, (2006, p. 213), however, strongly recommends laboratory work. He says, "It clearly aims to provide them needed opportunities for the development of essential laboratory skills for learning how scientific knowledge and principles work in practical situation or how the facts are discovered in Computer sciences". Rao, (2003a, p. 36) also

investigated, "Students learn more when most of the available time is allocated to Textbook-related activities and the classroom management system emphasizes maintaining their engagement in those activities". Changes in Computer Science Textbook are the need of young generation. It must support components of learning: active engagement, participation in groups, and feedback to satisfy the growing demand of students.

Research Methodology and Procedure

As the research was descriptive in nature therefore, survey method was used for the collection of data. Two hundred and twenty six Government secondary schools were selected from fifteen tehsils of Sargodha Division by balancing gender: male and female. All the 226 sampled Government Secondary Schools of four districts of Sargodha Division were taken as a sample by using random sampling technique. At least two students (452) from each of the sample schools were selected to obtain information. Two hundred and twenty head teachers and 220 Computer teachers and 400 students were selected. Three questionnaires were developed on five points Likert scale. Selected-response items were included in questionnaires to get relevant information while open-ended items were included to get responses that were creative and not known to the researcher. The face validity and content validity of the items of the questionnaires was reviewed by faculty members of Sargodha University. Pilot testing was conducted to minimize the misconceptions. To represent all levels of population, twenty Head teachers, twenty computer teachers and forty students were selected. Internal consistency of items was calculated through Cronbach's Alpha method. During tabulation data collected through questionnaires were processed, analyzed and discussed by applying statistical techniques of percentage and mean score.

Table 1 *Responses of Head teachers' questionnaires*

Sr. No.	**Statement**	SA	A	UD	DA	SDA	Mean Score
1	The Textbook of Computer Science is according to the needs of the students?	07	15	38	136	24	2.28
2	The contents provide up-to-date information in Textbook.	01	15	00	187	17	2.07

Table 1 reveals that Head teachers reported that the Textbook of Computer Science was not

according to the needs of the students and the contents of the Textbook did not provide up-to-date information.

Table 2 *Responses of Computer Teachers' questionnaires*

Sr. No.	Statement	SA	A	UD	DA	SDA	Mean Score
1	The Textbook of Computer Science Part 1 is theory-based.	44	152	20	04	00	4.07
2	The contents given in Part 1 of Textbook is sufficient to fulfill the needs of students.	06	32	10	129	43	2.22
3	The present Textbook of Computer Science is according to the international standards.	20	25	00	123	52	2.26
4	The contents of the Book develop the competencies of independent learning.	04	30	04	94	88	1.95
5	The presentation of the Book is attractive**.**	13	25	05	143	34	2.27
6	There is a need of Ms Excel and Ms PowerPoint in Part 1 of the Textbook.	25	125	35	20	15	3.57
7	The skill of writing program is developed through the contents of the Book Part 1.	02	03	01	157	57	1.8

The responses of computer teachers revealed that the Textbook of Computer Science Part 1 is theory-based. The contents given in Part 1 of Textbook is not sufficient to fulfill the needs of the students. The present Textbook of Computer Science is not according to the international standards. The contents of the Book do not develop the competencies of independent learning. The presentation of the Book is not attractive**.** **C**omputer teachers are agreed that there is a need of Ms Excel and Ms PowerPoint in Part 1 of the Textbook. However, they responded that the skill of writing program was not being developed through the contents of the Book Part 1.

Table 3 *Responses of Students' questionnaires*

Sr. No.	**Statement**	**SA**	**A**	**UD**	**DA**	**SDA**	**Mean Score**
1	Lecture of teacher is supported by practical work.	01	30	30	280	59	2.09
2	The Textbook is good and useful.	02	25	28	284	61	2.06
3	Screen shorts help to understand the function of computer program.	30	160	25	91	94	2.75
4	The contents of Part 1 of Book satisfy the learning needs of the students	05	04	02	312	77	1.87
5	Basic skills for writing program for computer are developed by the end of class IX.	04	03	10	314	69	1.89
6	Textbook of Computer Science Part 1 provides enough skills to work in the market.	00	02	00	375	25	1.95

The responses of the students reveal that the lecture of teacher is not supported by practical work. The result indicates that the Textbook is not good and useful. Screen shorts do not help the students to understand the function of computer program. It is inferred from the results that the contents of Part 1 of Book do not satisfy the learning needs of the students. Basic skills for writing program for computer are not developed by the end of class IX. Moreover, Textbook of Computer Science Part 1 does not provide enough skills to work in the market. Hence, the hypothesis, "*The contents of the existing Textbook do not meet the needs of the students"* is accepted in the light of these findings.

Discussion and findings

The rationale behind introducing technology in education is based on producing skilled work force for development of the nation. It is a matter of great concern that the Textbook of Computer Science is theory-based and does not involve students in practical work. Content standard and market requirements do not match to facilitate the student in global context of the world. In the absence of important educational software, students cannot develop the skills of writing program for computer. The knowledge provided in Textbook has little to address the needs of human and social development. A revised improved Textbook that meets the needs of high-school students is demanded by Head teachers, computer teachers and students as well. So, the Textbook is subjected to change in view of thecurrent prevailing situation as explained by the respondents.

Conclusion

On the basis of findings and discussion, following conclusions are drawn:

I. The Textbook of Computer Science of grade IX is of theoretic nature.

II. The present Textbook of Computer Science is low level. It is not up-to-date and according to the international standards.

III. The Textbook of Computer Science is not need-based, as it does not provide enough skills to work in the market. Important components of Ms Office: Excel and PowerPoint are not included in Part 1 of the Book.

IV. The presentation of Book is not attractive. It is also concluded that the Textbook is not useful.

Recommendations

In the light of the findings of the study, the following recommendations are made:

I. Content standards needs to be upgraded and updated to match the market requirements and internationally competitive in order to better prepare those students who are not going on further studies.

II. Ms Office may be included in part 1 of the Computer Science to make computer education meaningful and relevant to the needs of the students.

III. Education department and policy makers should evaluate the role of ICT in education and working of computer teachers in schools for better functioning of this technology in education system.

IV. Punjab IT lab Project requires continuous Monitoring and Supervision to ensure that the project objectives are being met.

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