Educational computer software, technical, criteria, and Quality

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Abstract
There are many computer programs available for use at home or in school, for educational or entertainment purposes. The main factor to providing a better learning experience lies in choosing software that successfully combines education and entertainment. The only way to know how learners will use a particular course of a piece of software and what problems they experience, is to study them using it. To obtain empirical evidence of pupils' performance in order to judge the instructional effectiveness of software, therefor choosing software can be productive, if using a select list of criteria. It is important that each instructor compile his or her own list of criteria, ranked according to their own needs. So the out line of this paper is to provide a variety of data and methods to be considered when trying the software packages, the overall emphasis is on educational issues.

Key words: Educational Software programs, for learning, Technical, Criteria, and Quality

Introduction
In software use, finding out what happens in practice with real pupils is crucial, as Jones et al, (1993, P. 119) agreed, "There is no design process or method that can predict the outcomes or per-empt all the learner's problems. So the design process must be interactive: the material must be tried out on students, and refined, and then tried again, and the cycle continued for as long as necessary". Some common criteria include:
Quality of feedback, coverage of relevant content, use of appropriate language, visual appearance, and variety of forms of interaction. A positive reaction at this stage is essential if the child is to grow up entirely lacking the stifling inhibitions of earlier generations when using new technology. Interactive response soon follows and at this early stage merely means that the action taken by the child will initiate a reaction from the computer which will differ according to the response given.
Compatibility of software with different machines is of considerable importance to teachers who have acquired libraries of valuable software but are faced with the problem of hardware obsolescence, or who simply want to make the best they can out of a diverse range of equipment. Good teachers look for a range of ways of introducing an idea to children and computers should be one of them. Teachers are still central, but computers do add a strong motivational factor. "Best software allows the user to proceed through a carefully constructed sequence of events with a controlled vocabulary". Bitter & Camuze (1984, P. 130). Consequently, children may not all use the same programs or in the same ways. When treating all learners in the same way, by implication, teachers should be competent in using a variety of software programs and schools must own an assortment of programs for student and teacher use. This means that all children use interactive technology in ways that engage them in higher-level thinking and productivity.

Criteria for choosing software
The conventional approach to predictive evaluation is to use a checklist. "Clearly a critical feature of any learning environment will be the role played by the teacher, and many educationalists now believe that a very important role for educational software is to foster a move from teacher centered to learner-centered pedagogues". Squires & Preece (1999, P. 470). The role of the teacher here is to guide peoples to appropriate contexts-including appropriate selection of educational software.
"Schools should be used and indeed be encouraged to participate, but the impact on any individual schools which are used for trial and testing purposes should be carefully controlled to ensure that the methods and materials being used are definitely going to benefit the children using them and that there is good curriculum justification for their introduction in the first place". Evans & Macmillan (1986, P. 23).
The computer then becomes a true 'tool' a means for the teacher to achieve particular

objectives. To apply rules learned in one area to another and to have an ability to integrate and develop higher-order rules. The intention of this framework of the criteria was to provide a variety of data and methods to be considered when trying the software packages, the overall emphasis is on educational issues, and therefore it is necessary to observe students or pupils using the software and to assess how usability issues impact on learning. Schools have changed dramatically in the last two decades with the advancement that have been made in technology. The appropriate way to use the computer is as a tool for learning, and the software as a support for the educational programs. Shade, (1996, P. 17) asserts that "of all the decisions made pertaining to the use of computers in the classroom, selecting software that is appropriate for children's learning is the most important". Teachers should be active participants in those decisions, and teachers need a criteria that is clear and easy to use. The table below shows the criteria selected when selecting mathematics software:

Educational Software Criteria for Review	
Software name, and age group	*Comments*
1 Quality of software program	It is important to attract pupils attention
2 Pass first level to go to the next	Pupils will take games more serious
3 Ease of use	Children will work more
4 Interactive learning	Keep pupils attention
5 Challenging games	Make pupils excited
6 levels of difficulty	For primary school children
7 Use of command language	They should be no language involved
8 Clear features	Gives good expression
9 Age appropriate	Important, for children's level of thinking
10 Thinking games for maths	Keep pupils concentrated on the subject
11 Exercise, and tests	To check pupils ability in learning
12 Suitable for group work	Pupils can work in two or threes
13 Clear menu with clear numbers	Provides clear picture
14 Encourages creativity	Keep children thinking
15 Feedback, and printing work	Pupils know how they did
16Appropriateness to the curriculum	This part is essential for learning effectively
17Concentration games	Keeps pupils attention on their work
18 Well Designed	How effective the program, in attracting pupils attention
19 Problem solving	Thinking games, to improve their creativity
20 Entertaining	The package is fun to use
21 Critical thinking skills	Attract their attention
22 Use of mouse	Pupils can move freely

"Criteria are needed to guide teachers' selection of software that support the most effective learning environment for children". Hall & Martin, (1999, P. 189). The above list, shows that teachers must be able to make decisions about the technologies, and in this case the software, that will positively affect children's learning. Hence the decisions about the selection of software for classroom use should be guided by the learning needs of children. Since "Teachers know very well that informatization of education involves first and foremost not computers but rather changes in the curriculum for preparing students". Uvarov, A, I (1995, P. 83).

It is important that certain features which allowed them to interact with the objects or information within the software, and also culture issues should be addressed as, Reyes, and Daunic (1996, P. 108) affirm that "Cultural and linguistic differences must also be integral to the teaching process". And they add that teacher's need to "Modify instructional practices to facilitate and promote academic success". Also "the number and availability of computers, the types of technology on hand, the quality of software, the distribution of hardware and software, and the maintenance of existing equipment all play a role in technology access". Chisholm, I M (1998, P 256).

Initially drill and practice programs are used, for basic word recognition, spelling and arithmetic these being the most commonly available types of program to be used in schools, dominated classroom work for 10

years. Some early pioneers however, began using the simple programming language BASIC with children, because of the flexibility and creativity, which could be developed.
It may be possible to overcome many of the short comings of present-day educational software, where the complexity of handling the range of learning behavior exhibited by different students overwhelms conventional programming approaches. Evaluation of software is becoming an important factor in the continuing education of teachers. Technical features are expanded to reflect the vast improvements that have occurred in the hardware and software industry. The best examples of software are usually expensive, because it has often taken many years of work to get them to near perfection. Packages are beginning to emerge from educational publishers, but the quality is key variable and likely to remain so for some time.

Practice programs for maths (Culture View)
Practice software programs that produce times tables tests or questions on the four rules of numbers or on money are always valuable for consolidating learning. One just needs to consider whether one could achieve the same results in other ways. The software here has got to extend the maths concepts children are exposed to. We need software that gives children the opportunity to work in a different medium and do things that teachers can not, but it should never distract the children from the fact that this is a maths lesson.
According to Downes, T (1998), in addressing these issues, and in addressing the other subject curricula in general teachers need to:

- create a classroom culture where all children can participate in and benefit from all teaching and learning activities, including those using new technologies;
- develop children's attitudes, values and skills which enable all to work both independently and co-operatively with their peers, sharing resources as needed;
- organize teaching and learning experiences in ways that ensure all children have access to and use of necessary resources and can participate in all aspects of the task;
- allocate time, particularly for children who do not have access to computers outside of the classroom.

Goodson et al (1991, P. 9) argue that: "The introduction of computers sets off a culture clash: a clash between cultures of teaching, subjects, personal styles, and cultures of computing". Also "In multi-cultural settings co-operative activities allow children to gain an understanding and an appreciation of others' perspectives". Underwood, J (1998). The rationale supporting group work has to do with the ways in which children learn to think.

Other instructional criteria, Software packages
Educational software is changing. Instructional and diagnostic software will always be valuable but recent developments have focused much more on using new technologies in resource based learning, which Taylor and Laurilland, (1999, P.56) define "open access, self directed learning from a large information source". It is useful in this regard to consider the following questions:
What are the objectives of the software?
The software program should make learning easier provide adequate "help" options, clear instruction, helpful feedback, and option to correct mistakes.
How easy is the software to use?

- Program and lessons be opened quickly and easily;
- The learner must be able to move from lesson to lesson easily while saving previous work;
- The learner must be able to quit from any point in the program;
- It must be possible to save previous work.
- Does the software evaluate the learner's responses?
- The learners must receive information feedback for their responses;
- The software judge responses in a way that fits with the learner's/instructor's standards for appropriate feedback.

General procedure of the software
What type of activities does the software offer?
Table (2) Software Exercises & Activities

Games	**Text Construction;**
Quizzes	Text Reconstruction;
Simulation	Problem;
Tutorial	Drill and Practice

Ease of Use
Children should be able to use the program with minimal help, and to use the program independently after the first try, and the accessing key menus should be straightforward and easy to understand. Graphics are only effective if they make sense to the intended user, also icons are large easy to select with moving cursor.
1- Printing routines are simple;
2- It is easy to get in or out of any activity at any point, (broader issue of navigation);
3- Icons are large and easy to select with a moving cursor;

Child Proof
The software should be designed with child-reality in mind.

- It should offer quick, clear, obvious response to a child's action;

- The child should have control over the rate of display;
- The program should operate smoothly and be bug free in a classroom setting.

Educational

The first thing we need to know is, technology used in schools? The answer is yes technology used in schools can be categorised as follows:
- productivity tools;
- communications and research;
- integrated learning systems;
- simulations.

Entertaining

Is the program fun to use?
- The program is enjoyable to use;
- Graphics must be meaningful to and enjoyed by children;
- Children must want to return to this program time after time;
- Challenge level should be fluid, or a child should be able to select from a range of difficulty levels;
- The program must be responsive to a child's actions;
- The theme of the program must be meaningful to children.

Design Features

How "smart" is the program? It should:
- Have a printing capacity;
- Keep records of child's work;
- Keep a history of the child's use over a period of time.

Value

How much does it cost, is it worth it?
Without appropriate software, computers are inoperable. Hardware purchase decisions are made based on the availability of appropriate software intended for use with the hardware. "Possible criteria relevant in the review process have been grouped under four main headings:
- Characteristics: program operation and documentation;
- Characteristics: students use;
- Characteristics: instructor use;
- Characteristics: content". Bitter & Camuse (1984, P 126).

Knowledge of software packages

It is usually the case that software will be of more value if students can load and operate it without teacher interaction, and with out lengthy training sessions.
- all instructions should appear on the screen and be easily understandable;
- there should be a high student involvement. The software should include all the elements that make a drill and practice session interesting for a student and not merely a series of boring questions.

This can contribute to student motivation, and provide a means by which records can be kept when no computerised management system exists. For best results in learning, the reinforcement given for correct responses should be more attractive than that given for incorrect responses. Otherwise, pupils will purposely answer incorrectly, hoping to see an attractive display they would not see for correct responses. "The evaluation of a piece of educational software is quite a complex and time-consuming task". Oldknow & Smith (1983, P. 255).

The author, is to consider technical qualities such as ease of use, response to incorrect input, text layout etc., educational qualities such as where it fits into the curriculum, what kind of pupils it might be appropriate for, and practical qualities such as what classroom organisation is required, whether it is suitabley motivational for pupils, whether it is straightforward for colleagues to use. OECD, (1987, P. 73) points out "We also have to bear in mind that the poor quality of the hardware and the computer language used in many schools almost inevitably confines them to elementary approaches". In a recent paper Shearer et al. (1997) point to the influence of assumptions about learning style/nature of the educational process on the design of educational software. At the institutional level, unless schools develop curriculum strategies that embrace computers then they will remain underused.

"The question of what hardware and software primary schools should have can only be answered if we think carefully about what we want the teachers and children to be able to do and how the hardware and software can contribute to the processes we desire to take place". Beynon & Mackay, (1993, P. 79).

This involves consideration of the educational process as it applies to both children and teachers, and the possible contributions of IT to that process. It is important to remember that, the purpose of the software is to provide students and pupils enrichment, extension, and/or repetition and practice around a particular subject, concept, and skills. The software is clearly supplemental to the curriculum and the primary instruction. It is important to explore the following:
- How the software will be used (e.g. drill and practice), extension of curriculum?
- The software's relationship and relevance to the curriculum;
- How the software meets district's instructional-technology and philosophy;
- How the software meets the school's goals;
- Quality and compatibility.

When used appropriately, technology can enhance children's cognitive and social abilities. Also, when a child is interacting with a computer program, he is potentially learning on three different levels:

- learning about technology and how a computer works;
- learning the objectives of the software, what the software itself is trying to teach;
- development of skills. Harvey, (1998).

What can a child learn from a software program?

- The program may offer a good presentation of one or more content areas;
- It may offers a good challenge range;
- The program may come with strategies to extend the child's learning.

Low quality software is a burden to users and is eventually either discarded or, in the absence of alternatives, tolerated. High quality software is accepted and promoted. Knowledge about software quality and the ability to practice it have been progressing slowly but inexorably throughout the industry. It has long been understood that quality in complex software cannot be achieved without attention to the software development process. Software reflects the psychological perspective of its developer. There are a number of factors, which contribute to this perspective. "The individual programmer/developer, the development environment, and the system". Wood Larry (1998). In building a good product with computer technology, software is the key. It represents the mind of the system.

Computers, generally speaking, are the most significant innovation in classrooms today. The potential uses for children and teachers alike are boundless, you just have to be game enough to try things out, and, for many teachers, to be prepared for the eventuality that one of your students might really know more than you!

"Each school has its own philosophy, which in many schools means the philosophy of the head teacher. Each school has to decide how best to use the computer". Quide, J (1982, P. 35). However, using a computer in school should be basic part for children's learning and education for three more general reasons:

- Computers can make learning easier, and they are valuable in developing children's language and problem solving skills;
- Children can acquire a large amount of information and knowledge that they couldn't possibly get from textbooks and more traditional learning tools, using computers to reach hundreds of information sources;
- An understanding of computer technology is necessary for most well-paid and interesting careers.

Using computers can also teach children important life skills, such as the value of working together and of staying with a project until it is completed, and the feeling of accomplishment when they solve a problem, they also learn to share information and skills.

"It is the responsibility of early childhood educators to critically examine the impact of technology on young children and be prepared to use technology in ways that are beneficial to these children". (NAEYC, 1996).

"Once a teacher is confident with a computer he or she should be able to manage the transition to classroom competence". And he adds that the "technical competence alone will not guarantee successful classroom implementation-teachers also need to learn the pedagogy of the computer". Andrews, P (1996, P. 311-313). It is important that trainers encourage teachers to adopt a critical awareness of the place of computers in their classroom, not only so that they become more effective evaluators of software, but also so that they question the values that underling computers and their software.

Children when making regular use of information-handling software like spreadsheet, database, word processors and software games, are likely to gain in various ways. According to Straker & Govier, (1996, P. 58), children will have "opportunities to extend their communication skills. Their learning of a particular subject will be enhanced, and develop an appreciation of the manner in which computers handle quantities of information, and of the speed at which this is managed".

Necessary characteristics of software

1-It should be easily installed, it should also be easy to print and save children's work. Anyone who has struggled with installing software with complicated procedures and then left the software in total frustration can appreciate the importance of simple installation. Printing gives children more opportunities to integrate their computer experience with concrete activities;

2-It is important that children know they can stop and revisit the software exactly where they left it, if they so desire. Saving also gives children the opportunity to reflect over time on an activity and make changes, thereby enhancing the learning experience;

With an ideal package, the children would be able to understand what the computer is asking without continuous help from the teacher;

Activities would always be self-explanatory and easily introduced to the class or to groups; and could always be introduced to the class or to groups of children and then worked on independently;

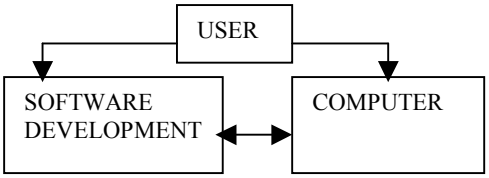
The first important thing to discover is whether the software in question has ever been used successfully i.e. with satisfactory learning outcomes. The performance of the software depends a lot on the context of use, so tests with real students as part of a real course are much more convincing that tests in a lab with paid subjects.

Computer Software

"The computer software actively responds to the users' commands in a way which they cannot anticipate". Finlayson & Cook, (1998,

P. 107). So what can active software can contribute in educational contexts. It is very important that learners are doing the thinking and making the decisions, rather than leaving it all to the computer and accepting its answers. The diagram below shows the triangle of control between the user, the computer, and the software development:

Table (3) Triangle of Control



The learning that results from using a multimedia system will be as much a function of how it is used as of what it contains, and that use will to a large extent be determined by the learning context-the task, the guidance given by a tutor, the social rewards of minor success, the links to what is already known and what is pertinent in the classroom. It is the information content which is the real benefit of multimedia systems, not the multimedia interaction. Without some facility in using software it is impossible to make effective use of a computer. "If the educational aim is to encourage interaction with information which is meaningful to the learner, and to facilitate interactions between children through and around the computer, then the learners' desires for worthwhile interaction are paramount". William, Noel (1998, P. 162).

No mater how good is the software, its graphics and how realistic the sound, a learning system lowers motivation if learners feel they are being told what they can do, rather than allowed to play and learn by using their own strategies.

The software chosen should have the following features:

1- Allows users to correct typing errors. It can be frustrating when programs do not allow this. You can check this criteria by typing in answers, then using the back arrow key or delete key to see if errors can be erased, allowing users to input the answers exactly as wished;
2- Documentation available and clearly written for teachers use. Unless very clear instructions are included in the package, teachers and students will find that operation of the package may require much too much guesswork;
3- Clear, nicely formatted screen displays. The format of the display should make the reading of the information presented as pleasant as possible;
4- Incorrect selection of commands or keys does not cause program to abort, for instance, if a question require a YES or NO answer, and the user answers with another word, number, does the software answer with a beep or with a refusal to accept the answer? Or is the program stopped in its tracks, with some esoteric error message printed on the screen? This event frustrates the user, and generally requires that the lesson be started all over again;
5- Menus to make the program "user friendly" the best software allows the user to proceed through a carefully constructed sequence of events with a controlled vocabulary;
6- Clear and useful summary of program operation provided for teachers;
7- Uses computer capabilities well.

As the software is going to be used for first time for Primary School children, it should have the following features: to make it easy for them to understand and involve themselves with the computer with great interest:

8- There is not much language required and there is the facility to retain and print a record of achievement;
9- Allows children actively to build their own mathematical knowledge;
10- Reinforce children's confidence and motivation;
11- It turns maths from being a chore into a fun subject, breaking down the mental barriers which often surround it;
12- Help pupils develop skills in counting number recognition, adding subtracting, multiplication, division, and identifying equalities and inequalities. (Age Group would be from 4-11).

Classroom Management

There is a world-wide industry that deals with the management and development of information. Therefore the techniques of classroom management vary greatly depending on the quality and quantity of equipment available. The use of a single micro, a group of individual machines or one multi-user system all pose different problems. Therefore it is important to have information on approaches which allow an entire class to be involved in a lesson associated with a single micro and not solely the pupil at the keyboard. Equally, it may be possible to schedule the use so that everyone has some time with the machine.

The software should be written to perform specific functions within a particular subject area. Examples are software which addresses historical facts and consequences, mathematical concepts or science simulations. The children should be using programs at exactly the right level, to encourage the development of skills and ideas. As many games and simulations affect the practice of skills in this way. At a simple level, DARTS for mental arithmetic has always been effective.

The software should provide children with educationally sound and highly motivating opportunities to explore the principles of mathematics in the context of the real world, and present children with opportunities to:

- reinforce and consolidate classroom learning;
- investigate mathematical principles in action in everyday situations;
- explore and discover essential facts;
- solve mathematical puzzles away from the computer;
- test their knowledge in each zone or in a special games area;
- write their own notes, in addition to collecting text and pictures from the CD-ROM;
- the software should be user friendly;
- be written in a language suitable for the age group of the intended users;
- provide good quality programs to suit children of primary school age of different abilities;
- meet a class teacher's exact and personal requirements, and provide opportunity for children;
- overcome compatibility problems, converting programs written for specific systems to fit a school's own system.

It is not usually possible to obtain software on approval from the producers, but the rapid spread of local "user-groups" offers an opportunity to see some of the more popular software in action.

The full potential of the computer will only be realised if there is quality software available for use. "Directions for loading the software need to be concise, specific, and easy to follow". Susan Haugland (1997, P. 179).

However checklists for software evaluation are probably adequate and flexible enough to serve the different purposes and intentions of evaluation.

With more influence on the part of teachers, more and better programs will be produced. There are enough programs available to keep children and computer working usefully together.

But "to provide any kind of review information, but merely list prices, ordering instructions, and describe available software for specific purposes. A perusal of a directory could add a lot to your knowledge of software for a particular brand of microcomputer, though you still will have no way to judge quality". Bitter & Camuse (1984, P. 120).

Conclusion

The implementation of new technologies is necessarily a good thing pedagogically sound and representing a necessary investment of resources in preparing children for life in a technologically saturated workforce. The implementation of new technologies generates a complex mixture of enthusiasm and frustration. The mere presence of new technologies creates a demand for technical expertise, and whoever has taken on the role of expert is placed in a professionally awkward situation. As Bryson & Castell (1998, P. 561), highlights that "The educational value of making more and wider use of new technologies in the classroom is taken for granted more often by principals and co-ordinators than by classroom teachers". The single most useful aspect of learning profile software was access to a facility that enabled the production of a professional looking product. The problem that, "Computers are not always integrated effectively into the primary curriculum partly because teachers do not know how to conceptualize their educational role". Wegerif, R 1995). Satisfactory ways of developing, describing and evaluating software are still being worked out, so there are difficulties, and buying software unseen is a risk.

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