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AUTHOR Ligon, Glynn
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ABSTRACT

When a school system chooses to buy into modern computer technology as the way to solve some existing problems and to meet pressing needs, a myriad of new problems and issues are created. However, the new problems are worth solving to allow the system to benefit from the new technology. In other words, the conversion to using the latest computer resources is accompanied by many growing pains, but the end result promises to be sufficiently more efficient and productive to justify the costs. This paper explores seven of the issues which are encountered when a school system implements modern computer technology. (Author)

Bringing Research, Evaluation, and Planning Together with Modern Computer Technology

Glynn Ligon
Austin Independent School District
Austin, Texas

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Contact Person: Glynn Ligon

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Bringing Research, Evaluation, and Planning Together with Modern Computer Technology

Glynn Ligon
Austin Independent School District
Austin, Texas

When a school system chooses to buy into modern computer technology as the way to solve some existing problems and to meet pressing needs, a myriad of new problems and issues are created. However, the new problems are worth solving to allow the system to benefit from the new technology. In other words, the conversion to using the latest computer resources is accompanied by many growing pains, but the end result promises to be sufficiently more efficient and productive to justify the costs.

The Austin Independent School District, Austin, Texas, has bought its way into the computer age. Microcomputers are being purchased for every campus. A mainframe computer is the core of an instructional computer center at one high school. Another mainframe computer operates at the central administration building with remote terminals in dozens of offices throughout the school system. Word processing, data management, and graphics software is available on these computers. We have the latest hardware and software. Now we have to work through the problems of using them. Indeed we are finding that because there was insufficient planning and preparation for this upgrading of our computer resources, much of our equipment and software is currently underutilized.

This paper will focus on some of the issues associated with a school system's move into modern computer technology. The issues we have discovered in Austin will be described, and if we have any, our ideas for addressing them will be discussed.

Answers to Questions

Answers to questions appears to be the bottom line for researchers and evaluators. Our contribution to planning and decision making is providing answers to the questions of decision makers. A fact we each learn with experience is that the decision makers do not or cannot state their questions a year in advance when our research and evaluations are designed. Our coping strategy has been to anticipate the decision makers' questions and to fill our reports with any information we expect they will need. Those of us with a few years experience also know that our anticipations are often inadequate. We find ourselves reanalyzing data, or worse, admitting that we did not collect the data as they are later needed.

As modern computer technology becomes more available to us, we have begun to look forward to the day when we can easily generate multitudes of graphs and tables which will contain, as the Tonight Show's

Ed McMahon says, "everything there is to know right there in that report." Not only may that day never come, but we may be better off if we stop working toward that singular, dubious goal of all-inclusive reports.

With the introduction of the latest computer hardware and software into the Austin Independent School District, our perspective has adjusted somewhat. The goal of the all-inclusive report appears to be impractical for two reasons. First, we cannot ever expect to anticipate every infomation need. Secondly, a report which contains every bit of information presented in every way possible would be so enormous as to be both too expensive to print and too overwhelming to use.

So we are resigned to filling our reports with the information which we predict is most likely to be needed. Here our new computer technology comes to our aid. We can now build comprehensive data bases from which we can efficiently generate an infinite variety of graphs and tables in response to last-minute information requests. As long as we are insightful enough to include in our computer files the information we will need, we can use the tremendously powerful software available to present that information in the form currently requested.

A trend worth mentioning is that decision makers and planners are asking more speculative questions such as how many more students will not meet certain higher graduation competency criteria. The ratio of these projective questions to the more traditional inferential ones, such as which group of students achieved higher, is evident in our evaluations in Austin. Decision makers appear to be asking for more information for planning in more areas. The questions about which programs work best are still there, but our role as the evaluator is expanding from program evaluation into areas more traditionally thought of as planning and management.

Now with the availability of ready-to-use software, the decison makers have the potential for answering their own projective questions from prepared data bases. Whether they will actually learn how to operate the CRT's and the software and will have the time to do so themselves remains to be seen.

Some Thoughts on Data Bases

Data bases tend to grow in size until they are unmanagable. This is especially true when we are anticipating every possible datum which might be needed. Some of our data bases, such as for longitudinal systemwide testing scores, become so large that we must find expansive computer space just to re-sort the information from alphabetic order to school order. An additional problem is the computer time required to use such a large data base. The large number of records and the length of each record result in the usually speedy computer taking extended time just to read through all the data.

In cases where time is a real factor, keeping smaller related data bases is a good alternative. There are two approaches to this. First, smaller files can be built which are copies of portions of the main file. Then the smaller file which contains the information needed at the moment can be used. A second alternative is to break the large file up into smaller files but have them all linked together, such as by a common student number. The critical issue with either approach is how to keep all the files up-to-date whenever a change occurs in one of them. This maintenance of all the files making up a data base is a key issue which requires forethought, communication, cooperation, and coordination among all the contributors to and users of the data.

Users and Abusers

The computer has changed research. In the 50's and 60's the mechanical calculator was still the most common appliance used to calculate inferential statistics. The tedium thus associated with statistics too often restricted researchers to samples of small sizes and to research designs with limited testing of interactions. In the past 20 years, computers have become available to almost every researcher, research designs have become more complex, meta-analyses have emerged, sample sizes have grown, and the number of research questions addressed in simple experiments has multiplied. The computer has indeed been the most important factor in the vast improvement in the quality and quantity of research.

Today, modern computer technology has opened up another major doorway to researchers. Current computer software has the potential of making less sophisticated researchers and evaluators into major producers of information for decision making. With the availability of canned statistical packages and simple-to-use graphics software, the researchers benefit from tremendous savings in time and improvements in accuracy. Accuracy must not, however, be equated with quality or validity.

An ominous threat to our enthusiasm toward the new computer technology is the potential for abuse by the multitude of new users. As complex analyses and illustrative graphics become available to more people, especially to a larger number of less sophisticated data handlers, that potential expands. We are given pause not only by the thought of the potential for errors and oversights giving decision makers inaccurate information, but also by the realization that the trained researchers and evaluators will in no way be able to check or verify all of the information being produced. We know that even trained researchers sometimes violate assumptions in their analyses, or concentrate too much on their sophisticated designs and too little on the accuracy of their raw data, or generate as many F tests as possible and revel in the 5% which prove to be statistically significant. What will be the case when school administrators who do not understand the difference between percentiles and percentages begin to generate their own graphics?

As an example of the potential for misrepresentation of data made possible by a sophisticated graphics package, we created a simple bar graph and then asked the computer software to change it into other optional forms. Figure 1 shows the original graph. Figures 2 and 3 show two optional types of graphics which can be generated with just a touch of a key. The bar graph is logical, but what real sense can be made from the others? (Figures 1, 2, and 3 appear at the end of the paper.)

Growing Pains

This paper began with the opinion that the growing pains associated with installing modern hardware and software were a reasonable price to pay for the benefits enjoyed. Some of Austin's growing pains have been just amusing, such as the example on the next page about typesetting our minimum competency tests. Some of the other six examples of benefits and their related growing pains require some careful planning to overcome.

BENEFITS FROM THE NEW COMPUTER TECHNOLOGY	RELATED GROWING PAINS
1. The vocational high school acquired the most modern computerized typesetting equipment for use by the students. Typesetting our minimum competency tests was our first task.	1. Students operating the type-typesetting equipment had not all met competency and had to be screened to avoid a student typesetting his own test.
2. A new laser printer was purchased to provide superfast printing on letter-size sheets thus saving us the hassle of dealing with bulky printouts.	2. Although creating printouts was a "no charge" item from our data processing department, laser prints were established as a 3-cent-per-page item. We are still printing the old way because our budgets do not include funds to pay for the laser prints.
3. Color graphics add a helpful dimension to reporting.	3. The cost of reproducing grahics in color limits them to just the top-priority jobs.
4. Access to the word processor is available to anyone with a compatable CRT.	4. The only printer for the word processor is located in the basement of the main building.
5. CRT's in all offices and schools promise to give everyone immediate access to records and the new software packages.	5. CRT's will compete with other jobs running on the computer thus slowing down the work and productivity of the full-time computer programmers.
6. Centralized data bases make analyses and reporting easier.	6. Data bases can grow to a size which is too large for the computer to handle efficiently.
7. More naive, less sophisticated computer users can create reports and graphics easily.	7. These less data-wise users are prone to misuses and misrepresentations of the data.

Micros Versus Mainframes

With the introduction onto the market of microcomputers under $3,000, the question arises as to the wisdom of buying comparably priced CRT's to tie into a mainframe computer. A CRT for Austin's mainframe computer competes with other users for time and relies upon the printers in the computer room which is in a separate building from the research and evaluation office. For about the same price as the CRT, a microcomputer and printer with word processing and simple graphics software can be purchased. In fact, in a large office, several micros could be purchased to share a single on-site printer.

A disadvantage of using the mainframe computer for word processing within an office is that when the computer is down, everyone is down. With separate micros, if one goes down, the others still work. In fact, a spare micro could even be purchased to fill in when one needs repairing.

The preponderance of benefits for one of these options over the other is still being judged in our school system. The factors to consider in such a decision could justify a symposium just on this issue.

Conclusions

If this paper has illuminated some of the issues associated with bringing research, evaluation, and planning together with modern technology, then its purpose has been met. There are undoubtedly hundreds of unmentioned issues, but the ones discussed here and summarized on the next page have been most urgent in Austin.

1. The growing pains which accompany a move into modern computer technology are justified by the benefits derived from more efficient word and data processing.

2. Answers to questions are the main focus of evaluators in public schools. Now we have the capability of providing more answers and more useful answers.

3. Producing all-inclusive reports is an impossible goal. Building comprehensive data bases from which quick answers can be pulled using available software is a more practical goal.

4. A larger proportion of the questions posed by school personnel are now projective or background for planning rather than about the relative outcomes produced by programs. Data bases are more important in this environment.

5. Data bases can grow to become unmanagable, and strategies for relating smaller data bases to each other are needed.

6. As more people become users of computers, there is more potential for abuse of data. A naive user may not even know that a graph or table produced is inaccurate or misleading.

7. Microcomputers offer some advantages over a single mainframe computer, but the relative benefits of each depend on many situational factors.

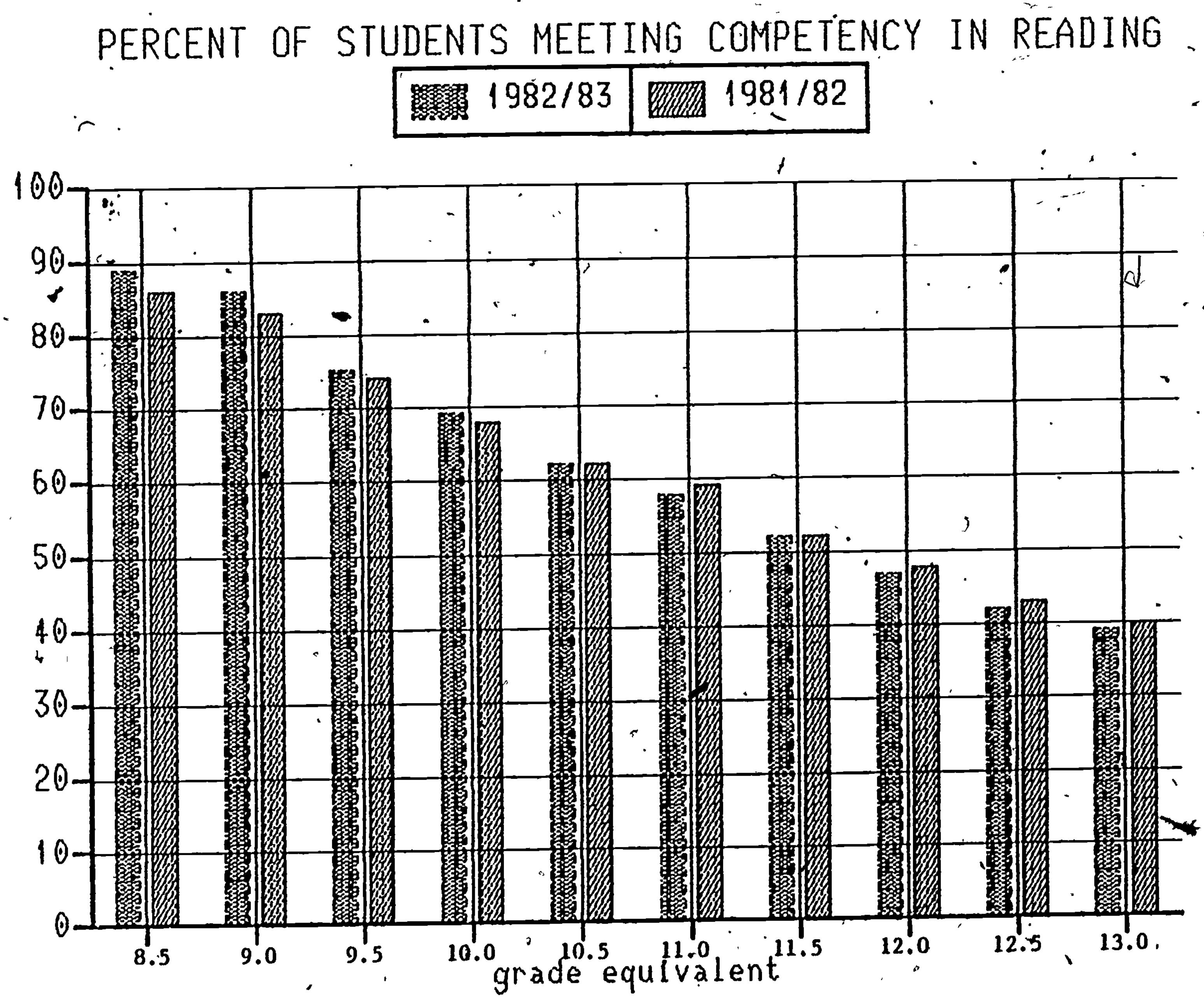

FIGURE 1. BAR GRAPH (ORIGINAL GRAPH)

PERCENT OF STUDENTS MEETING COMPETENCY IN READING

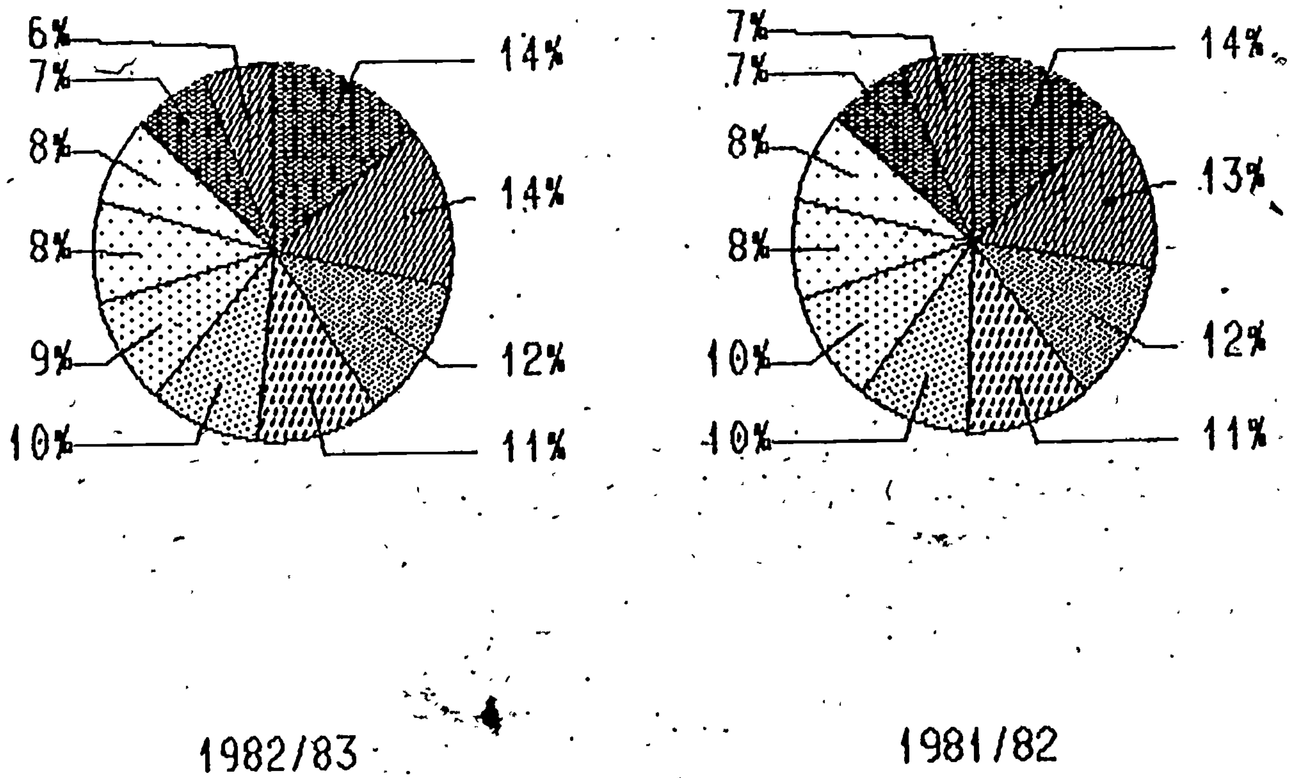

FIGURE 2. PIE GRAPH (GENERATED BY THE COMPUTER FROM THE BAR GRAPH)

PERCENT OF STUDENTS MEETING COMPETENCY IN READING

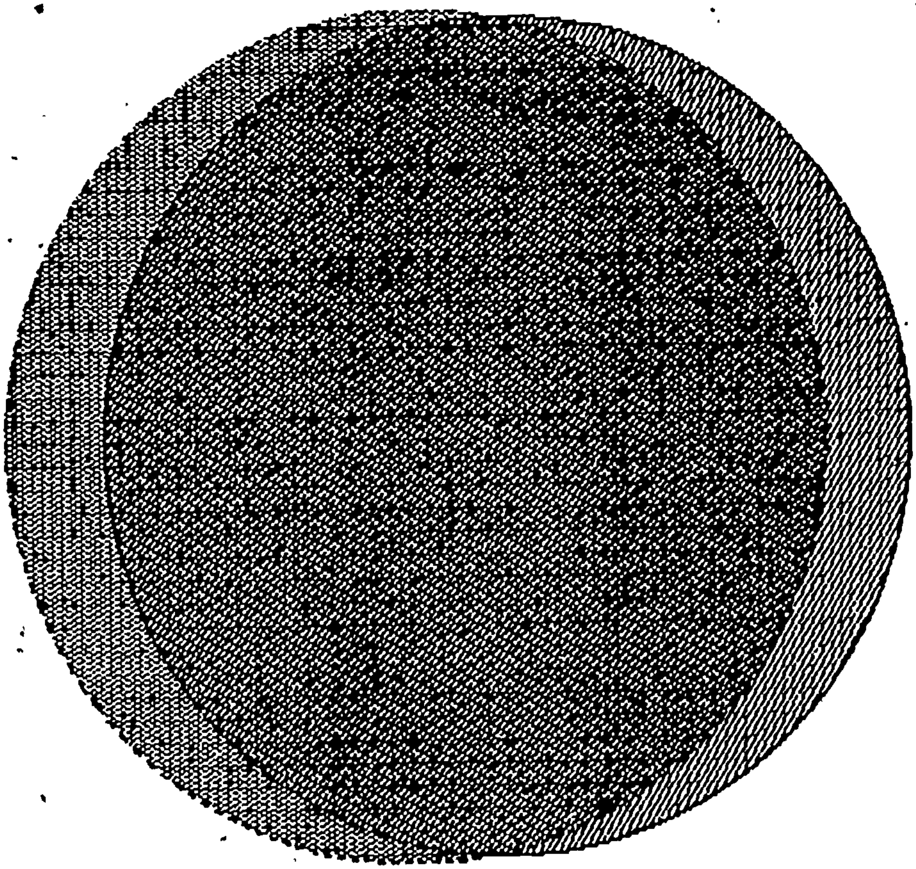

FIGURE 3. VENN DIAGRAM (GENERATED BY THE COMPUTER FROM THE BAR GRAPH)