R E P O R T R E S U M E S

ED 011 672 CG 000 103

THE COMPUTER IN EDUCATIONAL RESEARCH AND ITS IMPLICATIONS FOR THE COUNSELOR.

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PUB DATE 23 MAR 67

EDRS PRICE MF-$0.09 HC-$0.40 10P.

DESCRIPTORS- *COMPUTERS, *STUDENT CHARACTERISTICS, RESEARCH, STUDENT EVALUATION, *COUNSELOR ROLE, *RESEARCH METHODOLOGY, RESEARCH TOOLS, SPEECHES, DALLAS

THIS PAPER EMPHASIZES THE COUNSELOR'S NEED FOR RESEARCH INFORMATION ABOUT HIS LOCAL STUDENT POPULATION. NOW THAT ELECTRONIC COMPUTERS ARE MORE AVAILABLE, THE COUNSELOR CAN PRODUCE LOCAL NORMS AND EXPECTANCY TABLES. HE ALSO CAN STUDY THE RELATIONSHIPS OF VARIOUS STUDENT CHARACTERISTICS. THE "SEARCH TECHNIQUE" OF FEEDING A NUMBER OF VARIABLES LIKE INTELLIGENCE, SOCIOECONOMIC STATUS, VALUES, AND OPINIONS INTO THE COMPUTER AND TESTING THE VARIOUS RELATIONSHIPS BETWEEN GROUPS. THIS PROCEDURE OFFERS THE COUNSELOR A MORE EFFECTIVE MEANS OF UNDERSTANDING AND PLANNING FOR VARIOUS INDIVIDUALS IN SCHOOL, AND IT ALSO PROVIDES A SOUNDER BASIS FOR ACTIVE COUNSELING AND FOR THE DECISION-MAKING PROCESS. IT IS SUGGESTED THAT THE COUNSELOR ASSUME LEADERSHIP IN DEVELOPING DATA PROCESSING TECHNIQUES AND IN THE USE OF THE COMPUTER IN THE LOCAL SCHOOL SYSTEM. THIS PAPER WAS PRESENTED AT THE AMERICAN PERSONNEL AND GUIDANCE ASSOCIATION CONVENTION (DALLAS, MARCH 23, 1967). (NS)

ED011672

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THE COMPUTER IN EDUCATIONAL RESEARCH AND ITS IMPLICATIONS FOR THE COUNSELOR

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One of the persistent problems confronting a counselor is the lack of accurate, current information on the characteristics of his client population. Knowledge about the relationship among the students' backgrounds, attitudes, values, aptitudes, interests, vocational development and aspirations; not to mention the effects of the counseling program, follow-up studies, evaluation of counseling outcomes, and a host of related variables is vital for increased counselor effectiveness.

The counselor, cognizant of his need for research information is usually unable to find the time, energy, or resources to accomplish the types of on-going research studies which are necessary to his daily functions. While information regarding student characteristics retrieved from journal articles and other sources is important, the real need of the counselor is for relevant information about his local school situation. Most often, in this world of national norms and national research publications, the counselor possesses more information about students in general than he does about the ones with whom he counsels.

One answer to this dilemma is increased educational research on the part of the school and the counselor to develop a storehouse of information, constantly being revised, about the characteristics

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A talk delivered at the American Personnel and Guidance Association Convention, March 23, 1967. Dallas, Texas.

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of the student population. Unfortunately, the process is slow, difficult, and until recently, virtually impossible for the counselor to handle. However, with the introduction of electronic computers, the potential for thorough, relevant research is greatly increased. With the speed, power, and flexibility of a computer, the counselor, in conjunction with the educational data processing specialist, has the capability to develop the research studies which will provide him with the kinds of information that he needs?

What data do you, a practicing counselor, need about your students? The answer to this question is probably as individual as the students with whom you work. What I propose to do in the remaining time is to suggest a few ideas which may relate to your situation, but even if they do not, I hope they provide you with an idea of how the computer can be used in educational research to <u>your best advantage</u>.

Perhaps the most obvious, and even the most widely used, educational research studies of relevance to the counselor is the development of local norms and expectancy tables. Local norms provide the counselor with meaningful information to assist in test interpretation. What with scoring companies providing local norm options and IBM cards punched with student information, and the increasing appearance of computers in city or county educational offices, this practice should increase rapidly. It will be possible to develop local norms on various criteria; for example, norms based on sex, size of the school, and even special curricula or "tracks" within a school or school system. Your responsibility

as a counselor is to recognize the types of local norms that will be most useful to you and your clients, to communicate this information to the computer people, and constantly revise the estimation of your needs.

The use and development of expectancy tables is widely recommended, yet this simple, effective tool to assist in prediction of success for students in some future educational or vocational pursuit is not in general use. Up to now it has been extremely difficult to develop expectancy tables because of the time and clerical work involved. However, it is now possible to program a computer so that it routinely develops and prints expectancy tables, and will even incorporate fresh data supplied to up-date the predictions. One of the shortcomings of expectancy tables has been the limit of one predictor variable to one outcome variable. Use of multiple predictor variables becomes extremely difficult to handle. However, it is possible to program a computer so it will consider as many predictor variables as you want (up to the core storage capacity of the computer) in order to develop multi-variate expectancy tables and even regression equations on the variables. Here we have a good example where the potential of the computer will test your creativity as a counselor. Rapid and routine development of expectancy tables would demand that counselors turn their attention to developing expectancy tables which have special meaning for their local student populations. Instead of limiting our predictions to college success, we should develop expectancy tables for the non-college bound student; tables

which suggest success in trade and technical schools, in the armed forces, nurses training, dental hygenist, and very important, success in various job fields for graduates of your school who are similar to the students you are now counseling. You see, the limit of the computer is only the limit of your imagination.

Turning our attention now, I should like to discuss a more innovative, creative use of a computer for educational research, a use which will perhaps be one of the most important contributions which the computer can make.

The students with whom we work possess a myriad of attitudes, opinions, and values which affect their behavior and therefore play an important role in their educational and vocational development. Coupled with these characteristics are socio-economic background, test results, and a whole host of related information which we have about students. Until now it has been impossible for the counselor to wade through this maze of information in an effort to discover meaningful relationships among the data. One reason for this confusion is a lack of research evidence into what is meaningful and what is not. This is partly due to a limitation of current research which requires the investigator to hypothesize or "guess" at the results in order to isolate the possible relationships. This restriction on design limits our discovery to that which we can understand. If relationships exist which tend to be beyond our understanding, they remain unknown.

Another limitation of research into characteristics is that variables have been considered one at a time. In

other words, if one wanted to study the differences between over and underachievers and he suspected that intelligence, socio-economic level, reading achievement, and attitudes towards school and home were important causitive or descriptive variables, he typically has studied the differences between the groups, variable by variable. He would ascertain the differences between the groups on intelligence, then socio-economic level, then reading achievement, and so on with no attempt to combine the variables. Yet, psychologists have long suggested that a combination of factors which are operating together may better describe groups.

A few more recent techniques, such as factor analysis and regression analysis, have been developed to attempt to combine variables. These techniques, however, require that each variable demonstrate some linear relationship with the criterion. Yet, Meehl (4) has shown that two variables, each which do not by themselves tend to predict the criterion, may predict it perfectly in combination. Consideration of many variables operating simultaneously which may provide for meaningful understanding of the composition of groups has not yet been fully investigated.

However, it is no longer necessary for the researcher to place these limitations on the design of his study because the computer has the potential to process many variables about student characteristics all at one time in an attempt to draw meaningful relationships out of the data that were previously unknown. Once the investigator

gets the information stored in the computer, it is only a matter of giving the computer the proper directions to "test" the relationships among all the variables it has in its memory. One of the most recent techniques of this kind, developed by Professor M. Clemens Johnson, Research Associate at the Computing Center of the University of Michigan, "searches" the stored variables for combinations or patterns of two or three variables which, when operating simultaneously, tend to differentiate between groups. (1,2,3)

In this search program, each variable can exist at two or three levels. Basically what the computer does is to combine items and levels to see if the pattern differentiates between groups. For example, the computer may select item 1 at level 3, item 12 at level 2, and item 14 at level 1 and then determine the frequency of each group which possesses this combination. Should the difference between the frequencies be sufficiently large, the pattern is printed out for further study. However, the possible permutations of items and levels gets very large. Consider, for 5 items at 2 levels there are 40 possible paired combinations. Increasing this to 10 items at 2 levels there are 180 possible paired combinations. By adding a third level and increasing the number of variables, the possible combinations increase rapidly. For 75 items at 3 levels there are 25,000 possible paired comparisons, and 1,800,000 possible triple comparisons. Even for a computer this sorting task becomes very difficult.

An exhaustive search for relationships, with few restrictions, will usually provide vast amounts of data.

Many of the patterns uncovered may represent relationships which are difficult to understand. Others may be quite logical and not unexpected. And some may suggest new insights into the composition of groups.

A counselor might use this "search" technique to ascertain the differences between early school leavers and those students who complete high school. By identifying and submitting to the computer such variables as intelligence, socio-economic background, attitudes of parents, reading achievement, level of academic performance and the like, it would be possible for the counselor to develop patterns of personal characteristics which differentiate between early school leavers and those who persist in his local setting. He could then routinely search the personal characteristics of new students to see if they possessed patterns indicative of early school leavers. Once these individuals were identified, preventive programs could be developed.

Let me now briefly suggest some implications of increased educational research for the counselor. It seems to me that with more accurate, current, and meaningful information at hand, the counselor's functions will take on a sharpened focus. Having the right kinds of information about the individual client will greatly enhance the counselor's understanding of the student and his concerns. It will also tend to sharpen the significance of the decision-making process in counseling, to which we now give only lip service.

Also, much of what we do today as counselors appears to be predicted on a strategy of wait and see what develops

because our understanding of cause and effect relationships is so minimal that we are often at loss for answers. Increased knowledge of the relationships of meaningful variables will demand that the counselor be ready to act, as the need arises. We will no longer be able to be passive. We will have to have the courage to act, based on sound research evidence.

Conclusions

But now is the time the counselor must take the initiative, while data processing systems are being introduced into the school systems. The counselor must assume a position of leadership in his local situation in the development and utilization of data processing techniques. The counselor must familiarize himself with the potential of the computer for research and then work closely with the educational data processing specialist in creative and innovative uses of the computer in order to develop a meaningful bank of relevant research information.

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