# Teens Fold, Spindle, Mutilate Idea That Computer Class Bores

By ART BRANSCOMBE
Denver Post Education Editor

For those who worry about whether high school students today are learning mathematics, the computer math classes at Denver's George Washington High School provide one spectacular answer.

Let a visitor walk into Dr. Irwin Hoffman's classroom and he will see:

—A computer program created by Rick Blair, 17, which charts the visitor's monthly biorhythms, given only his birthdate.

—Two complex star charts, also drawn by a student-programmed computer, showing the heavens as they would look from the sun and from a star 11.5 light years — trillions of miles — from the sun.

—A computer-driven typewriter which, given a students or teachers income, exemptions and deductions, will not only calculate his income tax but also type in all the numbers — in exactly the right places on the federal tax form.

All of these complex productions have been done by Hoffman's star pupils.

But George Washington is an urban high school, with students as well who have trouble with fifth-grade multiplication and division.

For these students, too, there are challenges in Hoffman's classroom: curriculum units written by advanced computer math students on various topics in consumer mathematics.

These show a student, for example, how much he will need to save, at either simple or compound interest, in order to buy a $1,500 used car by the time he is through school — or how much he would need to save per month in order to go to college in five years.

Another program shows a student how to draw a pie graph depicting how much he spends per month for transportation, recreation, clothing, savings — and dating.

A student can compare his chart with pie charts showing the average amounts spent by GW students for those purposes — based on a questionnaire filled out by GW students last fall.

There is even a "store" unit, done by Hoffman's para-professional assistant, Evert Karman, which shows students how to compute sales tax on food and non-food grocery items.

"Most kids don't know that in Denver the sales tax is 3 per cent on food and 6.5 per cent on nonfood items," Hoffman pointed out. "They learn this way."

"We also teach them how to analyze paychecks to see if state and federal taxes and other deductions are right," Hoffman said. "One kid, after learning how to do that, found a chain firm in Denver had programmed its computer wrong, so employes were getting shorted."

Most of these consumer math units are set up so the student can start into them with arithmetic computations done by hand, Hoffman explained.

Then, if a student wants to venture into computerland — and has mastered the necessary algebra — there are step-by-step instructions on how to use a computer for solutions to more complex problems.

The emphasis in the consumer math programs is on realism — interest rates are those paid by Denver banks and savings and loan firms, and charges by stores and banks — and on relevance to student needs and interests.

In the first two computer math courses, the emphasis naturally has to be on learning the languages that computers speak, as well as their mechanical operation.

"A computer doesn't work unless you tell it every step to take—what it's going to read and what (that) is going to look like, etc," Hoffman noted.

Creating a computer program like the one that calculated biorhythms, Hoffman stressed, is an extremely painstaking, precise job—one that would tax the patience of many adults.

Even more difficult were the star charts task completed by Rick Johnson, 17. These involved complex calculations of angles and distances between stars, as seen from the two different viewpoints.

Johnson worked on this program all this school year, because, he said, "I want to be an astronomer."

Rick Blair did the biorhythms program because that topic interested him, and ditto for Mike Provo, who developed the program that tells a computer how to fill out income tax forms.

"After they get out of Computer I and II, they get a lot of choice in what they want to do," Hoffman said. "A lot of times we teach according to what their interests are."

Hoffman, a rasp-voiced, fast-talking man of 40, is the rare kind of teacher who isn't perturbed if students' interests carry them into fields where he doesn't know the answers.

Rick Johnson "used to spend my lunch hours teaching me about astronomy," Hoffman grinned. "We eat together in here and kids with advanced interests explain them to the rest of us."

Another youngster, Tom Birkle, was sitting nearby reading a book full of formidable-looking charts and graphs. "He wants to learn computer design," Hoffman pointed out.

"Nobody here can teach him, so he's learning on his own, from computer manufacturers' manuals."

The free-wheeling, far-ranging character of Hoffman's computer math operation makes it unique in the Denver area, according to William Goe, Denver Public Schools mathematics supervisor.

All the Denver high schools have computer math programs, as do several suburban school districts such as Cherry Creek, Jefferson County and Littleton. But most of them, Goe said, are considerably more structured than Hoffman's—using more "canned" computer programs and fewer created by students.

"Hoffman gives us problems," Goe chuckled. "He's the kind of guy who goes out and talks manufacturers into lending him equipment for demonstration purposes. Then the manufacturers come in and want us to buy all that stuff for other schools — and we don't have the money."

But a high proportion of the kids in both computer math and consumer math classes are turned on by Hoffman's interest-centered approach.

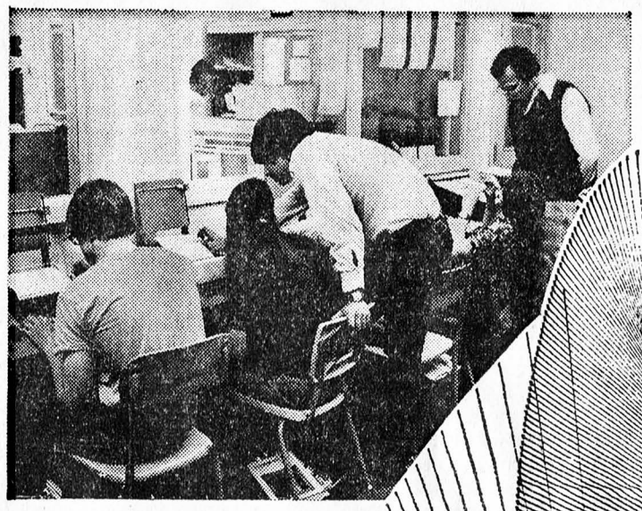
"School is out at noon," he noted, "but Karman has to push them out of the lab when the building closes at 3 p.m."

And Hoffman, who has been teaching at George Washington since it opened in 1960, is proud of what his graduates are doing.

"One is designing computers for the National Aeronautics and Space Administration," he noted. "Another did the program for one of the Mariner space probes. And one of our grads started teaching at Pomona College as a 19-year-old sophomore. He's a Ph. D. now."

Nevertheless, Hoffman takes a typically informal view of the intensely interested youngsters who flow in and out of his classroom.

"This," he said with a shrug, "is probably the kind of kid who, in our day in high school, fixed up Model T Fords."



Irwing Hoffman, right rear, talks with student at one of the console terminals.

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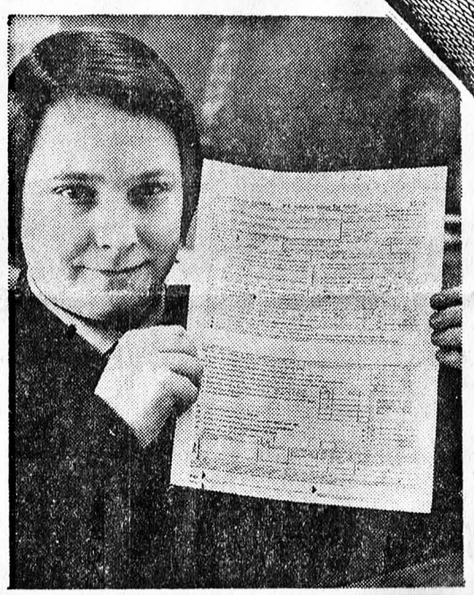
By BILL JOHNSON

Abstract design was drawn by computer programmed by one of Hoffman's students.

Rick Blair, student, watches computer-driven machine draw a chart.



Mike Provo displays income tax form filled out by computer which he programmed to make calculations.