GENERAL ELECTRIC Review

TOMORROW'S
ENGINEERS
READ THE COMICS

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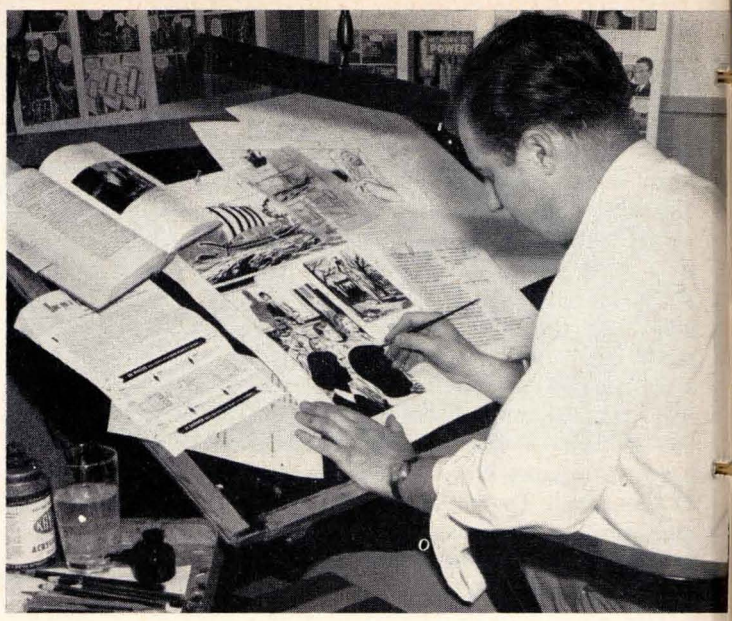
1 Story conference roughs out ideas for comic book (*author, right*). After final story board is approved . . .



2 Artists render oversize page layouts in full color prior to four-color printing process. After printing run . . .

Tomorrow's Engineers

By DWIGHT

Teachers, parents, and lawmakers were bitter about newsstand comics in 1945. But in the public relations field, although we were well aware of the adult fear that comic books were producing a crop of juvenile delinquents, we couldn't escape the conclusion that the medium had attractive possibilities for mass communication.

With these thoughts in mind we decided that a little cautious experimentation might lead to something interesting. And cautious it had to be, because even though we believed the comic might become an unusually attractive teaching aid, we had no intention of its backfiring on our public relations program.

After some preliminary discussions the first move was to consult professional comic-book writers and artists who, with the help of our staff, would bring the first story up to the finished-art stage. The plan then was to hold a conference before deciding to print or drop the entire project.

We found the professional artists and writers in the comic-book field to be a well-educated capable group, who were becoming more and more disgusted and bored by the industry's outpouring of brutes and miracle men. But they were convinced that color continuity could do the job that was proposed.

When the project got under way, this group found that their chief difficulty was convincing our staff that selection was the first principle of comic-book art; that even with 70 pictures it was impossible from an interest standpoint for them to combine narrative and everything known by G-E engineers about the "generation of electricity."

But after three months of work the first hand-colored hand-lettered art-board flats were completed. Although they looked good in this form, the decision to proceed with a printing was yet to be made. To get further reaction on the project, the art-board drawings were shown to several vice presidents and managers. Their opinions were to mold the final decision. And the results of these previews were indeed stimulating because the eight members of management who saw the colorful boards had so much fun looking, reading, and commenting that they not only gave their approval to the project, but also suggested many themes for future series.

Thus encouraged, 300,000 copies were printed in the first run and sent as examination copies to science teachers in high schools throughout the country. At the end of a month the stock was gone, and hundreds of requests were piling up. (Since that time the comic-book series has been to press 55 times.) Typical of requests was one that read: "So we have come to this! Please send me 120 copies!"

Why Do Comics Succeed?

Looking back, it's now easy to determine why this series of comic books is practically an integral part of instruction in many high schools throughout the country . . .

- Printed on mammoth presses on newsprint stock in quantities of 500,000 to 3,000,000, the unit cost is low enough to be consistent with amounts allocated for youth-advertising purposes.
- Many textbooks are in use six or more years, and in terms of such things as atoms, gas turbines, television, and fluorescent lamps, they are therefore obsolete; but today's teachers, wishing to keep up with progress, will accept industry's help—and furthermore urge industry to share their responsibility in the classroom.
- This series of comic books, approved by the Company's technical experts, has a reputation for accuracy and authority. Only *Adventures in Jet Power* has required extensive revision, and the fault oddly enough lies with engineers who refuse to design and manufacture a last-word turbojet engine and airplane, and have done with it.

3 Distribution is made. On one day this year, 3.6 tons of school publications—157,000 pieces—were mailed. Final . . .

4 Use in the classroom where 30 percent of General Electric's educational booklets are used as in-class texts.

Read the Comics

VAN AVERY

• Young people accept the comic technique as convincing, exciting realism and enjoy learning along with the main characters, Johnny and Jane. Through vicarious experience they learn; and because learning is fun, they remember.

What Teachers Tell Us

How do we know that comic books are effective teaching tools, and that they are helping create a favorable atmosphere for industry and the engineering profession?

First, you can't very well argue these points: knowledge precedes appreciation, and a growing appreciation of the scientist's discoveries and the engineer's applications, and public approval of the objectives and policies underlying a company's operation go hand in hand with industrial and professional progress.

This series of comic books is under constant scrutiny in graduate schools of education. For instance, we recently received a thesis that reported a study carried on with the help of pupils in elementary grades four, five and six (most readers are much older) with the most difficult comic book *Adventures Inside the Atom*, as the only text used for the "experimental" groups. Control groups used other noncomic materials. In this thesis the author attempted to ascertain whether "certain atomic energy concepts" could be understood by fourth-, fifth-, and sixth-grade pupils. Here are his conclusions:

"Because of the concrete presentation of atomic energy by this [comic] booklet the writer believes that it aided the teacher in making an adequate presentation of the constructive uses of atomic energy. . . . Children who cooperated in this study made significant gains as measured by a multiple-choice test. . . . Grade-group means showed little change between the pretest and final test results for the control groups. . . . The experimental groups showed statistically significant gains. . . . On the basis of this study, it seems reasonable to believe that many children can benefit from technical atomic energy instruction."

In 1951 we conducted a survey to determine how thousands of our teacher friends were using this series of comic books. After the returns were studied, the final report showed that 77 percent of the teachers used them with exceeding enthusiasm, and that the remaining 23 percent apparently had worked hard to fill in the spaces for unfavorable criticism. In this 11-page study the only adverse comment that appeared often enough to report was that "comic books are an inferior form of art, and passing them out endorses the use of *all* comic books."

This summary gave us, for the first time, a definite idea of what happened to comic books in the classroom: 45 percent were assigned as supplementary reading; 30 percent were used as source material and classroom texts; 28 percent were used for optional studies outside reading; and other uses totalled 3 percent.

It was equally important to know that in the opinion of teachers these booklets filled a definite need. Thirty percent reported that having been exposed to a subject through G-E comic books, pupils were more interested in (science) subject matter. Pupils learned more quickly and retained the information for a relatively long time, 28 percent of the teachers reported. And 16 percent of the teachers said that pupils learned by sharing the main characters' experiences.

A Pennsylvania teacher wrote: "It would take me months to put over the same idea. You may be interested in the enclosures."

The enclosures indeed were interesting. One was a Statement of Procedure that explained how, on 10 consecutive school days, 10 of our comic books were the sole text used in a general-science class. Another was an objective

test of 50 questions that was given on the eleventh day, together with a Summary of Results.

The test questions covered a great variety of things: What happens when a wire cuts a magnetic field, Newton's Third Law of Motion, how fluorescent lamps work, fission, electronic tubes, the number of miles of electrified trackage on the Pennsylvania Railroad, the Edison effect, and others.

The class average on that test was about 80 percent, and the boys and girls who were exposed to this experiment had an average age of 14.

Further reports have come to our staff. They give some indication that studies already begun will prove that this type of "text" can convey knowledge in equal measure to children of high or relatively low intelligence—as measured by conventional tests. It appears that superior groups are not showing markedly higher learning and retention than slow groups, when the comic book is the text.

(It's also interesting to note that some 30 big-name colleges have made class use of this series of comic books for quick reviewing of subjects.)

They Reach the Millions

These comic books are "engineered" with exceeding care. If you've ever worked out a crossword puzzle, you know that putting down a wrong vertical word will make it impossible for you to find crossing horizontal words that fit. Similarly, if you choose for a comic book an extended development of a narrative element that requires too many frames, there simply aren't enough frames left for the important expository elements. Or, if the expository elements block out into too many frames, the story suffers; that is, the thing becomes just another series of textbook diagrams. The story *must* capture interest so that the young reader will *care* when his counterpart (main-character Johnny) learns some basic scientific principle. As a teacher, the comic book has few rivals.

Its most attractive competition is the motion picture—which, incidentally, is blocked out in very much the same way. Actually, the movie, when skillfully done, is probably the best of all teaching tools; it is progressive action rather than a series of stills, and it has the added benefit of sound. But, at a fraction of the cost per impression—and at a fraction of time—the comic book can reach millions of boys and girls. The term *millions* is used purposely, because surveys show a 'pass-on readership of three-plus. It's now difficult to determine, within millions, the total readership of the 35-million copies that have been distributed, because it's impossible to count the number of parents who also have read our booklet—or the youth and older people of Finland, Denmark, France, and Italy who have read them in "strip" form as a result of various translation rights.

As a Recruiting Aid

Thirteen comic books have been produced since 1945. Twelve of them deal with basic scientific principles, the application of these principles in G-E products, and the historical evolution of the electrical industry.

Number 12 of the series, *Adventure Into the Future*, is a long-range recruiting piece for the engineering profession.

Excluding narrative, what is this booklet driving at?

Main-character Johnny says: "I'm going to be an engineer! What can I do about it while I'm still in high school?"

Answer: Study the right subjects, math and science for example. . . . About half the high-school graduates who would like to follow an engineering program in college find they haven't taken enough math and science to qualify! Plan your future now! Have some sessions with your school's career specialist.

Question: What about job opportunities?

Answer: An engineering degree opens the door to a number of interesting and challenging jobs. Even if a young man hasn't a college degree, companies need lots of skilled machinists and other craftsmen, and a wide variety of technical experts. . . . There are more women engineers than ever before. There are many interesting jobs, too, for girls without college degrees—assisting with laboratory work, experimental testing, analyzing data . . . each job lightening the scientists' and engineers' burden.

Question: What if I am not sure what type of engineering I want?

Answer: Be sure you want to be an engineer, that your subject choice and interests point that way. Find out what colleges require for admission. Get the groundwork first. Worry about specializing later. . . . Engineers aren't born, they're made. Rather, they make themselves. There's no such thing as an engineer "type." There's a job in engineering to suit the tastes and talents of everyone.

Question: Suppose I start to become an engineer and change my mind?

Answer: You'll be that much more eligible for a greater variety of jobs. Engineering students learn to think, to stick with a problem until it's solved . . . and business and industry want and need people who have been trained to think.

As the story closes, Johnny says: "Count me in our 'adventure into the future.'"

Of the two- to three-million readers of this comic book that came off the presses in October 1952, many may have been persuaded by its message. Many will take the prerequisite math and science and perhaps go on to join the great body of engineers in America.

Has this particular approach been effective? One of the sincerest compliments to the effectiveness of this booklet is the fact that teachers have written: "Naturally, you or we don't expect or want every boy and girl to be an engineer, so we are using this booklet as a guide to the type of information that should be sought no matter what the choice of career."

What Adventures Next?

We don't know. But we do know that Johnny is anxious to explore the heat pump, the atomic submarine, and many other wonders of these exciting years.

The comic book has a more secure place as a teaching aid than was ever dreamed possible. And we are sure that, as the years go on and new "adventures" roll off the presses, it will prove even more valuable, and gain more acceptance with the engineers of tomorrow. Ω

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For 16 years Mr. Van Avery taught English in college and public schools. Joining GE's Public Relations staff in 1943, he has been Supervisor, Editorial Services Unit in Schenectady for the past five years. Booklets, posters, charts, and periodicals are prepared by his unit for use as supplementary texts and motivating tools in thousands of classrooms.