

Naval War College Review

Volume 24
Number 4 *April*

Article 5

1971

Implementing New Educational Technology For the Military

Edward B. Roberts

Henry B. Weil

Follow this and additional works at: <https://digital-commons.usnwc.edu/nwc-review>

Recommended Citation

Roberts, Edward B. and Weil, Henry B. (1971) "Implementing New Educational Technology For the Military," *Naval War College Review*: Vol. 24 : No. 4 , Article 5.
Available at: <https://digital-commons.usnwc.edu/nwc-review/vol24/iss4/5>

This Article is brought to you for free and open access by the Journals at U.S. Naval War College Digital Commons. It has been accepted for inclusion in Naval War College Review by an authorized editor of U.S. Naval War College Digital Commons. For more information, please contact repository.inquiries@usnwc.edu.

The professional education of military officers has been criticized by knowledgeable people from both within and out of the military services. As an educational tool, the computer offers a unique device in the educational process, one which, if thoughtfully employed, could make significant contributions in areas causing concern among military educators. In this article the authors discuss the current status of computer-based educational technology in the military and offer some proposals on the next steps in this field.

IMPLEMENTING NEW EDUCATIONAL TECHNOLOGY FOR THE MILITARY

An article prepared
by

Dr. Edward B. Roberts and Mr. Henry B. Weil

A New Approach to Military Education. An increasing number of thoughtful military educators are calling for innovation in their field. This stems from a combination of dissatisfaction with present practices and a foresight that causes them to question whether approaches that seem quite appropriate today are satisfactory for meeting the future's requirements. And it is striking that many of their suggestions have much in common.

Here are a few examples. Rear Admiral Eccles has argued strongly for the development of a comprehensive military theory to serve as an integrating framework for War College curricula.¹ He asserts that the preoccupation of higher military educational institutions with being "preparatory schools for Pentagon duty" has led them to abdicate the intellectual initiative to civilian universities and "think tanks." To quote Admiral Eccles, "Professional military intellectual leadership has declined both in substance and in authority."

Vice Admiral Hayward, former President of the Naval War College, has expressed a very similar point of view.² Admiral Hayward feels that "Education programs have tended to lag behind the military leader's present environment, let alone anticipate the challenges he will face in the future." He called for broad professional education covering all the components that influence our national strategy and objectives. And he asserted, "It is in these areas where we must educate rather than in the 'knowledge' of green or buff papers or the mechanics of the Joint Staff daily routine."

Professor William D. Coplin of Syracuse University's Maxwell School (a consultant in the area of politico-military gaming to the Industrial College of the Armed Forces) has stated that midcareer education of already experienced military officers should offer: (1) exposure to a new type of decision environment, i.e., the "soft"³ decisions that are made at the national policy

level; and (2) a big picture perspective for people who heretofore have always worked on just a part of the overall system.⁴

These, and other commentaries like them, seem to have several elements in common:

1. They criticize an alleged over-emphasis of military education with organizational and procedural details (Admiral Hayward's "knobology");

2. They point to the diversity of knowledge that an institution of higher military education ought to be teaching (the "comprehensive theory," "broad professional education," "big picture," et cetera) and to the absence of integrating vehicles for trying it all together.

3. They lament the paucity of new conceptual insights coming out of the system of higher military education.

These points may sound very familiar, because not too many years ago they were directed with considerable justification toward the process of *management* education. Yet more recently, forward thinking management educators have made significant progress along all of these fronts. And they have done it through more enlightened application to their own activities (i.e., the generation and transfer of knowledge) of some of the same technologies they are espousing for the solution of managerial problems. Out of this has emerged the computer as a powerful high-level *educational* tool, supplementing its long-recognized utility as an analytical tool.

The Computer as an Educational Tool. What, precisely, do we mean by the computer as an "educational tool" (as distinct from an aid to analysis)? And what contributions have already been or can be made by this technology in the three areas of concern enumerated above?

Talking about the computer as an educational tool is a shorthand way of

referring to the technology's ability to enhance the teaching of certain classes of lessons and to enhance the management (directing, pacing, scheduling, testing, et cetera) of educational processes. The former role is most relevant to the points raised above. In that role the computer acts as a teaching medium: presenting facts, illustrating principles, and offering students an opportunity to explore cause and effect relationships. A number of specific examples are discussed below; efforts to date largely fall into one of the two broad categories of "programed instruction" or "gaming."

The critical difference between this educational role and the technology's traditional role as an analytical tool is the difference between active and passive. An effective computer-based educational medium is actively trying to *teach* a series of predefined *lessons* (facts, concepts, principles, algorithms, et cetera). And a significant portion of the teaching strategy is inherent in the medium. As an analytical tool, on the other hand, the computer is an available capability that facilitates solution of more complex problems. But the capability is merely there for the using. It does not actively seek to teach any broad lessons.

Computer-based educational technology of this sort, when thoughtfully employed, has made considerable contributions to education in other fields.⁵ And (again, if *thoughtfully* employed) it can make quite significant contributions in the areas now causing concern among military educators.

Current Status of Educational Technology in the Military. Computer-based programed instruction (computer aided instruction, or CAI for short) is presently being employed to teach various kinds of structured knowledge: foreign languages, scientific subjects, organizational relationships, and standard operating procedures. Much of the

"knobology" (which, given the current facts of life, an officer indeed *must* learn in order to be effective) should be taught through this medium. In the presentation of structured knowledge, repetitively, to large audiences, CAI is a considerably more efficient teacher than traditional media. Its broadened use would significantly reduce the proportion of his educational experience that an officer would have to invest to acquire this structured knowledge.

We recognize that the Navy is undertaking a number of important efforts in the CAI field. At the Naval Academy, for example, a number of CAI-based courses are being developed, tested, and refined in areas that broadly cover the curriculum: chemistry, modern physics, naval operations analysis, introductory Russian, and thermodynamics. The Naval Academy's experiments in multimedia course development are truly a pioneering endeavor. Here, three contractors are developing instructional materials and management tools (for progress monitoring, scheduling, reporting, et cetera) for prototype courses in physics, economics, and naval leadership. These materials employ such diverse media as human instructors, CAI, TV, tapes, programed instruction, films, slides, texts, and special devices. And the Naval War College itself has recently implemented programed instruction approaches to teaching the planning process and other areas.

Computer-based gaming is another form in which this technology is being applied to educational processes. As an educational medium, the computer game has great potential for teaching complex cause and effect relationships *even more effectively than actual experience*. Yet, at present, civilian management education is far ahead of military education in recognizing and realizing this potential.

Gaming, of course, is nothing new to military education. It was invented there. War gaming was first introduced

at the Naval War College in 1886 and became a regular part of the curriculum in 1894.⁶ These games were played at the strategic level with pins and symbols on charts; at the tactical level, it was done with miniature ships on a large "maneuvering board." Battle plans were prepared by both sides within the framework of the game scenario. Play was subjectively evaluated after the fact by a panel of experienced officers. Physical facilities for military gaming have been upgraded as technology and resources permitted. At the Naval War College this first meant larger maneuvering boards and miniature fleets and then later the NEWS electronic maneuvering board system.

The current state of the art in games for military education is illustrated by such diverse examples as: the TEMPO resource allocation game; SIR (Simulated International Relations), developed by two Naval War College students; Monopolog, an Air Force logistics game; Politica, a game about revolution in Latin America; the TEMPER global cold war game used in past years at the Industrial College of the Armed Forces; and WPS (World Politics Simulation) presently in use at ICAF. One can make a number of generalizations about the current population of games that, really, summarize the present conceptual approach to military gaming as an educational technique:

1. Their principal objective is to provide *exposure* to decisionmaking situations;
2. They are seen as *experience-giving* devices, not as teachers of specific pre-defined lessons;
3. They emphasize detail and realism to make the "exposure" and "experience" as lifelike as possible;
4. They require significant *subjective* direction and adjudication by human referees;
5. They are competitive, with "winning" (in one way or another)

vying with learning for the student's time and energy;

6. They emphasize role playing;

7. There is not very much time compression;⁷

8. Computers, where used, are employed either for "bookkeeping" (data storage or simple calculations) or status representation (display generation, et cetera);

9. They are developed and employed as a distinct and separate part of the educational program, often as a final exercise.

Proposed Next Steps in Military Educational Technology. In the field of civilian management education, we have come to realize that gaming technology is much more effective as an *active* teaching medium than as a synthetic, but highly realistic, experience-providing environment. And we have found (as the information systems people have also found) that computer technology permits much more than simply automating traditional methods.

Exploited to its fullest, computer gaming enables us to teach classes of lessons that really cannot be practically taught through any other medium—even actual experience. These are lessons about cause and effect in complex political/economic/social systems, where relationships are too obscure and complicated to be deduced intuitively and where real world "experimentation" is a practical impossibility. In the case of an international politico-military game, such lessons might include:

1. Why international agreement on common goals does not necessarily produce compatible national foreign policies;

2. Why different "actors" in the international scene can make such widely varied interpretations of the same situation;

3. How misinterpretation of the actions of others can produce serious political-military problems;

4. How domestic politics affect international relations and conflict;

5. Why it is useful to have "neutral" international forums like the U.N.

In addressing questions of this sort, computer gaming can provide an integrating framework for the broad body of knowledge that a military officer must acquire. The kinds of lessons that gaming teaches best are lessons that tie together the traditional functional areas of study, i.e., planning, military operations, international relations, budgeting, law, politics, et cetera. And a good game forces the student "... to cope with the simulated reality and then... to step back and evaluate that reality in terms of his assumptions of the real world."⁸ Thus, the effective game causes the player to reevaluate his own intuitive "model" of cause and effect.

Karl Deutch (of Harvard) stressed these points in a recent discussion of politico-military gaming.⁹ Among the most important benefits of a well-conceived educational game he included:

1. It stimulates student interest, thereby increasing learning efficiency;

2. It highlights certain conceptual lessons that are difficult to teach through alternative media;

3. It provides an opportunity for student "discovery" of "new" cause and effect relationships;

4. It provides a vehicle for self-criticism, something that is very difficult to do objectively under the stress of real world situations;

5. It provides an opportunity to recognize mistakes openly and to learn from them without inhibitions;

6. It can be systematically refined through repetitive use and evaluation.

To be effective as an educational tool of the sort just described, gaming must be an integral part of the student's total learning experience, not a separate exercise. Quoting Professor Coplin again, gaming should be made

... an integral part of the curriculum by relating certain aspects of the simulation... to relevant auditorium presentations, instruction discussion sessions, case studies, and reading materials. Assignments which attempt to force the student to relate his simulation experience to the opinions of experts on particular topics can provide a learning experience which is not a matter of photocopying details but rather includes re-evaluation of the student's and the experts' assumptions about a world in which he will be making increasingly important decisions. Those who are traditionally concerned with curriculum could be most helpful by using... simulation to teach what they want it to teach...¹⁰

Lastly, this type of game has some important characteristics that differentiate it from the present population of military educational games:

1. It is *noncompetitive*, in the sense that success is not measured by "winning" per se, but by increased understanding;

2. It is not overly concerned about detailed realism, but rather seeks an appropriate balance between simplicity for teaching's sake and enough realism to make the lessons credible;

3. It emphasizes *causality*, in the sense that it explicates and encourages the probing of cause and effect relationships and seeks to develop *generalized understanding* of how things interrelate and why things happen the way they do;

4. The cause and effect linkages that produce responses to player decisions are *explicitly* represented in the structure of such a computerized model, not implicit in the interplay of students in various roles or produced by the reaction and intervention of a human control team. In fact, the nature of

these linkages and their implications are the main lessons that this type of game teaches! And this causal structure can be made explicit only with the help of a computer;

5. Significant time compression (of the order of 400:1 to 1000:1) permits players to see the long-term implications of their decisions.

Summary and Direction. In summary, we are proposing a new approach to military education that is relevant across the entire spectrum of the Naval Command and Staff Course, the Naval Command Course, the Naval Warfare Course, and the Senior Officers Management Course, to use Naval War College courses as examples. Central to this approach is the use of computer gaming as an *active teaching tool*—to teach specific predefined lessons as an integral part of a student's total learning experience. And these lessons would be of a general cause and effect sort that will tie together a diversity of knowledge from many sources.

This approach is directly responsive to the aforementioned concerns about overemphasis of procedural details, integration of curriculum, and lack of new conceptual insights. In the last regard we are quite confident that the process of developing and using games of the type being discussed will produce a clarification and refinement of causal hypotheses—and the flow of new insights that critics are demanding.

The proposed approach is *not* a repudiation of past and present efforts. Rather, we feel that it represents a natural evolutionary step in military education that is already underway in other areas. To implement the approach at an advanced military school such as the Naval War College, a task force could be established, drawn broadly from the War College community, including representation from the administration, the civilian and military faculties, the ADP and war gaming

specialists, and the student body. It should also utilize outside experts, as needed, in the areas of advanced educational concepts and educational hardware and software technology.

A broad involvement of this sort is essential if the many relevant points of view, expertise, and follow-through authorities are to be mobilized and involved—as they must be in an endeavor of such importance. It is important that such an educational task force act with knowledge and authority in deliberating alternatives and making recommendations.

The Task Force on Educational Technology would serve a number of interrelated functions:

1. It would be an assemblage of considerable and diverse expertise in the area of military education and relevant technologies. In this role the task force will serve as a working body of *experts* (representing various points of view) that would take on a series of important policy issues;

2. It would be a group that includes people with the responsibility and (in most cases) the authority for accepting and implementing whatever recommen-

edations are produced. In this role the task force would serve as a medium through which responsible individuals will *actively participate* in the process of innovation and change. This should produce recommendations that are fully understood, accepted, and supported by those who will have to live with them. This is far better than the much more typical case where the responsible individuals are being “sold” a single predetermined set of recommendations by some third party;

3. It would serve as a managing and directing body for a series of “subteams” working on selected projects in more depth and detail.

The type of task force envisioned could be constituted immediately and might begin an oriented review of the entire War College curriculum in search of appropriate opportunities to exploit the *teaching capabilities* of computer-based gaming. As these opportunities begin to appear, they should be assigned to “subteams” for more detailed investigation and development of educational strategies: specific lessons to be taught,

BIOGRAPHIC SUMMARY



Henry B. Weil received his S.B. and S.M. from MIT's Sloan School of Management. A lieutenant in the U.S. Naval Reserve, he served on active duty from 1967 to 1969 assigned to the staff

of the Secretary of the Navy, the staff of the Special Assistant to the Secretary of the Navy, and the Office of Information Systems Planning and Development. Mr. Weil has been active for some years as a consultant, applying management science techniques to policy and strategy issues in business and government. One of his specialties is the field of computer simulation and gaming. He is presently a principal in Pugh-Roberts Associates, Inc.

BIOGRAPHIC SUMMARY



Professor Edward B. Roberts received four degrees from the Massachusetts Institute of Technology, including an S.B. and S.M. in electrical engineering in 1958, an S.M. in management in 1960, and a Ph.D.

in economics in 1962. He has served in all faculty ranks at MIT, culminating in promotion to Professor of Management at the MIT Sloan School in 1970. Dr. Roberts is active in government and industry, serving among other positions as president of Pugh-Roberts Associates, Inc., a member of the U.S. Department of Commerce Technical Advisory Board, and former member of the Air Force Scientific Advisory Board. In 1969-70 he occupied the James V. Forrestal Chair of Military Management at the Naval War College.

specifications for games, integration into the present syllabus, et cetera.

Subteams would be staffed principally by interested and qualified NWC students (with assistance as needed from task force members). A master's degree in computer sciences, operations analysis, education, or some other relevant area would certainly "qualify" an interested student. Student participation in this effort could be in lieu of some regular course work (which their advanced qualifications would make less important) and might, in fact, be organized as a special research seminar directed by a task force member. To provide an incentive for involvement, as well as strengthened in-house implementation capabilities, some student participants could be offered an opportunity to pursue their gaming work after graduation through 1-year assignment to organizations like the Joint War Gaming Agency and the Center for Naval Analysis.

One year of effort along these lines

should result in several principal end products:

1. A several years program of curriculum development aimed at an integral use, wherever appropriate, of computer-based educational tools;

2. Detailed plans for a limited prototype implementation of this educational approach (one or two experimental courses) during the following academic year;

3. One or more demonstrable educational games of the sort described previously, to serve as (or be developed into) teaching aids for the prototype courses mentioned above.

The tradition of leadership and innovation in educational technology that started years ago in the Naval War College needs to be reaffirmed if military education is to keep pace with the demands for more sophisticated officers, able to cope with more complex environments. The approach outlined above provides an implementable basis for initiating the needed response.

FOOTNOTES

1. Henry E. Eccles, "Military Theory and Education," *Naval War College Review*, February 1969.

2. John T. Hayward, "The Second Class Military Advisor: His Cause and Cure," *Armed Forces Management*, November 1968.

3. "Soft" here merely suggests difficult to specify and to analyze in a rigorous quantitative way.

4. William D. Coplin, "It's Time for All to Ponder," *Perspectives in Defense Management*, December 1969, p. 55-57.

5. Numerous references to computer games in a variety of fields are included in "Simulation and Gaming: a Symposium," AMA Management Report No. 55 (New York: American Management Association, 1961); C.J. Craft, et al, *Management Games* (New York: Heinhold, 1961); A.G. Dale and C.H. Klasson *Business Gaming: a Survey of American Collegiate Schools of Business* (Austin: University of Texas Press, 1964); Clark C. Abt, *Serious Games* (New York: Viking, 1970).

6. A history of war gaming at the Naval War College can be found in Francis J. Mellugh, "Eighty Years of War Gaming," *Naval War College Review*, March 1969, p. 88-90.

7. This varies quite a bit from game to game, but few come close to the 400:1 compression (1 year simulated per day of play) common in the most effective management games.

8. Coplin.

9. Karl Deutch and Dieter Senghaas, "Simulation in International Politics: How to Get Your Money's Worth," *Perspectives in Defense Management*, March 1970, p. 37-40.

10. Coplin. Also see William D. Coplin and Fred R. Brown, "The World Politics Simulation at the Industrial College," *Perspectives in Defense Management*, June 1969, p. 39-43.