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ABSTRACT

In 1979 the adult basic education department at the Alberta Vocational Centre (AVC), Edmonton, began to use the Control Data PLATO system. Results of the first PLATO project showed students using PLATO learned at least as much as students in regular classes. Students learned faster and reported great satisfaction with PLATO experiences. Staff and administration acceptance ranged from enthusiastic to none. During Project Two staff were to learn how to create their own lessons. Problems included delayed project approval and staff difficulties with the PLATO-based program for teaching the Tutor language, CREATE. An application of PLATO Learning Management (PLM) was designed for AVC's Registered Nursing Assistant program as part of Project Three. One of the program's instructional modules was selected for testing on PLATO using PLM-generated multiple choice test items. PLATO users were remarkably consistent in their positive views about PLATO and in their tendency to view module content favorably. PLATO and PLM showed some AVC instructors and administrators how present instructional practices can be integrated with increasingly independent student learning. Existing staff attitudes that will inhibit or prevent genuine curriculum change were made more apparent. Greater staff commitment was seen as necessary to the success of any plan for change. (YLB)

Learning About Computer-Based Education

in

Adult Basic Education

Patrick J. Fahy

It's tempting to make an article like this reflect only the good decisions and the hoped-for results. It would be creative fiction, however, and no one familiar with the process of introducing computer-based learning into an educational environment would be taken in. So I will try to describe both the warty and the unblemished experiences we have had at the Alberta Vocational Centre, Edmonton, over the past three years with the Control Data PLATO system. What I will be describing is the initial introduction of computers in an adult education institution's academic upgrading program, in (until recently) economically bouyant Alberta, one of Canada's leading agricultural and resource-producing provinces. The Alberta Vocational Centre enrolls about 1500 day students in its single downtown campus, of which 600 to 750 are enrolled in the upgrading program I will be talking mainly about. Fulltime students in the Adult Basic Education (ABE) program comprise about 200 students, ranging in age from seventeen to mid-fifties (averaging about 28), of which about sixty percent are women.

Project One: The Beginnings

In 1978, the ABE department at AVC learned about the PLATO system.

We read the literature and made some contacts with other users, and in April of 1979 I spent several days in Minneapolis at Control Data Headquarters, and in touring various sites where PLATO was in use around the Twin Cities. At that time, Alberta Vocational Centre's needs were pretty plain:

1) We wanted greater learning flexibility for students, because a high proportion of our students were single parents whose absenteeism was high due to their family responsibilities;

2) Among the other students there were those who were working parttime or who had other commitments, and who would appreciate greater access to our programs;

3) Even among students who had no other commitments there was a need to permit greater time flexibility, as students varied widely in motivation, ability, and prior learning.

Technologically, we had these requirements:

1) We didn't want to have to become experts to use the hardware, and we couldn't afford to hire an expert to do it for us;

2) The hardware and the courseware had to be usable by students who had varying reading ability levels, and different levels of self-confidence, independence, and initiative.

From our initial survey, we concluded that PLATO appeared to offer what we wanted. In the Spring of 1979, we submitted a proposal for extra funding from Alberta Advanced Education's Innovative Project Fund. The proposal stressed we were interested in experimenting with a system which did not require a major training effort, and which had a proven record elsewhere, so that if we were disappointed our investment would be minimal. The proposal was approved, and the initial use of PLATO at AVC occurred from September, 1979, to January, 1980, using the PLATO

system at the University of Quebec, some 2400 miles distant. (Control Data paid the telephone connection costs for the five months, as its contribution to the experiment.) Figure one shows the major questions and answers resulting from this project (from Fahy, 1980).

Figure 1: Results of First PLATO Project, 1979-80

Question	Finding
1. Do students using PLATO learn as much as students in regular classes at AVC?	In Basic Math, as measured by the Adult Basic Learning Examination (ABLE), they learned more. This was especially true for the lowest-functioning students, who made the greatest gains from pre- to posttest. Results in the English area were ambiguous: the ABLE test showed both PLATO and non-PLATO students made the same gains, but the Tests of Adult Basic Education (TABE) showed greater gains favoring the PLATO students.
2. Do PLATO students learn faster?	In Math. Continuing Education (evening) students moved one-third faster through the basic math course on PLATO. In English, no testing was provided except at fixed dates. Thus, no estimate of speed was possible.
3. Do PLATO students accept computer-based learning?	Students reported great satisfaction with their PLATO experiences on an attitude questionnaire. In interviews, comments were uniformly positive. Only one student requested transfer out of the PLATO group, a request which was granted immediately in view of other problems present. Many students requested extra time on PLATO.
4. Do staff and administration accept PLATO and use its capabilities?	Acceptance comprised a continuum from enthusiastic to none. (See p. 6 and 15 for further comments.)

Other findings of the first project included the following:

1. PLATO students' confidence in their own learning abilities, as expressed by them in interviews and on the attitude questionnaire, improved.

2. PLATO students' fears of tests declined.

3. Word-of-mouth brought many students asking to use PLATO. Some simply wanted to satisfy their curiosity, but a surprising number wanted to work systematically on deficiencies they had identified.

4. Staff decided they wanted to learn to program PLATO.

5. Some staff who worked with the project concluded that students should have a mixture of PLATO and teacher-performed instruction -- even if the students didn't think so themselves!

6. Some staff could not be interested in working with PLATO or, in a very few cases, in even looking closely at it. (See below for comments on how this problem of instructor inertia or resistance is being addressed now.)

7. Finally, not all staff who worked with PLATO came to the same conclusions about it, or about the potential of computer-based education at AVC generally.

Project Two: Programming

This one turned out to be a wart. Put simply, after our first project we thought that we already had some instructional material that was better suited to AVC's student clientele that what we saw in some PLATO lessons. We wanted to learn how to create our own lessons. A dozen staff were recruited from various programs in the institution who were interested in learning PLATO's Tutor language, another Innovative Project proposal was submitted to pay for it (still using the University of Quebec PLATO system), we sharpened our pencils to become eager students -- and then everything fell apart. First, the project was delayed and was finally approved in

mid-May instead of April 1. This made it impossible for trainees to complete their training and their programming projects before the end of the school year and the start of summer vacation. Second. Control Data's PLATO-based program for teaching the Tutor language, CREATE, turned out to have an extensive introduction to systems design in curriculum -- a great idea, really, but not what we expected. (In our naivete we didn't realize how important it is to fundamentally reconsider all elements of curriculum when introducing a powerful medium like the computer.) So our people largely skipped the boring parts in the CREATE program to get to the good stuff: writing Tutor code!

In the finish two instructors did complete programs which students were able to use, one in English as a Second Language (a drill on irregular verbs), and one in Basic Math (a drill on whole number operations.) The rest of us got far enough to realize a good lesson is harder than we thought it was. The experience resulted in the following conclusions:

1. Making good computer-based instruction takes time and special training, neither of which the typical instructor has. Furthermore, the training needed is definitely more than simply learning how to write code.

2. Learning the Tutor programming language would be very much easier if an instructor were available, even if only by phone. (We tried to learn Tutor using workbooks and the on-line PLATO lessons only.)

3. We concluded we wanted more of this "technical" training in the future, both to make us better technicians ourselves and to permit us to speak the language of the programmers and others we now felt we would be dealing with in any future programming projects.

(Fahy, 1981)

Interlude

By the end of 1980 we had one pretty solid success (the original project) and one pretty sorry failure (the programming project.) We knew systematic curriculum design, and programming PLATO, were complex skills, but we didn't know much more than that about either. The two projects had also given various impressions to staff members about computer-based learning, some of which were negative, some of which were ill-informed, and some of which were both. Finally, we still had the same needs for flexibility in our instructional offerings as we had had when we began a year earlier.

Our next step depended greatly on staff receptivity. A recent article by Rose (1982) summarizes several ideas and attitudes which, if not exactly prevalent, were at least in evidence at AVC at that time:

1. We were viewing the computer as a tool for the teacher to use to support his or her performance in the classroom, rather than as a resource which could be made flexibly available to the student to use on his or her own terms.

2. "Many educators are inherently resistant. They know little about the potentials of modern technologies, and do not care to learn" (Rose, 1982, p. 13; emphasis Rose's).

3. Consistent with number one, above, many instructors had attitudes Rose calls impediments to use of technology: ". . . teaching is a solo activity, /and the teacher needs to/ manage and direct the learning situations as completely as possible. In relation, most educators feel that deciding what will go into a course and enacting that plan is a personal and individual challenge. One aspect of this is personal, one-to-one interaction with students, which provides ego satisfaction from student attention and constant, immediate feedback about one's teaching efforts. Educators who prefer privacy in teaching and 'hands-on' involvement hesitate to use the new technologies. To them, this is not 'teaching' because they cannot see, feel, or know intuitively what happens to learners in other locations." (Ibid., p. 14)

Because a good many of AVC's instructors held some or all of the above views, a persistent problem was how to introduce wider use of the advantages PLATO had by now demonstrated, in the least threatening way possible. As a primary instructional tool available to large numbers of students, PLATO did not seem viable both because of staff attitudes and fears about their own roles, and because of costs. As a supplemental or remedial resource for "special needs" students, we still had to find the right mix of PLATO and other activities, since many staff were uncomfortable with a total PLATO diet for any student. And if students were involved in a "mixed" program of PLATO and other instruction, we would have to assure that the two elements were mutually compatible.

Project Three: PLATO Learning Management (PLM)

At about this time, the University of Alberta in Edmonton acquired its own PLATO system and formed the Instructional Systems Group to manage its implementation. Through the Group's Manager, Dr. Michael Szabo, and an analyst, Greg Anderson, AVC became acquainted with PLATO Learning Management (PLM), a product which Control Data describes as follows:

> The PLATO Learning Management (PLM) system is a computer-based system that helps authors organize instructional materials for individualized delivery and manages the delivery process for students. Authors need not acquire programming skills in order to use the full power of this system to administer tests, prescribe individual study assignments, and keep important records. PLM is designed to support a well-defined model of instruction characterized by modular organization of content and materials, defined mastery criteria and self-pacing.
> (Control Data, 1982, p. 1)

What made PLM immediately attractive to AVC was the fact that

it permits tests and exercises to be entered into the PLATO system without coding. A typist can do the entry, in fact, if standard forms are used and a little training is provided. Once entered on the system, students can access this material at their own election, to test or drill on elements of their courses. Records and results are voluminous, as we knew, and are automatically and securely kept by the system.

What I am describing, of course, is computer-managed learning. And for AVC, in late 1981, it was a timely discovery. With CMI we could begin to provide some flexibility to students, without disrupting the traditional classroom patterns of most instructors. Students could use PLATO to test themselves, take this information back to their instructor, and proceed from there under the instructor's direction. If the testing experience showed no study was needed, it would be impossible to ignore the need for personalized study prescription, we felt.

A trial of PLM was clearly needed. In early 1982, Greg Anderson and I designed an application of PLM in AVC's Registered Nursing Assistant (RNA) program, where one of the program's ninety instructional modules was selected for testing on PLATO using PLM-generated multiple choice test items. The module chosen contained seven instructional objectives, for each of which six test items were written and entered into PLM. A group of students was randomly assigned to PLATO, and told simply that they could use PLATO to test their understanding of the module, and that doing so would probably help them when they wrote the classroom test on it. They were also told that the project

was an experiment, and that their views on the whole experience would be of great interest to Greg and me (Fahy, 1982).

A bit more information about the RNA program might help explain our choice of it for a trial of PLM. Since the RNA course had been extensively revised in the late 1970s it had had as a major goal the provision of learner self-pacing and self-direction, but it had not achieved either to any degree because of the sheer complexity of issuing tests, scoring them, and assigning instructional resources for well over one hundred students who would be working at various places in the curriculum, and who would require different amounts of time for mastery. As a result, the program had become much more "lock-step" than its instructors and administrators had intended. As well, because all testing and recordkeeping was done manually about sixty percent of the time of the program's Instructional Assistant was spent doing these clerical tasks -- time both she and her colleagues felt she could better spend dealing directly with students. Finally, the program at AVC was and is one of only two in Alberta for the training of Registered Nursing Assistants (the other is in Calgary). Anything which would make the program more accessible to people outside metropolitan areas would be a major improvement over present, costly efforts at portability. Our choice of this program, then, was based on the conviction that at least some of its problems could be solved by the technology PLATO offered, especially if PLM made that technology more accessible.

In March of 1982 a total of eighteen RNA students commenced use of PLATO to study the pilot module, averaging 0.7 hour to complete it. The range of time required was from 0.5 hour to 1.4 hours, with a

median of 0.65. These figures were of immediate interest, as they confirmed Bloom's (1977) contention that students will vary widely in the amount of time they require to master given content. It also reinforced our belief that flexibility was not only desirable philosophically but a practical necessity for these students.

Concerning achievement of mastery of the content of the module, table 1 shows the results of the in-class test written by all the students.

Table 1: In-class Test Results on the Pilot Module

	Passed on First Test		Passed on First Re-write		Passed on Second Re-write	
	#	%	#	%	#	%
PLATO group (n=17*)	13	76	4	24	---	---
Non-PLATO group (n=27)	19	70	7	26	1	4

*One student in the PLATO group did not use PLATO because of absence during the pilot week.

Obviously, given the small numbers and the even smaller differences between the groups, no generalizations about achievement can be made. And, given the fact that this was the first experience of most of these students with a learning resource such as this, perhaps no effect could immediately be expected. What was notable and significant, however, was the perception of the PLATO group about their preparedness for the test, and their attitudes toward the material they had studied this way. Figure two summarizes attitudes toward PLATO.

Figure 2: PLATO Students' Attitudes Toward PLATO

Eighty percent or more agreement was expressed for the following statements:

-- PLATO helped me to learn the module more easily.
-- Learning to use PLATO was easy.
-- I would like to use PLATO again to study something else.
-- I enjoyed using PLATO.
-- I used PLATO's records to help me know my progress.

Both PLATO and Non-PLATO students completed a questionnaire describing their feelings about the material they studied in the pilot module. Table 2 shows the items on which the two groups differed.

Table 2: Attitude Differences Between PLATO and Non-PLATO Groups

1 = Strongly Agree 2 = Agree 3 = No Opinion 4 = Disagree 5 = Strongly Disagree	PLATO Group (n=17) Mean	Non-PLATO Group (n=27) Mean
-- I enjoyed studying this module.	2.3	2.5
-- When I had questions, or wanted help, I was able to get it.	1.9	2.7
-- I like to try new things.	1.6	2.2
-- My reading ability is as good as most people's.	2.6	2.1
-- I feel confident I will do well on the classroom test of this module.	2.1	2.3

After all students had completed the in-class test on the module an interview was held with the group. The following comments were made:

"I thought it should have been during class time, instead of having to squeeze it in."

"I liked it. I don't think I would like not to have a teacher there, on top of it, but I really liked it."

"Twenty minutes wasn't long enough. It should have been half an hour, minimum. You couldn't get very far the first time on in only twenty minutes."

"We should use it more often, for more modules. I think it would be good for more people. It helped me."

"People were coming in and out. They should give you a quieter place to use it."

"I think it would help us really know if we understood what we're reading. It's testing us. We understand it if we know the computer questions."

In summary, PLATO users were remarkably consistent in their positive views about PLATO, and in their tendency to view the content of the module favorably. No student expressed negative views on either the anonymous questionnaire or the interview, except those who complained that their exposure to PLATO had been too brief.

As we reflected on these results we noted that Alderman (1978) and his colleagues, in another pilot use of PLATO, had found this same combination of attitude differences, but no marked learning differences, between PLATO and Non-PLATO students. Alderman had further found that the presence of an instructor along with the use of PLATO improved results (p. 45). This was pointed out in the report, to emphasize that this application of technology did not imply the removal of the instructor from the scene. In combination with Hoffman's (1982) report that, even when students' reactions to computer-based training were deeply rooted in their personalities drop-out prone Navy trainees could

be helped to complete training in greater numbers if interaction, quizzes, discussion sessions and group work were provided, we saw a clear role for the instructor as assessor, prescriber, monitor, evaluator, motivator. These roles are different, but they are very compatible with traditional teacher images -- or so we hoped.

The RNA project gave us a glimpse of how the new technology, as represented by PLATO and PLM, might mesh with our present instructional format and outlook. It proved capable of keeping routine records and course data; it was manageable by students, freeing manpower for other tasks; it was compatible with the kinds of tests and exercises instructors used; it was reliable; and it was "programmed," via PLM, by staff who had no special computer training. Instructors and administrators went on record in our final report as wishing for more experience with PLATO and PLM. From their point of view it appeared to be a congenial addition to the program; from ours it was a timely success.

The Present and the Future

The success of the RNA project has propelled us into a cautious appraisal of aspects of the upgrading program, in which we are now looking for instructional problems which instructors believe students can solve themselves, without group instruction or close instructor supervision, if appropriate instructional resources are made available. (Examples are things like the times tables, spelling and usage rules, some elementary reading skills.) The approach is cautious because when I say "we" I mean a handful of staff who don't feel this technology will go away and, more positively, who have seen the benefits students have

enjoyed from its use in making their learning more accessible and individual.

Speaking personally, I believe there will be further exploitation of PLM and other PLATO-based authoring utilities in AVC's immediate future. I agree with Eisele (1982), who concluded his brief article on the advantages of authoring systems versus programmirg by saying:

> My conclusion is that authoring systems will play a major role in introducing the use of computers to entire faculties where adoption is school or system-wide. (p. 28)

Eisele had pointed out earlier that ". . . authoring systems could accommodate a wide range of applications, but there will always be limitations determined by the system's sophistication" (Ibid.). For this reasons I believe the PLATO system continues to be the best for our purposes: it has proven durable; it is extremely "user friendly," an advantage for both students and staff; and it has the potential for easy inter-user communications. (This last point is a whole separate article, but I mention it here because I am convinced of the importance of preventing unnecessary, costly duplication of programming/authoring efforts -- something which easy communications can prevent.)

I am encouraged in this conviction about the importance of author languages by the work of others. Davis and Lunderville (1983), for example, at the University of Wisconsin, River Falls, have reported success with the "Teaching Information and Processing System" (TIPS). TIPS, the authors state:

> -- Gives students the opportunity to take individualized quizzes via and interactive terminal.

-- Assigns individual students remedial work based on quiz performance.

-- Accumulates student performance data for immediate use by the instructor. (p. 47)

TIPS uses a Hewlett-Packard 2000 at River Falls, but the authors note that it has been adapted for the DEC PDP-11, the Apple microcomputer, and the HP/3000 (p. 47,49). Their findings and their outlook on computer-managed instruction, if not their hardware, parallel AVC's, and suggest to me that we are on the right path here.

As we move into the future we have firm plans to attempt to interest new staff, following Gaff's (1978) advice: "By persistently accenting the positive and emphasizing the possibility that some improvement may be made . . . some change can indeed be accomplished." Like Grossnickle (1982) and his colleagues, we have, as I have said, experienced some "lack of desire to change their established teaching routines" (p. 18) on the part of some staff. Other instructors have exhibited traces of the "not invented by me" syndrome (Robyler, 1982, p. 29). Gaff counsels that an "organic approach" will treat these attitudes most effectively:

1. A positive outlook;
2. Orientation to action (rather than to debate);
3. Focus on concrete, familiar problems for pilot study;
4. Reliance upon and development of a nucleus of committed individuals;
5. A long-term view of change, and a similar plan for achieving it;
6. A low profile, avoiding resistance where possible. (Ibid., pp. 49-50)

While all these are part of the ongoing change strategy, point four is emerging in my mind as a particularly crucial component. Lewin (1982) advises that an "informed teacher group" (p. 16) is helpful in encouraging others to become involved in change. I would go further: a core of such people is indispensible to the success of any plan for change. It is because PLM is so "friendly" to novices that it figures in our plans for the future. It is possible to demonstrate PLM to people who have little computer background, and have them appreciate its usefulness immediately. As they overcome their hesitance and become more informed they become potential participants in pilot projects and small-scale demonstrations, where they learn and apply their experience to real-life learning problems. It is a painless exercise in personal and program renewal.

Of course, if an institution or program does not believe in individual treatment of individual student learning problems, then of all innovations computer-based education makes the least sense. Brudner (1982) has put it this way: "Any attempt to fully integrate the . . . computer must first deal with the issue of individualized instruction. It is a basic classroom management issue, and it is the logic behind computer-managed instruction" (p. 26). Avner puts the same point another way, managing to make at the same time another important point about the various economies of an individual orientation to teaching and learning:

> . . . computer-based education permits the time savings inherent in individually paced instruction, the higher efficiency inherent in instruction selected to meet the needs of an individual, and the higher effectiveness inherent in learning under conditions of active student involvement. (p. 24)

All of these -- more efficient use of student time, instruction better suited to individual needs, the benefits of more active learning -- must be agreed-upon goals of programs investing in powerful technologies such as PLATO. If they are not, only trivial applications and outcomes will result.

Conclusion

PLATO and PLATO Learning Management have shown some instructors and administrators at the Alberta Vocational Centre how it might integrate its present instructional practices with increasingly independent student learning. It has also made more apparent existing staff attitudes which will inhibit or prevent genuine curriculum change. Between negative attitudes and the new technology must come some sensitive decisions about implementation and change. I am personally convinced that positive student response to computer-managed instruction, and increased motivation among formerly unsuccessful and discouraged students, will demonstrate to open-minded staff the merits of computer-based learning. The need for sensitivity enters in at the point where staff are invited to learn about and participate in these developments -- hopefully with verve at the prospect of an exciting new challenge.

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