A Systematic Methodology for: KEEPING THE TEACHER IN THE LEARNING PROCESS WHILE UTILIZING NEW TECHNOLOGY TOOLS

Melvin J Anderson, Ph.D.
Adjunct Professor
Embry-Riddle Aeronautical University
College of Career Education, Colorado Springs, Colorado

ABSTRACT

A Systematic Methodology for:
KEEPING THE TEACHER IN THE LEARNING PROCESS WHILE USING THE NEW TECHNOLOGY TOOLS

Melvin J Anderson, Ph.D. May, 1998

This paper describes a systematic process for implementing effective use of new technology tools in the modern college classroom. It provides a workable method for insuring that specific necessary conditions have been met for each teacher and each classroom--not a "silver bullet" that will work everywhere for everyone, but a case-by-case way of assessing and implementing.

The paper begins by recognizing the changing educational environment and the emergence of the "cyberschools"--the electronic classrooms that distribute training via video tapes, the internet and cable television. Although these media are becoming more prolific, they do not provide the interactive learning environment of the formal college classroom. Traditional academe has already updated most classrooms with video tape recorders and overhead projectors, but these do not constitute "new technology tools" such as state-of-the-art high-definition video projectors, computers, interactive computer simulation software and distance learning tools that link classrooms. Many students now use personal computers to access oceans of data via the World-Wide Web--"new tools" from the student's perspective, but teachers do not always insure that students use them effectively. The problem is not the capability of these new tools, but in the teacher's inability or reticence to use them effectively, or worse: allowing the tools to push the teacher out of the learning process and the student to substitute "search" for research.

The author maintains that each teacher-classroom situation presents a unique case. The new technology tools alone do not make a college teacher a mentor, nor do they make lectures into interactive learning experiences. The challenge lies in using the new tools effectively to enhance teaching skills, not to replace teachers. There is a middle ground in which the effective teacher uses the tools to teach students how to think and how to ask the right questions--to prepare them for life in a future in which the current answers will not work and in which new answers do not yet exist. This is the real goal of higher education; this is the basic advantage traditional classroom teaching has over its electronic competitors.

A simple but fully-articulated logical process of improvement is presented that permits a case-by-case diagnosis of each teacher/classroom situation to ascertain actions required to overcome specific obstacles to the effective use of the new tools. The paper shows how to match each obstacle with an appropriate action that will overcome it, resulting in a workable checklist for insuring that each of the three basic necessary conditions for effective use of the tools is met.

The paper concludes with a method for overcoming the layers of resistance to implementing the tools by exposing typical flawed assumptions. It does not offer universal solutions or answers, but rather a method for asking the right questions to overcome the obstacles that prevent effective use of the new technology tools and keep the teacher in the learning process while using them.

A Systematic Methodology for:
KEEPING THE TEACHER IN THE LEARNING PROCESS WHILE USING THE NEW TECHNOLOGY TOOLS

Melvin J Anderson, Ph.D.

INTRODUCTION

Education in the 1990s has seen a dramatic increase in the number of nontraditional education and training programs. The "electronic classroom" is available to any student who has a computer with modem, a cable television connection or video cassette recorder. To the chagrin of many traditional academists, "cyberschools" have become a competitive force that must be reckoned with--one way or another. While some colleges and their faculties have chosen to ignore these external threats, others have claimed to "join them" by adding audiovisual capabilities (overhead projectors and video recorders) to the classroom environment. Unfortunately, joining them or emulating the competition has not given higher education a new competitive advantage in the changing academic environment.

New Technology, but . . .

A number of schools have recently introduced truly new technology tools to their classrooms. When properly used, this new technology can make a good teacher a great teacher, a good course a dynamic learning experience, and make an interactive real-time lecture available to students in distant locations. Many colleges have successfully extended their reach and enhanced their curricula with distance learning tools, effective new classroom technology tools and innovative interactive simulation software. Unfortunately, some of their faculty have had less-than-satisfactory experiences in integrating these new tools into the existing academic formats and courses. There is something to learn from the positive experiences, but the negative outcomes present a complicated set of circumstances that are related to the teachers' abilities and willingness to use the tools, as well as to the tools themselves.

The situation is complicated by the fact that each teacher's experience with the new tools is unique. There can be no one "silver bullet" solution that will bring each teacher to an ideal level of success using these tools.

The Problem Goes Both Ways

While some teachers have underutilized the tools, other teachers have allowed the tools to "take over"--to push the teacher into the background and come between hem and the students. Neither of these outcomes is desirable. Both of them can be corrected.

The situation is complex. Unfortunately, complex solutions only add more complexity. What is still needed is a simple (not simplistic), solution based on the real causes for the undesirable outcomes. Simply citing the undesirable effects of a deeper core problem does nothing to resolve things. In fact, "attacking the effects" is a poor substitute for defining the real problem and constructing a system-wide solution--one that can determine what must be done to bring *each teacher* (not the same as "*all teachers*") to the desired outcome--effective use of the tools--*and keep hem there*.

This paper is about finding and overcoming the obstacles to effective utilization of these new technology tools in the classroom. The key to removing these obstacles lies in *identifying the flawed assumptions that underlie resistance to change.* The longer it takes to do this, the more urgent and more difficult the problem will be.

The Problem is Still Growing--Internally

American higher education faces new issues regularly. Tenure, sexual harassment, campus politics and affirmative action created brief furies and then began to respond to sensible solutions. Other issues, like textbook obsolescence and grade inflation remain to be resolved, but one academic issue that is still growing and exposing new problems for schools, faculty and students--all at the same time--is the use of new technology tools to improve teaching skills.

The question is not whether we will have these tools. The question is whether we can bring the tools into successful use in the college classroom *while keeping the teacher in the learning process*. A lot of planning and expense have already been directed toward new classroom tools like video projectors, sophisticated presentation software and computers with distance learning systems that link up several classrooms in real time. But despite considerable effort to make these new tools really work to enhance teaching skills and make the teacher more a part of the learning process, there is evidence that the tools are frequently not being used effectively to these ends.

Most classrooms already have overhead slide projectors and video tape recorders. Many teachers and schools have developed extensive libraries of impressive materials to use in these media. They've mastered these earlier tools and materials and they're very happy with them; they work as expected. They do not replace the teacher; they do not intimidate hem. But the new technology tools are different. They're more sophisticated; they require training, new course materials and application software. The presence of these new tools in the classroom does not automatically create a successful educational experience.

Meeting the Challenge

No systematic approach to this issue has been developed. The undesirable outcomes are evident, but differences of viewpoint abound. What is still needed is a systematic analysis of the entire issue to uncover the real core problems therein, and a logically-developed action plan that will overcome every real obstacle to effective use of these tools. Blanket approaches have little hope of success because for each case of ineffective use of the tools, there is a unique and different cause. Every teacher and classroom is a different case. Moreover, ineffective use of the tools can be caused by overuse as well as underuse. To achieve effective use of these tools, it is important to consider both ends of the issue--a teacher's hesitancy in using the tools as well as Hess potential "submission" to them at the expense of interactive learning. Anything that comes between the teacher and the student inevitably detracts from the learning process. The tools alone are not the answer. The answer lies in *keeping the teacher in the learning process* while utilizing them.

Using the Tools Incorrectly

With faculty encouragement, many students have found that researching their coursework on "the web" is much easier than spending hours in cold, inhospitable, music-free libraries with musty old books and methodical old librarians. While many libraries have enhanced their internal resources with computer filing systems and online research to other libraries, students now see them not as repositories of words and ideas but as centers for retrieval of information--or just data.

A number of educators report a sudden decline in the quality of student research and originality of thought in term papers because of ineffective use of new technology tools. David Rothenberg, in an August 15, 1997 article in *The Chronicle of Higher Education* (Point of View, page A44) entitled "How the Web Destroys the Quality of Students' Research Papers," describes " . . . the latest easy way of writing a paper: doing their research on the World-Wide Web." Such work, says Rothenberg, usually cites no books, just articles and references beginning with http://www, etc. Quotes and comments, beautiful pictures and graphs, often poorly related to the topic of the paper, masquerade for original work. A student confronted with thousands of supposed references to a single topic can only hunt and peck for one to use. Since these references are not arranged in order of importance, the student picks a suitably-titled or adequately-sized piece to fit. Instead of books that one must read carefully and understand, the student cites quips, blips, pictures, short summaries and fragmented summaries of summaries--all in perfect style thanks to a word processor that corrects spelling and can even "fill" white space by increasing font size and widening margins. The audiovisual versions of this type of paper--overhead

slides and Power Point presentations--are equally attractive, simple to create--and unable to sustain a learned argument. According to Rothenberg, college libraries with limited budgets must divert funds from books to computer technology that will itself become obsolete in a few years. The message to students is clear: "Don't read, just connect. Surf. Download. Cut and Paste. Ignore credibility, logic, judgement, passion. Disregard differences of opinion. Any exploration tool is a good one if it gets you some random hits. Arguments do not progress beyond the appearance on the screen of a suitable reference. Your attention span only needs to be long enough to wait for the modem to connect to another site." There are even World-Wide Web sites named "Cheating."

When a university merely joins "them" (the electronic classrooms) by adding technology, the students may learn current right answers to questions; but in time all the answers will change. What they will not learn is *how to ask the right questions.* And that's what formal higher education provides that no other type of training or education can deliver.

Defining the Problem

The problem is that we are not using the new technology tools in academe effectively. The mere possession of these devices doesn't make them useful. In fact, allowing them to become commonplace items for faculty and student use without determining their proper role in the learning process can result in poor learning outcomes masked by glittery lecture materials, smooth student presentations and impressive-looking term papers. While some students are retreating from legitimate research by using the World-Wide Web, some teachers are retreating from interactive classroom discussions by using showy projector slides and video tapes.

Most college deans and department chairpersons know the difference between substance and show, between logic and randomness, between "search" and research, and between original thought and chunks of data that appear on a screen.

If deans and other academic leaders know these non-subtle differences, then why do the problems associated with implementing technology tools persist?

A Process of Ongoing Improvement

Nothing really happens by chance; all undesirable outcomes have causes, and immediate causes are merely effects of more basic causes. If we recognize the undesirable academic effects cited above--unrealized improvement in learning despite new technology tools--and we know that better outcomes are surely intended and sorely needed, then the question must focus on the points in the system that most constrain the successful use of the new technology. Focusing on everything is focusing on

nothing; improvement requires first asking: *what to change?* We must identify the few real core problems that constrain system performance. In a chain, it's the weakest link. In a factory, it's the slowest machine. In an organization, it's usually the absence of one or more necessary conditions for achievement of a specific objective. With logical analysis, it is possible to systematically trace undesirable outcomes to specific core problems that are clearly *what to change*--what critically few things that when changed will lead to the most improvement.

Then, if we know what to change, we can ask the two remaining questions: *To what to change?* and finally, *How to cause the indicated change*? All change necessarily involves these three questions.

Answering these three questions of change outlines a step-by-step process of ongoing improvement that will address the needs of each school and each teacher more effectively than broad-brush, one-size-fits-all approaches that get a few "hits" but still leave many teachers not using the new technology tools effectively.

WHAT TO CHANGE?

We acknowledge the obvious value of technology in the classroom and we can justify the expense incurred in acquiring the new technology tools of teaching and learning. These tools usually arrive at the schools capable and ready to improve the learning process. If we also acknowledge that the intended educational outcomes therefrom are not materializing satisfactorily, then we must conclude that something *internal* prevents the effective use of these tools in achieving the desired result. We cannot blame the World-Wide Web, IBM or Microsoft for providing students with remarkable new avenues of information and versatile computer hardware and software that can find it, paste it and print it. Nor can we blame God for that aspect of human nature that causes students to want to get better grades with less actual work, or for teachers' resistance to change. Every undesirable outcomes has a *root cause* that is an internal policy of the institution--something that is *within the span of control* of the persons who make policy in the institution or in the classroom--especially in the classroom.

Classroom technology and the decision to use it is not the core problem. Neither is the students' access to the "electronic superhighway;" these external tools are no more to blame than the internal ones. The teacher can either lead people to knowledge by teaching them how to think and ask the right questions, or simply allow the classroom to become a reporting point for what students find in the placelessness of the Web. The teacher can interact with the students and cause them to think, or simply show them the current answers to questions. It's up to the professor to demand legitimate research in the real world and to demand

legitimate, researched discussion in the classroom. Then and only then will students address real problems, test theories and concepts proposed in the classroom, and bring into the classroom knowledge about what works and what doesn't work. With a teacher capable and willing to use the new technology tools, valid research and interactive discussion can turn a lecture into an even more dynamic learning experience. Moreover, these tools permit the use of the latest and best learning devices ever developed: interactive computer simulations.

Means, Method and Motive

Almost every teacher knows how to begin using classroom tools--at least how to plug them in, turn them on and make them light up. But it takes more. As we introduce new tools into the classroom, we must insure that the *three necessary conditions* for their successful academic use have been met. These three necessary conditions are the basic universal requirements for any action to be possible. Simply stated, they are *means, method and motive*.

The *means* to the use of technology in the classroom consists of the actual resources--state-of-the-art technology tools that are capable of bringing new knowledge into the classroom, presenting this knowledge effectively, and extending the classroom to persons at other sites electronically. Attractive overhead slides and entertaining video tapes have a tendency to detract from the content of lectures or reports; they can falsely impress the students and they can cause the teacher to spend more time on their appearance than on their content. Today's new technology tools are much more; they are hardware and software items that can extend both the student's ability to learn and the teacher's ability to teach; they enhance the lectures and enable students to do legitimate research--if the teacher knows how to use them.

The *method* of using technology in the classroom is equally important. The teacher must know how to use the tools to lead students in the search for knowledge. There is no shortage of data, but data must be sifted and classified to be useful information. A computer can sort data, but extracting knowledge from information requires a human intellect--someone who can determine relevance to specific needs and objectives. The teacher must levy clear performance requirements on students that result in legitimate research and reports that answer specific questions. S/he must transmit expectations to students that reflect the testing of ideas, synthesizing disparate sources and arriving at defensible conclusions. With this mandate clearly explained, the student is more likely to use the most appropriate sources for the synthesis of knowledge. If the student knows how to use these sources for relevant information, and if the teacher demands that the student produce conclusions based on asking the right questions of these sources, then two positive things occur: First, the student actually learns how to ask the right

questions to gain knowledge in hoes future educational and professional efforts.
Second, the student begins to learn how to think--not just how to find and report, but to think. But this requires a teacher who wants to make this happen.

The *motive* required for successful use of technology in the classroom is more difficult to define and create. The teacher must himself possess sufficient motivation to want to adapt his courses to the proper use of technology tools. Getting teachers to learn to use these tools effectively isn't the biggest challenge. Getting teachers to *want to* use them and to want to require that students create and present learned work with them is the real challenge. Remember, the objective is the effective use of the new technology tools--neither ignoring them nor allowing them to push the teacher into the back of the room.

If we accurately answer the first question, *what to change?* then we know what necessary conditions are unmet for effective use of the tools for each case. We can proceed to the second question, which addresses the answer to the first question.

TO WHAT TO CHANGE?

Answering the first question, *what to change?* identifies the absence in each case of adequate means, method or motive (any or all of them) necessary for effective use of the new tools.
The second question is also important. If we're going to change something, we also must know *what to change it to.* This seems almost too basic to need restatement, but unless these questions are answered in the correct order, we get wrong results--we get "ready, fire, aim."

The desired outcome (objective) of our change activity is clear: "The teacher possesses the means, method and motive necessary to use the new technology tools effectively." For this objective to be assured, three necessary conditions must be met for each classroom and teacher.

Necessary Condition 1:
The new technology tools are available and useable in the classroom *(means).*

Necessary Condition 2:
The teacher knows how to use the tools effectively *(method).*

Necessary Condition 3:
The teacher wants to use the tools effectively *(motive).*

Unless all of these three conditions are met, the objective will not be achieved. It's like a three-legged stool; remove one leg and it cannot stand. *To what to change* is clearly the assured satisfaction of these three conditions in each teacher/classroom situation. But a third question must also be answered--with action that causes the needed change: *how to cause the indicated change?*

HOW TO CAUSE THE CHANGE

Causal relationships involve step-by-step logical connections, without missing even one step. It's somewhat like dominoes being set in a row so that when the first one is pushed over, all the rest fall in order. If one domino is missing, the action stops. If one step in an analysis is omitted, the logic stops. In every organization, a series of causal relationships exists. If we miss one "domino" in the analysis of a problem, we fail to identify its root causes. If we miss one "domino" in constructing and communicating a solution, then our efforts toward change have no effect on the final outcome. All three "legs" (conditions) must be met and all three must be rooted in actions that cause them to exist--truly exist. But causing the needed changes to meet these conditions does not occur without identifying and overcoming the specific obstacles that prevent implementation--on a case-by-case basis.

Overcoming the Obstacles

As previously stated, the three necessary conditions for a teacher to use the new technology tools effectively are:

(1) The tools are available and useable in the classroom.
(2) The teacher knows how to use them effectively.
(3) The teacher wants to use them effectively.

Causing each of these conditions to exist requires actions to overcome specific obstacles. Unless the obstacles (current and potential) are known, the requisite actions cannot be determined. For each classroom and each teacher, the current and potential obstacles to actual implementation of the tools must be known.

A Checklist for Identifying Obstacles and Overcoming Them

As we examine each of these obstacles, we can probably think of at least one way to overcome it. We can then choose the best way to overcome each obstacle, one by one, and arrive at the best required action to overcome it. Then we can arrange the pairs by sequence/dependency until all the obstacles are included with their respective actions, in an order that describes the logical sequence leading from one to the next. The resultant list gives us a checklist containing the order in which we must perform the required actions:

Necessary condition 1: The new technology tools are available and useable in the classroom.

Potential Obstacles:

a. The tools have not been delivered and installed in the classroom.
b. The tools lack necessary additional software, equipment, hookups and supplies.

c. Funds are not available to purchase the types of tool required.
d. The proper types of tool have not been determined or approved.

Placing the obstacles and required actions to overcome them in a logical sequence, we get:

Obstacle d: The proper types of tool have not been determined or approved.
Action required: Conduct appropriate analysis to determine tool requirements.

Obstacle c: Funds are not available to purchase the types of tool required.
Action required: Allocate necessary funds for purchase of the tools.

Obstacle a: The tools have not been delivered and installed in the classroom.
Action required: Deliver and install the tools.

Obstacle b: The tools lack necessary additional software, equipment, hookups & supplies.
Action required: Acquire and install additional equipment and obtain software & supplies.

When completed, we will know exactly what actions must be taken to overcome all the known obstacles to meeting each requirement, and in what order, as appropriate for each case:

1. Conduct appropriate analysis to determine tool requirements.
2. Earmark necessary funds for purchase of the tools.
3. Deliver and install the tools.
4. Acquire and install additional support equipment and obtain software and supplies.

When these actions are completed, the tools will be available and useable in the classroom. The same analysis can be used for the other two necessary conditions.

Necessary condition 2: The teacher knows how to use the tools effectively.

Potential Obstacles:

e. The teacher hasn't attended adequate training on the effective use of the tools.
f. The teacher is unaware of timely and convenient training opportunities.
g. The teacher doesn't know that thorough training is necessary.
h. The teacher isn't aware of the value of the tools in meeting his teaching goals.

Next, pair each obstacle with the action that will overcome it, and arrange the pairs by

sequence/dependency, in the sequence appropriate for each case:

Obstacle h: The teacher isn't aware of the value of the tools in meeting his teaching goals.

Action required: Educate teacher about the value of the tools in meeting teaching goals.

Obstacle g: The teacher doesn't know that thorough training is necessary.

Action required: Insure that teacher realizes training is necessary for effective use of tools.

Obstacle f: The teacher is unaware of timely and convenient training opportunities.

Action required: Schedule convenient training and provide the teacher with the schedule.

Obstacle e: The teacher hasn't attended adequate training on the effective use of the tools.

Action required: Provide the teacher with thorough and convincing training.

Again, schedule the actions determined above, as needed:

1. Educate the teacher about the value of the tools in meeting his teaching goals.
2. Insure that the teacher realizes that training is necessary for effective use of the tools.
3. Schedule of convenient training and provide the teacher with the schedule.
4. Provide the teacher with thorough and convincing training.

Necessary condition 3: The teacher wants to use the tools effectively.

Potential obstacles:

i. The teacher is not aware of the importance of new technology tools in academe.
j. The teacher does not believe that his lectures will be enhanced by the tools.
k. The teacher does not believe that students' learning will benefit by the tools.
l. The teacher believes s/he can agree about the tools and then ignore them.
m. The teacher does not believe s/he can personally master the use of the tools.

Paring each obstacle with a proper action to overcome it, we get:

Obstacle i: Teacher is not aware of the importance of new technology tools in academe.

Action required: Establish a program to develop every teacher's belief in the importance of the tools and their impact on student learning, the future of the institution and his job.

Obstacle l: The teacher believes s/he can agree about the tools and then ignore them.

Action required: Show teacher a firm schedule for measuring performance with the tools.

Obstacle j: The teacher does not believe his lectures will be enhanced by the tools.

Action required: Get teacher to attend lectures of teachers who use the tools effectively.

Obstacle k: The teacher does not believe the students' learning will benefit from the tools.

Action required: Show teacher difference between students' work with/without the tools.

Obstacle m: The teacher does not believe s/he can personally master the use of the tools.

Action required: Do not conclude training until teacher demonstrates mastery to himself.

Now schedule the actions determined above, as needed:

1. Establish a program to develop every teacher's belief in the importance of the tools and their impact on student learning, the future of the institution and his job.
2. Show the teacher a firm schedule for measuring performance with the tools.
3. Get the teacher to attend lectures of other teachers who use the tools effectively.
4. Show the teacher the difference between students' work with and without the tools.
5. Do not conclude training until the teacher demonstrates mastery to himself.

How to cause the change is a systematic process of overcoming obstacles to meeting specific objectives by determining and carrying out specific actions--in the proper order. This process can become an ongoing improvement process; as new teachers join an institution's faculty, the same potential obstacles may exist and require appropriate actions. But we aren't done yet.

LAYERS OF RESISTANCE

Who could possibly resist this approach? Everyone! We may convince ourselves that these actions are necessary in terms of the problem as we perceive it, and that their completion will solve it. But we know intuitively that not every educator and administrator will agree on what the problem is, how to solve it, and if our solution will actually work throughout the system. Whenever there is disagreement about how to achieve an objective, we can usually find hidden conflict. But is the perception of conflict accurate?

The hard sciences maintain that there is no conflict in realty, only perceptions of conflict based on *flawed assumptions;* that people

usually fear, like loss of authority, security, comfort and control. Therefore, to break a perceived conflict, we must systematically expose the underlying flawed assumptions and address them to the satisfaction of the persons affected by the change.

Overcoming Resistance

Besides identifying the core problems and generating systematic, domino-like solutions, causing change also requires overcoming the layers of resistance generated by flawed assumptions.
There are five potential layers of resistance that must be "peeled away," one at a time--in the following order:

1. "The problem you cite is not a real problem."
2. "The solution you offer won't fix the problem."
3. "We have no control over the resources needed."
4. "Your solution will cause more problems than it fixes."
5. "You and I may be able and willing to do it, but will *they* do it?"

On the surface, these assertions seem plausible. However, if we state each assumption in its most extreme level (use words like *"all," "no way," "only,"* etc.), it becomes obvious that it may be a generalization that can be resolved by providing a proper response. For example:

1. "The problem you cite is not a real problem. Academe is in *no way* threatened by the electronic classroom; student work *cannot* be improved. The slides and videos we use now provide *all* that we need. Student use of the World-Wide Web for research produces the *best* work possible. *No one* will benefit from being able to access lectures electronically. Our present methods can *never* be improved upon."

Response: There is ample evidence that a real problem exists. This is the necessary first step in getting buy-in from resisters, but there is more persuasion needed. Much more; after the resister realizes what the real problem is, s/he is very likely to resist the solution. Read on.

2. "The solution you offer will *never* fix the problem. New technology tools *never* work. The technology isn't good enough yet. Teachers *cannot* learn new teaching methods. *No* teachers will go along with the use of new technology tools."

Response: Good examples of the tools working already exist; the necessary conditions for effective use of the tools can be shown to work elsewhere, and they make sense when examined.

3. "We have no control over the resources needed. We *cannot* afford the necessary tools. We cannot require teachers to attend training. The teachers will *never* go along.

They will *never* throw away their old lecture materials."

Response: The flawed assumptions above can be exposed by showing resisters the logical step-by-step process of overcoming the objections in "how to cause the change" in this paper. If the resister comes up with additional potential obstacles, they can be inserted into the solution with appropriate intermediate objectives to overcome them.

4. "Your solution will cause more problems than it fixes. Asking the teachers to learn new techniques will *always* cause more going than growing. The technology tools will cost *too much*. The training program for teachers will take so much time, they'll *never* be able to lecture. Our lecture methods will actually be degraded by changing them."

Response: It's unavoidable that some of the actions we take will create negative side effects. But these effects can be predicted beforehand, and avoided by adding additional actions into the solution. As each level of action is resolved, fewer and fewer negative effects will emerge in the analysis. Again, the resister can be shown how each potential obstacle can be overcome, one by one.

5. "You and I may be able and willing to do it, but will *they* do it? I *cannot* make commitments for other people. There's *no way* to get everyone to go along. You may convince a few of us, but *no one* else will try to make it work."

Response: This is the one level of resistance that takes more than logic to overcome. Here is where the leadership skills of the change agents are revealed. More importantly, here is where the existing quality of leadership makes the biggest difference. At this layer of resistance, the answer may well be a question: *How well do you run your school now?* Solving this final layer of resistance will depend on your ability to persuade others to change, and that ability will depend on what kind of leadership already exists.

CONCLUSION

This paper shows that by examining the entire issue in terms of the objective (effective use of the new technology tools), analysis can reveal the core problems (unmet necessary conditions) that result in undesirable outcomes. But complex problems have many parts, just as complex organizations have many detailed issues and viewpoints. Only a systematic fully-articulated analysis can expose the relatively few root causes of each problem and point the way to a noncomplex, understandable solution. The paper also shows that by using a checklist for exposing and overcoming the obstacles in each teacher/classroom situation, an effective step-by-step plan for change is more easily determined. Finally, a method for "peeling away" the layers of resistance to

change is examined, to arrive at a systematic process of ongoing improvement.

No Simplistic Solutions or Answers

No simplistic solutions or answers are offered in this paper that will instantly resolve all the problems in implementing effective use of the new tools. What this paper presents is *a method for asking the right questions*--a logical process of finding what to change, to what to change, and how to cause the indicated change to resolve *each problem*. In many respects, this is what higher education is about--learning how to ask the right questions.

The preceding process has universal application. It is a systems management approach; it deals with the obstacles to goal achievement of the system, not just one part of it. New technology tools are not an end unto themselves; their effective use is not the goal of higher education; it is a means to that goal.

The Goal

The goal of higher education is *preparing people for life*. As with all products and services, the real measure of success rests with the customer; the user--the student. And since the student is very obviously attached to some of the new tools (the computer and the World-Wide Web, for example), then the effective use of them in our classrooms is not only desirable, it is essential. It is *expected*. We had better make them work as they are capable of working--as tools that can make any teacher a more effective educator and every classroom a place of interactive learning. Otherwise, we will continue to see a breakdown in the teacher's ability to lead his students to understanding. Alison Schneider discusses this trend in his *Chronicle of Higher Education* article (March 27, 1998), "Insubordination and Intimidation Signal the End of Decorum in Many Classrooms."

The teacher who possesses the means, method and motive (ready, able and willing) to use these tools effectively will promptly invent operational rules for himself and his students that will make the tools work. The result will invariably be a classroom environment that inspires learning rather than simply reports findings, and generates participation by both teacher and student.

If we can systematically overcome the obstacles that prevent each teacher from using the new technology tools, then we will indeed keep hem in the learning process while utilizing them.

BIBLIOGRAPHY
With Brief Descriptions

Books:

Dettmer, H. William. *Breaking the Constraints to World-Class Performance.* Milwaukee, Wisconsin: ASQ Quality Press, 1998. The author presents a systematic method for solving problems in organizations by identifying the obstacles to goal achievement.

Goldratt, Eliyahu M. and Jeff Cox. *The Goal: A Process of Ongoing Improvement* (Second Revised Edition), Great Barrington, Massachusetts: The North River Press, 1994. This three-million-copy bestseller provides a remarkably clear view of the use of constraints management to overcome the obstacles to goal achievement.

Goldratt, Eliyahu M. *Critical Chain.* Great Barrington, Massachusetts: The North River Press, 1997. A challenging view of higher education in the 1990s that describes many of the problems addressed in this paper.

Perelman, Lewis. *School's Out.* New York: William Morrow, 1992. This author offers some controversial opinions about the survivability of traditional institutions of higher learning in the new "electronic classroom" environment.

Articles and Papers:

Max Hitchens, "Taking Control with Software Modeling; Simulation, Emulation and Monitoring." *APICS Magazine*, December 1996. A powerful support for management simulation software as an effective learning tool.

Robert Lenzner and Stephen S. Johnson. "Seeing Things as They Really Are--College Education as we Know it is Threatened (Peter Drucker)." *Forbes Magazine,* March 10, 1997. Another strong warning that higher education faces formidable challenges to its very survival.

Nancy M. Levenburg, Ph.D., "Production/Operations Management Curricula: Thoughts from Practitioners and Professors." *E & R Foundation Research Paper Series,* 1996.

Michael Prowse, "Endangered Species. Modern electronic technology could mean that the days

of academics at higher-education institutions are numbered." *Financial Times,* November 20, 1995. A hard-hitting discussion about the changing academic environment.

David Rothenberg, "How the Web Destroys the Quality of Students' Research Papers." *The Chronicle of Higher Education,* August 15, 1997. A sobering view of today's learning tools.

Alison Schneider, "Insubordination and Intimidation Signal the End of Decorum in Many Classrooms." *Chronicle of Higher Education, March 27, 1998.* The latest challenge? Scary.