

Total Quality Management: Implications for Educational Assessment

By Stuart C. Rankin

The approach to quality that transformed industry in Japan may help to improve educational quality in American schools. In 1982, W. Edwards Deming identified 14 principles for the transformation of American industry. Recently he developed his "System of Profound Knowledge," which is even more fundamental than the 14 principles. Here's a look at their implications for education.

Many administrators are interested in educational reform, new directions in assessment, and total quality management (TQM) issues. They seek to determine whether ideas for improvement in education can be found in increased under-

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standing of the work of W. Edwards Deming and others who have helped industry improve quality through better management. The changes in management are deeply rooted in cooperation through a win/win approach for total system optimization.

The 14 Principles

Deming resisted reducing his ideas to 14 principles. It was only under strong pressure from those who wanted to implement his ideas that he agreed to do so. He was greatly concerned that such enumeration would mask the interdependence of the principles as a total system. Educators should keep this caution in mind as they study his work.

1. Create Constancy of Purpose.

The purpose of the system (or entity) undergoing change must be explicit, clear, and shared by all members of the system. System aims may include the improvement of products and services, staying in business, providing rewarding jobs, and serving the interests of owners and management. Customer needs must be the driving force in establishing aims. Knowledge of the customer's real aims, by means of ongoing communication with the customer, should forecast future as well as present desires and needs. There must be a balance between short and long-term concerns. The system must be well-defined so that boundaries are clear, components

are known, and component members see themselves as part of the system. The idea is to optimize the total system, not its components. The components must be seen as contributing to the total system.

Several implications for education are seen. Customers must be clearly defined: Are they the students, the parents, the community or society, the board members, business, higher education? Is the middle level school a customer of the elementary school?

System boundaries must be clear: Is the system the school district or a single school? If it is the school, then either the school must become autonomous from the district or the district office must become a full party to the transforming system and committed to all the 14 principles. If the system is the district, then all schools in the district must be in the program.

The system must improve so that the customers receive quality education, benefit from continual improvement, and act in support of the system. Educational output must be clearly defined, and where possible it must be measurable, although some of the most important aims may not be measurable.

2. Adopt the New Philosophy.

Total commitment from the top down must be given to the new approaches. Old myths and old procedures of management must be replaced. Within the system, and in working with suppliers and cus-

tomers, cooperation replaces competition. The win/win model replaces the zero sum model. Dedication often must be given to doing things the new way, not to doing the old way better. The performance of each component is seen in its contribution to the total system. People must develop openness to new ways. Improving the quality of process and method is seen as the way to improve product and service.

In education, total commitment is also needed. Existing methods, materials, and environments may be replaced by new teaching and learning strategies where success for every student is more probable. Differences among students and teachers are addressed and used. From the top down, including all components of the educational system, there must be total commitment to putting new processes into effect.

3. Cease Dependence on Inspection To Achieve Quality.

The need for mass inspection after a process is completed can be decreased by designing the process so that quality is built into the product in the first place. Educational systems often do more screening and sorting of students than teaching and learning for students. This problem is an example of dependence on final inspections.

Educators should monitor the teaching process as it occurs and use feedback to adjust teaching methods and materials as needed. Less reliance on remediation should be

necessary if proper mediation occurs during initial instruction. In addition, mass inspection through standardized tests can result in overemphasis on actual items tested, cheating, and increased variance; and can limit educational achievement to those objectives most easily measured. Educational measurement is more likely to be used to improve the teaching and learning process when it occurs as part of the ongoing instruction rather than at some annual testing period.

4. Consider Total Costs. Do Not Trust the Low Bid on Each Item.

Awarding a purchase for a certain material or service on the basis of price alone may mask other costs that overshadow the savings. Developing a strong, cooperative working relationship with a single supplier permits increased loyalty and trust, and provides long-term savings on other items.

In education, this principle may be appropriate to the purchase of textbooks and tests, computers and other equipment, and supplies. Multiple suppliers can increase output variability, and may lead to consideration of contracting for custodial, transportation, cafeteria, data processing, and other services. It suggests greater use of distance learning via interactive television, or even contracting for some instructional services. The important thing is to consider the total costs and benefits of the alternatives, not just their initial cost.

5. Improve Constantly and Forever Every Process for Planning Production and Service.

This improvement cannot be achieved by simply meeting standards. The processes must be made to produce stable results and then must be reviewed frequently to find ways to improve quality.

Many superintendents and principals put great pressure these days on teachers to improve scores on standardized tests. Often the result is not real improvement in the quality of education or the number of students succeeding, but in increased performance on a small number of easily measured targets.

The focus of improvement efforts, under a Deming approach, would be on the teaching and learning processes, using the best research to suggest strategies, then trying them out, studying, and acting on the results. There would be attention to both failure and success, and changes in the processes would be prompter and more targeted.

Statistical control can be used in education as well as in industry, but with techniques appropriate for educational variables and conditions. Greater emphasis would be placed on ensuring that all students improve and that minimum quality standards are met and constantly raised along with improvements in teaching methods. Substantial improvements would be needed in the measurement of those learnings that are measurable and in managing for the attainment of important learnings that are not measurable.

6. Institute Training on the Job.

Training is needed as part of the regular work assignment for all employees in the system in at least two areas. First, there must be training in whatever new processes and process control techniques are developed. Such training should be provided in a timely fashion, as needed. Second, there must be training in the principles and techniques of the new system of management.

Teacher training often occurs after school, on the weekend, or in the summer and away from the work site. Such training may be connected directly to teaching problems, but often it is not. The school day should provide time for training that is directly related to plans to improve instructional quality.

Much training is needed in the proper use of assessment. There may be some greater costs to allow for such training, but in the long run, educational quality gains should more than make up for the costs.

7. Adopt and Institute Leadership.

Managers must be responsible for the transformation to the new system. They must have a working knowledge of variability and its causes. They must understand people inside and outside the system. Their primary task is to improve the system: its outcomes, its processes, its inputs. They must not oversimplify the task. They should develop expectations with employees and provide a supportive working environment.

An understanding of Deming's "System of Profound Knowledge" (to be discussed later) will be needed. In addition, leaders must eliminate processes and systems that impede the attainment of improved quality; e. g., quotas, standards, performance appraisal, ranking of staff, and management by objectives (MBO).

Education is full of quotas, standards, rating systems, and MBO systems for educators. Educational leaders will need to eliminate such processes and learn to improve the system itself: its outcomes, processes, and inputs. They must learn the same skills as leaders in industry, and they must learn to carry out the same responsibilities.

8. Drive Out Fear.

This is probably the one principle that has greatest impact on all the others. Employees fear loss of promotion opportunity, loss of job, criticism, low ratings, being held responsible for results when they do not control the process or the inputs, and not being valued or appreciated. Such fears lower productivity, produce inaccurate information about problems and results, remove honest and open responses, reduce innovation and risk taking, and may produce cheating. Fear can hamstring employee effort and creativity. Fear must be eliminated or markedly reduced.

These same fears are present in the education system. We must recognize that nearly everyone does the best that she or he can under the existing circumstances. The

focus of our improvement efforts must be placed on the processes and on the results, not on trying to make people accountable. If the quality is not there, the fault, most likely, is in the system, not in the teachers and other workers.

Educational leaders must remove worry and fears, and work with employees on improving the processes. The improvement tasks in education are hard enough if we all sheathe our swords and work cooperatively; they are impossible under conditions of fear and mistrust.

9. Break Down Barriers Between Staff Areas.

This principle is closely allied to the first principle, dealing with constancy and unity of purpose. Competition among functions must be replaced with cooperation so that total quality is maximized and total costs are minimized.

In education, this principle applies to interdepartmental cooperation. It also applies to interdisciplinary instructional efforts such as teacher teams, writing-to-learn programs that involve several subject areas, and student investigations of problems and issues that require the application of learnings from different disciplines. In addition, it suggests the sharing of resources such as computers among the staff.

10. Eliminate Slogans, Exhortations, and Targets for the Work Force.

These programs often have an adverse impact on the staff, and imply that people are the only

source of problems. Slogans oversimplify the improvement process and can insult or demoralize staff members. The hoped-for motivation does not occur.

Teachers and principals are intelligent, dedicated workers who can have internal motivation and can craft carefully-designed processes to improve teaching and learning. Lasting increases in effort derive from sterner stuff than slogans.

11. Eliminate Numerical Quotas for the Work Force and Numerical Goals for Management.

Eliminate MBO; it produces minimum performance. There will always be variability in every system. Quotas are often unrealistic and not attainable on a regular basis, because of both common and special causes of variance, many of which are beyond the control of the work force. And they lead to acceptance of minimum quality or low production.

Management must substitute leadership for quotas and focus attention on the processes rather than on the outcomes. Quotas ignore the quality of inputs and do not provide direction for improvement. They reward the system, not the staff member.

Superintendents often set numerical targets for principals in terms of attendance rates, failure rates, test scores, dropout rates, etc. One fundamental problem is that knowing both the target and the current performance may show the size and direction of the discrepancy, but it gives no clue as to the method of

improvement. In addition, variances in intake and resources are often ignored. Cheating in reporting is encouraged, and other important aims may be ignored or underemphasized. Finally, attention is directed away from those processes and methods that can facilitate instructional improvement.

12. Remove Barriers that Rob People of Pride of Workmanship.

Merit pay is a major barrier. It destroys teamwork, fosters mediocrity, increases variability, confuses people with the other input resources, and focuses on the short term. Daily or weekly production reports are also barriers to be removed. They may produce immediate profits, but can kill the organization in the long run. The system should emphasize intrinsic motivation, rather than extrinsic rewards.

Ideally, educators would all be self-evaluating, self-rewarding, and self-directive. Intrinsic motivation that is supported by the system is the best bet to engender pride and quality of workmanship. Merit systems are often statistically random in the long run, are held in suspicion by educators, tend to divide rather than unite, and are often no more deserved by one teacher than by another.

13. Institute a Vigorous Program of Education and Self-Improvement for Everyone.

Life-long learning by employees is important, but it need not be closely tied to the immediate system func-

tion. It may provide retraining for a new job. Or, it may make the worker a more vital, interesting, inquiring person. Such qualities transfer to both workmanship and employee contribution to the quality of the work environment. A self-renewing institution is more likely found where there are self-renewing people. Corporate investments in such education may have short-term costs but will also have much greater long-term gains.

These conditions apply at least as well to the educational community as to the industrial community. Inquiring, vital educators who are up-to-date in their field and on current world issues are more likely to find quality solutions to instructional problems, and will surely make learning more interesting for students. The educational system should view the continuing education of its staff member as an investment in educational quality for students.

14. Put Everybody in the Company to Work To Accomplish the Transformation.

Establish top-down understanding and commitment. Send senior staff members to Deming workshops. Provide statistical training for managers and Deming system training for statisticians. The system cannot be implemented piecemeal; all 14 points must be implemented; they are interdependent.

Educators with some sophistication are leery of adopting an entire

philosophy; they prefer to choose improvement strategies from many sources. But with Deming's approach, it is necessary. All the key parties in a school district must have substantial understanding of the system, and many of them will need specific training in advance of any decision to go forward. They must know the consequences of an agreement to transform their district using these principles, and be eager to do so. This requirement also implies that the program must provide adequate training and other resources for implementation.

Deming's System of Profound Knowledge

Deming has described a "System of Profound Knowledge" which is even more fundamental than the 14-principle system-transformation guide. Four interdependent components comprise this system. They are system, variation, a theory of knowledge, and psychology.

1. A System

First, we must understand and appreciate what a system is. It is a network of function components that are interdependent and which, taken together, can attain clearly-stated aims. The system makes its boundaries explicit by defining which people, functions, components, and aims are included, and which are not. The components must serve the total system, not themselves. Managers work on the system to optimize it (to

attain the total system's aims). The work force works in the system.

The aim of the system must be clear to all and consistent with the needs of the system's customers. Each component has suppliers and customers within and/or outside the system. The term "suboptimize" is used to mean benefiting one component, function, or subsystem without concern for the impact on the total system.

But the system is greater than the sum of its parts. It is even possible to suboptimize every component and still not optimize the system. It is also possible to increase profits in the short run but go out of business in the long run.

If we take a secondary school as a system, we can think of several examples of suboptimization. Some of the school activities may not contribute to the aims of the total system. Optimizing the cocurricular program may damage the curricular program, or vice versa. Assigning extra resources to one department may optimize the total system, or it may not. Each action taken for improvement of one function has implications for the others.

Recently, many schools have tried to make explicit their aims or mission, and have worked diligently to ensure that the aims are supported by the whole school community. These total system aims must not be only on paper, but must guide decisions about priorities, experimentation, and allocation of resources. Raising scores on a state

or national test may look good, but may delay more important aims.

2. *Variation (Statistical Theory)*

A process combines the input of people, material, equipment, method, and environment to produce output. That output has a distribution with variation. If the mean and standard deviation of the distribution are consistent over time; the system is said to be "a stable system," or "in control," or "in a state of control." The variability in the system has "common causes" and "special causes." Common causes are sources of variability that are always present. Special causes are not always present. The variation in stable systems is limited to common causes.

In order to improve the quality of a system, one approach is to reduce its variability. But first, one must measure and plot outcomes over time and determine if the system is stable or not. If not, it must be stabilized before it can be improved. Improvement is then made by changing the process to move the mean, or by changing the process to reduce the variability.

Attempts to improve quality without statistical control are wasted effort. Much of what has been taught in statistics is not of value in improving quality. For example, hypothesis testing is only satisfactory for describing, not for predicting, but statistics instructors continue to teach otherwise.

Understanding statistical control

is central to the entire effort to improve industrial product quality and to improve long-term profitability. But in studying a process, both successes and failures must be examined. Not only can we learn from both, but looking only at failures (or successes) can deprive us of key information.

Education is still as much art as science. But, increasingly, research has shown the way to improved practice. Current efforts toward greater collaboration between schools and universities (and other research centers) must be extended and expanded. By means of collaborative inquiry, practitioners and theoreticians can improve both schools and teacher-education institutions.

The new professional development schools appear to hold much promise for such inquiry. As we seek better methods of instruction, some variables can be controlled and some can be measured; others cannot. But if we are to teach all youngsters well, we must know a great deal more about variation in outputs, processes, and inputs.

3. A Theory of Knowledge

Communication about process and improvement requires precise language. Processes must have clear operational definitions and clear concepts. Communication between supplier and customer and among people in different function components must not be ambiguous if understanding and improvement are to occur.

When a plan is made to improve a process, it must be based on some predictive theory, which in turn should be based on knowledge or experience, or some restructuring of elements within and/or outside the present process. Trying something without a theory to confirm or deny prevents the advancement of knowledge. No number of successful examples can prove a theory, but one counter example can disprove it.

Statistical control experts can help with the improvement of processes and methods, but they cannot select or define our educational variables. They cannot decide for us which variables can be measured, or which can be managed, or which can be ignored. That knowledge can only come from those of us in the field of education. We learn it through study of our own business. Without full knowledge of our own business, improvements will come only by luck. If we are to make good decisions about assessment procedures to help improve instruction, we must understand the key variables, and use the wisdom gained by other practitioners and researchers.

4. Psychology

Psychology allows us to understand the interactions between people and their behavior. Intrinsic motivation is superior to extrinsic motivation. All people need fun, freedom, belonging, success, recognition, and joy. Positive, honest, direct reinforcement is more effective than fear. But overjustification (unsought and

unnecessary rewards) can be insulting. Individual differences are always present in the ways in which people learn, and in the speed with which they learn. Fear can change the behavior of people and can affect the quality of data where they are involved. Attention to psychological principles provides opportunities to improve inputs and processes, and, therefore, can improve output.

A knowledge of psychology is evident in the operations of some schools. Intrinsic motivation of students and staff members is prized.

Differences are honored. Reinforcement strengthens desired actions. Needs are met. Fear is eliminated, or at least diminished. Success is seen as the consequence of effort rather than aptitude, luck, or ease of task. Reports of information from teachers and students are reliable because of lack of fear, a shared commitment to the total system and its aims, and a belief that self and institutional renewal are possible.

Implications for Educational Assessment

Deming would probably argue that the term "Total Quality Management" (TQM) places quality in the wrong place. We seek quality in outcomes. It is the responsibility of management to improve the total system processes so that quality of product is continually improved. Clearly, the work of Deming and others associated by reputation with TQM has implications for leader-

ship and management of secondary schools. Some of those implications are targeted in the area of testing and assessment:

1. The role of assessment is system optimization. Test usage in ways that expand competition among students, programs, and schools does not optimize the total educational system. Assessment should be used as a tool to improve the processes of instruction, not to screen and sort students or to compare programs or schools.
2. Cooperation in a win/win mode which is directed toward system aims should guide the allocation of assessment resources.
3. Assessment should be connected to the aims of the total system. Deming would argue that the joy of learning is a key aim of education.
4. Assessment strategies should recognize that there are many variables among the means and methods of education; some are measurable, some are manageable, some are both, and some are neither.
5. Precision in the definition of key variables and in the meaning of research findings should be prized.
6. A variety of assessment devices is needed to reach the range of input and process variables.
7. Assessment as final inspection with annual tests should have a lesser role in the total assessment picture than ongoing assessment, which is part and parcel of the improvement of the methods and processes of instruction.

8. Student failure should be eliminated or minimized.

9. Accountability in schools should mean "making honest, accurate, and open reports of progress, problems, and the analysis of factors and reasons," rather than "responsibility for results." Variability has many causes.

Readers will observe that impli-

cations for educational assessment derived from TQM principles are consistent with many of the current thrusts in the reform of schools.

Reference

Deming, W. Edwards. *Out of the Crisis*. Cambridge, Mass.: MIT, 1982.

Parents Helping Students Succeed: Some Tips

What can parents do at home to help their children do better at school? A survey of elementary school and middle level principals, conducted by the National Association of Elementary School Principals and World Book Educational Products, revealed the following tips, which can apply to parents of secondary school students also:

- Say "good job" and "I knew you could do it"
- Ask for the student's opinions and listen to them
- Limit television time
- Let students know how important education is.