A Technology for Improving Performance in Schools

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Research on improving performance in schools has an extensive literature.[2] Particularly useful for the current discussion, however, is research in the field of Human Performance Technology (HPT),[3] which has found extensive application in the private sector and government, and is beginning to be applied in schools. In the HPT framework, "technology" has its general meaning: a standardized means of accomplishment. Computer hardware and software may or may not be involved in HPT, though it often plays an important enabling role.

One of the earliest and best-validated HPT models for improving performance in organizations is by Thomas F. Gilbert (1996). Gilbert identifies six general strategies for improving organizational performance, summarized in Fig. 1.

	Capability	Resources	Motivation
Organization	1.Information	2.Tools	3.Incentives
Individual	4.Knowledge/skill	5.Capacities	6.Motivation + Confidence

Fig. 1: Adapted from Gilbert's Behavioral Engineering Model

The model is a useful framework to diagnose the root causes of performance problems, by asking questions such as these:

Cell 1: Does the teacher know what the desired performance is?

Does the teacher have the information needed to do the performance, in an accurate, timely and useable fashion?

Cell 2 Does the teacher have the tools and resources needed to do the desired performance well, quickly and

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[2] A useful resource, with an excellent annotated bibliography, is Havelock, R.G. and Zlotolow, S. (1995). *The Change Agent's Guide, 2nd Ed.* Englewood Cliffs, NJ: Educational Technology Publications.

[3] An excellent resource on HPT is the International Society for Performance Improvement, www.ispi.org. The most comprehensive book is Stolovich, H. and Keeps, E. (eds.) (1999). *Handbook of Human Performance Technology, 2nd Ed.* San Francisco: Jossey Bass.

efficiently?

Does the teacher have accurate, specific and timely feedback on whether the desired performance is being accomplished?

Cell 3   What are the incentives to do the desired performance?

What are the disincentives to doing the desired performance?

What are the competing incentives for doing other, incompatible performances?

Cell 4   Does the teacher know how to do the performance?

(Or, more colorfully, could the teachers do it, if their lives depended on it?)

Cell 5   Does the teacher have the opportunity to do the desired performance?

Is there time to do the desired performance?

What other required tasks prevent the teacher from doing the desired performance?

Cell 6   Does the teacher want to do the desired performance?

Does the teacher find the desired performance intrinsically rewarding or satisfying or worthwhile?

What are the rewards for doing competing, incompatible performance?

How confident is the teacher of success in doing the desired performance?

Six general strategies are available to address barriers to performance in any of the cells. The first three apply to organizations as a whole:

Improve availability, quality and timeliness of information on what performance is expected, how do to what is expected, and whether what is expected is being done. (Cell 1)

Improve availability, power and usability of tools and resources; Improve accuracy, detail, and timeliness of feedback on success of performance (Cell 2)

Create incentives for desired performance, and eliminate competing incentives for undesirable performance. Incentives include recognition and praise, special assignments, and career advancement, among others, as well as pay. (Cell 3)

The next three strategies apply to individuals within organizations:

Improve individual knowledge and skill through professional development. (Cell 4)

Improve individual capacity to perform through flexible scheduling, performance support tools, adaptation of performance requirements to capacities of individuals, and selection of capable individuals. (Cell 5)

Improve individual motives to perform through assessment of motives and recruitment of people who match the realities of the situation. Improve confidence through positive feedback on success, and by assigning easier tasks first. (Cell 6)

Research by Gilbert and others has shown that the first three interventions are the most powerful, yet least commonly done. Instead, administrators (and private sector managers) attempt to deal with performance problems using only two of the individual strategies by providing training, attributing failure-to-perform to poor personal motivation, and attempting to recruit better motivated people.

This is an error that only exacerbates the situation: the newly recruited and highly motivated workers are trained in what they should do, but then are frustrated by organizational barriers to performance. Demoralization and "burnout" result, and in the long term the same old performance problems result. In the words of one wag, "pit a good person against a bad system, and the system will win every time." It's an all-too-familiar syndrome in education, where a large proportion of new teachers leave the field within their first three years of service.

If we apply Gilbert's model to the performance gaps identified in Part 1, we can identify a number of performance improvement strategies that can be implemented using appropriate technology.

Gap #1: Connection to Standards and Accountability

The question a teacher lives with is, *what do I do Monday?* One of the biggest difficulties teachers have is translating the ever-changing standards and benchmarks from their state or district, into concrete, specific lesson plans supported by instructional resources and assessment activities.

In Gilbert's terms, the barrier to performance here is having a clear understanding of what the desired performance is. This is an information gap, which can be addressed by an appropriate technology backed by a complete, current, detailed and credible data base that links standards and accountability to learning activities at the level of daily learning activities. The outcome is real learning (of standards), with real (measured) results—with feedback provided in real time to teachers and administrators, with real consequences for success (or failure).

Gap #2: Better-Aligned Instructional Resources

Using standards to find each day's assignment of textbook sections and other instructional resources is often beyond the time and capabilities of individual teachers.

In Gilbert's terms, this is a lack of information needed to facilitate selection of the right tools for the job. Providing the information, automated access to the resources, and the information to use them, is the required solution.

Gap #3: Need for More Great Teachers

Certainly, it is important to recruit and retain high-quality teachers. But, in Gilbert's terms, there are many things we can do to improve the quality of our teachers and their teaching. In many ways, the job of teaching as it is usually defined is simply beyond the capability of all but the most capable and most dedicated.

Gilbert's framework reminds us, however, that improving recruiting is only one strategy for improving individual performance. We also need to improve the capacity to perform by providing a range of productivity aids, and we need to improve teachers' knowledge and skills through training and other means.

For all these strategies, technology has a major role to play. In industry, there is considerable experience with **electronic performance support systems** (EPSS). We can adapt this technology for teachers, administrators and parents in seven ways:

Technology can automate much of the routine lesson planning, record-keeping and reporting.

True individualization for mastery learning is feasible only by using technology to take on the load of management (see gap # 8, below)

Technology can provide information that models and supports "best practices" in a "just in time" fashion.

Technology can provide knowledge of standards, "best practices" and a supportive community of practice, using "just in time" delivery.

Technology can provide near-immediate feedback to teachers on how they are doing with the students, by automating some kinds of assessment and reporting of results. This, in turn, makes it practical to use much more finely grained, and finely tuned assessments, rather than depending on relatively large and rare cumulative assessment events.

Technology can provide near-immediate feedback to administrators on how their students are progressing toward standards. This creates the possibility of intervening with individual classes and teachers, to provide highly targeted assistance.

Technology also can provide similar feedback to parents on the progress of their children against standards. This kind of detailed, near-real-time feedback is much more useful and informative than the usual grade-letter quarterly report card, which says little about where the problems and successes are, and says it too late to do anything about it.

Gap #4: Revolutionize Education Delivery by Using the Internet.

Gilbert points out that one of the best ways to improve capacity is to introduce flexibility of scheduling of the performance. In conventional teacher-centered classrooms, scheduling is inflexible, and virtually all learning activities place the teacher in the center—as the sole source of information. This not only restricts learning to what the teacher can provide, but it also restricts learning to a predetermined time and place, thus making it difficult, at best, to accommodate individual needs and interests within a standards-based framework.

Technology can play a major role in introducing flexibility to improve capacity. The basic principle is to use technology to deliver the kinds of instruction it can, and to automate assessment and management where possible, both within and outside the classroom. This allows for individualization and frees up teacher time to work on instructional tasks only humans can do. It can help move the teacher from a "sage on the stage" to a "guide on the side" role. Technology can improve instruction in three ways:

> Certain kinds of tutorial activities can be delivered directly by technology, on demand, in a self-paced format. This greatly improves the ability of learners to master what is taught, and frees the teacher to concentrate on teaching activities that can't be automated.

> Technology can serve as a tool and information resource directly for students, thus greatly increasing their productivity in learning tasks.

> Thanks to the Internet, there is no reason to restrict learning activities to the time and place shown on the schedule sheet. Learners can access learning activities from anywhere, at any time, and work on them at their own pace, while still empowering the teacher to assure that all learning activities are on-task and productive.

Gap #5: Assure Network and Internet Curriculum Accessibility by Teachers to Enhance Instructional Planning

Access to the Internet, as discussed in Part 1, includes both providing the hardware and software capacity for access in school and at home. However, in Gilbert's terms, this critical question of access to tools also includes training and providing a user environment that supports productive work by teachers and administrators. By its nature, training is delivered "just in case" and often long before it is needed. Performance supports built into a supportive user environment are delivered "just in time." Furthermore, motivation is improved when teachers faced with the same performance requirements are in contact, both face to face and electronically (via chat rooms and e-mail). This kind of contact overcomes the isolation of the classroom, and helps to create a supportive community of practice.

Gap #6: Promote Standards-Based Use of Internet by Students.

Similarly, it is not enough to provide hardware and Internet access to students. In Gilbert's terms, providing the tools here also implies providing a structured plan for standards-based use of on-line resources, whether provided through the Internet or local LAN or CD-ROM. It is all too easy for students to be "distracted" from the standards-relevant learning task by becoming engrossed in the technical details of making the software work, producing an attractive presentation, or browsing the Internet. This is one case where "hands-on" doesn't necessarily mean "minds-on." By creating a structured environment for standards-based use of the Internet, we can help assure that time on line is also time on task.

Gap #7: Provide Technology Skills and Support for Teachers

The skills to use technology are, in Gilbert's terms, a basic issue of knowledge and skill. Here, training is needed for some skills, but technology can offset some of the training requirement by direct technology-based delivery of training through the Internet. In addition, some kinds of technology training can be eliminated entirely through skillful user interface design and incorporation of performance supports directly into software.

Gap #8: Improve Instructional Management

In Gilbert's terms, a key part of improved information to guide performance is detailed and timely feedback on performance, coupled with appropriate and timely decision-making on what to do next. This need is equally critical for teachers and students.

Educationally, we refer to this process as instructional management. Using technology, it is practical for the first time to obtain data and information on performance on literally an hour-by-hour basis, and use that information to guide decisions on what to do next for each individual learner. It is possible to eliminate the practice of "one size fits all" instruction.

It is equally important for the all the feedback and prescriptive information to be stated in terms of progress toward standards. Stating the information in non-standards-referenced terms (such as global grades, chapters or topics, etc.) only serves to divert attention of teachers, students and parents away from the main objective. Teachers are hungry for standards-specific information they can believe about performance requirements. In the information vacuum that plagues most

classrooms, this can lead teachers to "teach to the test," for lack of a better alternative. The lesson here is that the technology system needs to provide all of its information in terms referenced to local standards, if the information is to be interpretable as knowledge by teachers and students.

Gap #9: Provide Ongoing Professional Development

In Gilbert's terms, knowledge gaps need to be addressed through a combination of training, information and placement. For educators, this means that teachers need to continually develop their skills in teaching, what is expected of them by standards, and how to ensure all of their students attain the benchmarks keyed to each standard.

Pre-service, or beginning-of-the-year, one-shot professional development has been shown repeatedly to be useful only for laying the groundwork for changed behavior. As we would expect from Gilbert, the more isolated the training is from the performance, and from performance improvement interventions using other strategies, the less likely the training is to actually change practice.

Technology can provide part of the solution. By reinforcing the messages of training with "just in time" knowledge and performance feedback, technology can greatly increase the effect the training has. Furthermore, the assessment and instructional management capabilities of an appropriately designed system can be used to target the needs of individual teachers. As discussed above, a face-to-face and online community of practice can be a powerful tool for mentoring and professional development. "One size fits all" works for teachers just as badly as it does for students. And, one-time workshops are ineffective.