

New Visions for Teaching and Learning in the 21st Century

By Ian Jukes and Ted McCain

© The InfoSavvy Group and Cystar, 2007

Synopsis

In an education system that emphasizes standards and high-stakes tests, is it realistic or even possible to encourage students to think, explore and develop their own understanding? This handout is designed to outline how schools can develop a research-based constructivist model to encourage students to search for understandings - while at the same time still have student excel at the tests. This presentation focuses on a fundamental shift in the basic paradigm of teaching that is required to prepare digital students for the Communication and Information Age. It provides a pragmatic look at current teacher practices and explains why they are becoming increasingly out of synch with our rapidly changing world. It then asks how we can teach effectively in an age when new technologies cascade onto the new digital landscape at an astonishing rate and identifies the principles and processes that transcend these new technologies.

Readers will come away with a clear understanding of how to address learning standards and improve test scores to meet both curricular goals, as well as strategies that will prepare students to meet the new realities of the 21st Century. Included is an overview of the 4 D's thinking process (Define, Design, Develop and Debrief) 7-layered curriculum model (content, process, tools, school to career, school to community, school to home, and contiguous assessment), the 5A's as well as a variety of inexpensive and free resources that can be used to support the transition to this new model. Readers should come prepared to have many of their present assumptions about education challenged. Counseling will be provided.

There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things, because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new.

Machiavelli, *The Prince*

What are the mandates of public education?

Put another way, what makes for a complete education?

Essentially, we have two mandates. The first is the acculturation of the individual into society. It's the passing on of the accumulated wisdom of the nation to the next generation through literature, poetry, history, geography, science, and mathematics. We want to develop students who have an appreciation of the aesthetic, the esoteric, the philosophical, the ethical and moral through art and music. What they learn will not necessarily be practical, but it should help them to become to become good citizens.

Our second mandate

Our second mandate is equally important to the first. It's to prepare students to be productive members of society. Learning to work, working to learn, learning to be a good citizen through literature, poetry, history, geography, science, mathematics. We want to help them to become productive members of society who are able to contribute economically to the nation while also ensuring their own financial success.

So how does the public think we're doing?

Based on watching the news, reading the newspaper and listening to politicians (Some whose most difficult three years of school were apparently grade 1 and whose senior year was grade 6) it's my observation that despite NCLB that education continues to be under attack

From who?

Back to basic zealots
Shortsighted politicians
People with personal agendas
Drive-by critics

The media

All feeding off our seeming paralysis

What's really happening?

Based on my research, it's my belief, that despite public perception, and despite the incredible diversity that American schools face, that:

IQ scores are up

Graduation rates are up

SAT scores are up

Participation in specialized courses like AP is up

But if this is the case, what's the problem?

Again based on my research, despite the issues of culture, race, and poverty this generation of student's is the best educated students in the history of American schools. Yet there is still increasing pressure to change.

Why is this happening?

At the same time that they are the best educated, his group of students is also the least prepared for the world outside school - but how could this be? The answer is that based on what Friedman and Pink are telling us it's that schools are operating on the wrong premise. We have the wrong mindset! Schools are based on Industrial Age thinking and the idea of scientific management developed by Frederick Winslow Taylor and popularized by Henry Ford.

Scientific Management

The principles of Scientific Management are based on the assumption that only the 15-20% academically blessed needed the broad conceptual skills and that the rest needed to be trained to be blue-collar followers. This is an assembly line mindset that broke tasks into sub-tasks, which were performed by Specialists who didn't need to know the big picture. They only needed to know their part - essentially they were expected to become machine-like

This wasn't just the mindset of the assembly line. How many have asked for help somewhere and gotten the response "It's not my department."

This assembly line mindset is everywhere in Industrial Age life - banks - department stores - insurance companies - even Schools

So what were/are the skills that are valued in the assembly line mindset?

Punctuality

Obedience - the ability to follow orders

Memorizing procedures

Essentially don't think - just do

These are skills that were learned once but lasted a lifetime. Industrial Age schools mirrored the businesses of the time.

From Agricultural to Industrial Thinking

As we moved to urban Industrial life there was a need for a properly trained workforce. Schools modeled the assembly line in their approach to learning. They taught punctuality and rote memorization - the implicit message was "Don't think - just do it."

What was the curriculum?

Content based

Informational and organizational

Compartmentalization

The students' main job was to memorize content and follow orders. The teachers' job to pass this mindset on to next generation.

I was 25 when I became a teacher. So you might wonder how did I teach? I followed my role models - my own teachers as a student, my sponsor teachers as student teacher, my veteran colleagues on staff

How did I do this? How did we teach? Both of us followed our role models. Listen closely and consider what skills are being valued.

In particular - listen carefully to what I say and try to determine what skills I'm emphasizing?

The full frontal lecture - a one act play

Okay guys, let's go. Let's get moving along here. Where were you yesterday Tom? We have a lot to get through. I only have 5 periods to get through all this stuff on Japan. Come on guys - 7 minutes have already gone by. Hand in your homework please. Where's your homework Patty? Did you forget it again?

Tony, please get your hands out of your pockets and take your feet off the desk. Mary, please get your stuff out. You'll need to take notes Where's your notebook? No you can't borrow my pencil.

Beverly, tell me what we were talking about last class. What do you mean you don't remember? Look - come on folks - let's go. I need you to take notes on the major towns, population, transport, industries, lifestyle and history of the Kansai region of Japan. You better write this down because you'll need to remember it for the test.

The Kansai regions of Japan has three major cities, Osaka, Kyoto and Kobe Osaka is the hub city. It has a population of 2,146,000. It's a port and financial center and also heavy manufacturing.

Kobe has a population of 1,875,000 people. It has copper smelters and is a major textile producer. Bill, did you write that down? We need to get through all this material for the test next Tuesday. Kobe is also port city - it's the center for ship building in Japan.

Kyoto has a population of 1,352,000. It's a center of heavy industry. It's known for its cultural heritage. In fact, during WW II, it was considered to be so rich in cultural heritage that the Allies made a conscious decision not to bomb it. A high-speed railway connects the 3 cities together

P

Pardon me James? No you don't have to write this all down if you don't want, it's entirely up to you. Yes, of course it counts. Yes you will have to know some of this for the test. Yes some of the information is in the book but not all the stuff I'm telling you. Jason, please settle down - this isn't going to take that long. What do you mean Gail? Yes, of course this is relevant. Now don't argue with me. What do you mean why? Because I said so - that's why. Yes, there's a written assignment - read Chapter 3 and do questions 1 - 7 from the end of the chapter. Yes, I will be marking it... yes of course it's graded and it could be on the final.

Do you recognize this approach?

I affectionately call this the full frontal lecture model. Do you recognize this approach? What's being valued here? What skills are being emphasized? Is it on problem solving?

No - the primary focus is delivery of content together with classroom management. The goal is to cover the material so kids can successfully write test

Who is being active here? Who owns the problem? The teacher of course!
What level of thinking is being valued - higher level or lower level? Lower level naturally.

Does this approach occur in your school? Do you know anyone who is teaching this way? Is its use more common than is acknowledged? Are there differences between the frequency with which it's taught at lower and higher grades?

This is TTWWADI (That's the Way We've Always Done It)

I don't know about you, but this is the way I was taught. Unconsciously it is my native language. Unconsciously it is my comfort zone. For many teachers, they have invested their lives in teaching this way because for the longest time, this is the way we were expected to teach.

And speaking for myself, when push comes to shove, it's very easy for me to unconsciously revert to this approach. It's the rubber band and TTWWADI

What else drives this?

Parental expectations - the curriculum guide. The sense that we just have to cover it. It's all about getting kids to the next class, the next grade, and the next level of education. It's particularly built into the evaluative tools of system and the multiple levels of testing that students face - the test on Monday; the end of unit, end of term, end of year tests; the state and national exams.

What's really taught?

The major focus is on content, on the explicit following of curriculum guides. If we look at it honestly, much of it is instruction in vacuum with little relevance to the real world. How do students respond? By asking questions such as "Why do we need to learn this?" or "Will this be on the test?" or "Does this count?" They don't have to say anything. You can tell what they're thinking from their body language.

Why do students tolerate this?

Primarily because they have to! We're in control. What is taught and how it's taught define the learning environment. This tends to create a sense of absolutes. It also rewards rote memorization and the regurgitation of the 'right' answers needed to pass the test. However, much more than content is learned. Students learn a fundamental approach to life with the teacher as their role model who sends powerful explicit and implicit messages about how and what students will learn.

So what's the message?

Read the book, take the notes, answer the questions, take the test - then forget it (teach, test, turf.) The teacher speaks and the student listens. The teacher initiates, the student reacts. The teacher is proactive and the student passive. Basically, the message is to follow orders, don't think, just do it - and your opinions don't matter.

Where did this model come from?

This culture of dependency is a perfect fit with the Industrial Age workplace and mindset. Accept the way things are, depend on a manager for decision making, solve problems by following instructions, and don't think, just do the job.

So what's wrong with that?

Don't get me wrong - this model worked well for almost a 100 years. It was part of an educational system that was specifically designed to ensure that students would drop out. Why? Only the top 20% needed to move on, and there were lots of good paying, union protected jobs available for the rest. School was simply part of a bigger societal process.

Not anymore

Today, we live in a fundamentally different world. There has been a technologically driven transformation of the workplace, along with a proliferation of automation, robotics and information technologies. Yet many schools still haven't changed. Many are still trying to uphold the fundamental tenets of the Industrial Age workplace that largely no longer exists.

So what happens?

What happens to students when they are taught this way for 12 months? What happens when this becomes the norm and students are taught this way for 13

years? Does it affect the way they think and the way they view the world? And if this is the only way they are taught, what's in a student's mental skill toolbox at graduation? What happens when he or she tries to use the toolbox?

This is the Industrial Age mindset

Teachers as specialists. Students are products. The purpose not to actualize the full personal potential of each student. The purpose is to sort by intelligence with the top 15-20% - the academically blessed who will move on to college & ultimately management positions. Schools were very successful using this model for a long period of time.

And when that happens, when that's the case, it leads to resistance to change. Teachers have invested their lives acquiring the skills and resources needed to support this premise and have been successful for many years - now they're being asked to change?

Why?

This is because the world has shifted to the Information Age. The only way I can put a change of this magnitude into perspective is to look at the last time a shift like this happened. This was the shift from Agricultural to Industrial Age. At the time, beast of burden agriculture was the norm. Much time, effort, money and infrastructure was in place to support this way of doing things

But then a new age emerged

Along comes mechanized agriculture in the form of the tractor. The tractor represented productivity gains so substantial they simply couldn't be ignored. The result. In 1900 it took 85% of the American population to feed the country once. Today it takes only 2% of the population to feed the world three times over

This has a huge impact on people. Longstanding jobs disappeared. People were compelled to migrate **to cities**.

So what happened to the skills of the Agricultural Age?

Overnight a new set of skills and knowledges were needed for the new age. New industries appeared to support mechanized agriculture

What happened to all those who had invested heavily in beast of burden agriculture? It was change or die. Adapt or become irrelevant!

Overnight new methods rendered old ineffective. This was very hard for many of that generation to accept because what was valued wasn't valued anymore. It's not that they had bad skills. They were just the wrong skills for the new mainstream of economic activity

How did this affect our schools back then?

The profound changes in society lead to new demands on schools. Schools were asked to shift gears to mirror the changing realities of the time. This meant a new curriculum - a new focus - new courses - new measures of accountability - new Sciences that were focused on the principles of Industrial Age

And now it's happening again!

Right out of left field we've had the unanticipated explosion of microelectronics into our lives. We've seen unprecedented advances in the exponential growth in power & productivity and InfoWhelm. The changes in last 10 years are greater than the last 10,000 and the changes in next 5 years will absolutely dwarf the changes we've experienced to date.

As Yogi Berra once said, this is déjà vu all over again. Dramatic productivity gains from new electronic tools are rendering Industrial Age tools and skills ineffective and irrelevant across all sectors of the economy. This has led to a new workplace and new global economy. We are making the shift to a new age again like we did before. When this happens, like before there's tremendous pressure to change or run the risk of becoming irrelevant as new methods and new technologies render old ones obsolete.

And like before, once again change is hard to accept. What was valued isn't valued anymore. And those who don't change tend to lag behind. This is the gap between the world of yesterday and the world of tomorrow - the world has already shifted gears, but schools have been very slow to change.

Now once again there's a gap between skills students need to operate in this world and what they're getting from schools so schools are being asked to shift gears again and there is resistance again.

The new workplace reality

A look at the modern workplace is an opportunity to look through a window that many people haven't seen. In the community where Ian lives is a large manufacturing company called Western Star. Western Star builds 16 wheel trucks and all terrain vehicles. They employ more than 5,000 people in 5 production facilities. Several years ago, in response to changing times, they abandoned the old ways and adopted the Toyota Manufacturing System model. Using this model, the production line is actually five parallel lines.

On the production line, orders reach and "pull" materials through the plant. If your customer doesn't need a product, the company doesn't produce it. Using the principles of zero-inventory and just in time delivery, the orders pull supplies into the production line. Suppliers deliver materials, typically within a 2-hour window. Trucks literally back up to the production line and off-load the necessary metal, plastic, hoses and other parts.

In the plant, every worker has a customer. The welder's customer is the framer; the framer's customer is the painter. All of the workers work to keep their customers happy. To do this, they only produce materials when they are needed. That's because wide-area networks and computer systems keep Western Star in close contact with both their suppliers and customers. Based on the day-by-day input they receive, they redesign the products and then reprogram the robots every night. If you build something and the design changes, the parts you have may not fit.

This is an amazingly high tech environment. Robots and human labor work together side by side. When a problem is encountered on the production line, lights that are positioned on the production line start to flash and the production line slows or stops. At that point, all of the workers on the line - painters, welders, framers - all work to make decisions to solve the problem in real time.

Meanwhile a clock tracks the amount of down time on the production line - that's because bonuses are paid for production, not just for working. This is high-pressure work. And you may be surprised to learn that the workers absolutely love their work because they own the system. But to work here, the workers need a completely different set of skills than they needed than in the past.

GenNext meets the new workplace

Junior gets a job in such a production facility. The days of storehouses of inventory are gone forever. They just cost too much. Timing is everything. If supplies don't make it in time, the whole production line may have to shut down. Junior works both independently and as part of team. His job is to deal with complex statistical numerical control systems in order to quickly load trucks in the correct sequence for delivery in a very narrow time frame. This is extremely high-pressure work.

One day, Junior's department has a problem. Suddenly there are an increasing number of complaints over missed and incorrect deliveries. There is trouble loading trucks on time and in the right sequence. Management asks for creative solutions to the problem. The department manager turns to Junior for help and requests a definitive solution in the next 24 hours.

How does Junior respond?

If Junior is a product of Industrial Age thinking and systems, we have a serious problem. If he's a product of the traditional school system, he's been raised in a culture of dependency and probably has little if anything in his intellectual toolbox to help him solve the problem. That's because the Industrial Age model never expected Junior to make important decisions. He was just expected to follow orders and take multiple-choice tests. So what does he do? He suffers immediate physical and mental paralysis followed by a strong desire to run away.

Junior is a product of the system. In all likelihood he is a dependent, theoretical learner with few applied higher level thinking skills. Consequently, he's generally paralyzed without specific direction because most of his learning has occurred in isolation. He doesn't easily make connections between subject areas or disciplines. He has a fragmented, ready-fire-aim approach to problem solving. With little experience or self-confidence, he waits for instructions.

Inevitably this leads to complaints from employers. While reading and writing is important to them, their number one complaint is that students wait to be told what to do. In business today, employers want workers that can hit the ground running because they do not have the time to teach them these skills.

Thus, when Junior fails to respond to the situation, this inevitably leads to questions and complaints about what we teach.

In today's world, what do they want - what do they need?

Business today wants independent problem solvers with good interpersonal skills who can function well in a team. They want people who view issues holistically and who can apply theory to real time, real life situations, and who demand excellence from themselves and their team.

It is obvious teachers must teach a fundamentally different set of skills in a fundamentally different way. We need to systematically teach problem solving skills. We must teach both the theory and the application of theory to real world, real time situations. Willard Daggett tells us that applying is a higher order thinking skill because you can't apply something until you first understand the theory behind the application of the skill. Today, the term 'applied' is as used as a euphemism for 'easier,' 'dumbed down,' or for skills for slow students.

How can we do this?

How do we get beyond TTWWADI? What would the curriculum look like? Here is another one-act play - another approach - a 21st Century approach. Read carefully and consider what's different. What skills are being valued here and how are they different from the skills that were valued in the last example?

A 21st Century Approach

Good morning class. Please hurry up and let's get going. I've got an interesting problem for you to solve this week, so the quicker I get out of your hair, the quicker you can get on with it. Usual groups please.

Okay folks, let's go. Each group has been given an outline of the problem, the resource guides, the self and group evaluation forms and the problem solving forms. They're in the blue envelopes on your table. Your job for the next 5 periods is to become travel agents. Remember that in business today, it's really competitive - it's all about adding value to your services. The value you need to add is the informational service you provide in addition to the normal services of a travel agent. There are lots of travel agents out there - how do you gain a competitive edge other travel agents?

Try to keep this in mind as you work through this problem You are about to get a phone call from Svenn Mikkelsen, the president of IT Pacific Shipping, they're one of our biggest clients...

Good morning - this is Svenn Mikkelsen at IT Pacific calling. We're going to be sending 3 of our execs to the Kansai region of Japan 2 weeks from tomorrow. They will spending 2 nights each in the cities of Osaka, Kyoto, and Kobe where they will be looking for new business - we'll provide you with the dates they'll need to be in each city. Now to prepare for the trip we'll need travel costs and accommodations built into an itinerary

We'll also need to know the best way to get around while we're over there The purpose of the trip is to explore the possibility of building a branch office in the are.

Now remember we ship via containers on ocean freighters so we need your recommendations for the best city to locate the office based on port & financial services

Also, these folks have been working hard so we want you to build in 3 days of holidays for them during the trip - so any suggestions for popular tourist type activities would be most helpful - they happen to be history buffs - be sure to arrange some good holiday & rest & relaxation experiences. They'll definitely want to slip in some sightseeing if possible.

They'd like to visit some religious & historical sites, see the government buildings, do a bit of shopping, try some different foods, and maybe see a cultural event or two. They've mentioned that they'd especially like to visit some places that Western tourists wouldn't normally go

No - thanks for the suggestion - IT Pacific will not pay for the trip to the Geisha house! (And no, it won't help you or your group to get a better grade)

Remember that we are very price sensitive so don't even think about sending them first class!

Yes, a Japanese hotel instead of a Western hotel would be just fine. Economy class is good! They'll need a complete itinerary including information on the hotels, airfare, railways, travel costs, historical background, tourist destinations - the works.

Now we will need a group of three of you to come and make a presentation to their

board of directors next Tuesday. The presentation should focus on what you have found so they can make a quick decision for the trip, We'd also like you to leave some printed materials that they can examine after your presentation is over. Please keep track of your time and create a bill for your services as you normally do. We're looking forward to seeing you next Tuesday

What's different here?

How is it different? Who owns the learning? Will the students discover the content covered in the previous lesson using the traditional teaching we watched previously? Will they discover the major economic activity in the cities? Will they learn that Kyoto was not bombed? Will they learn about the high-speed train system? Maybe.

The difference here is that the content is learned within the context of a specific problem to be solved, which allows for a greater probability of long term recall. Context is the key here because things are learned and taught. The learning is driven by the context of the problem. Students become the owners of their own learning as they deal with real world problems.

At the same time, the teacher takes on the role of a customer or client. The teacher gives the problem while playing a relevant role and then sits down. Initially most students will sit there, waiting to be told what to do. The teacher, still role-playing, may now stand up and say "it's worth 400 marks and it's due on Monday - do you have any questions?"

Handing over the task to the students fosters the personal ownership of the learning. It becomes the learner's issue, not the teacher's, and it provides role-playing opportunities for people with little or no previous experience.

The teacher's task is to add value to the content and to add value to the experience by crafting problems that provide a framework on which to hang the information that must be learned, thus allowing the content to be learned in a far broader context. The teacher is the one who shapes the learning so the students interact with the structured process skills required to tackle such tasks.

The key here is developing an engaging methodology - something that hooks the students. This is combined with pre-determined criteria in the form of a checklist of specs negotiated by both the teacher and the student that outlines precisely

what students need to do and what mark they will get if they accomplish all of the criteria.

And now here's the critical question. When if kids are taught this way (even on a part-time basis?) If they forget the content, will anything else of substance remain behind after the fact? And the answer is it will be the process skills that have been learned within the context of a real time, real world problem or simulation of this problem.

What's being valued here?

It's the things needed for success - the 21st Century fluencies. It's not stand-alone content. It's content taught within the context of a defined process that's used to solve real world problems. The context of the problem makes the content relevant so there is a far greater chance of long term recall of content when this approach is used

As an aside, using this model what is the role of technology in solving this problem. Is technology the focus? No! Will learners have to use technology to solve aspects of the problem? Yes! Will the students develop technology skills? Yes, but the difference here is that solving the problem provides the context for the learning so technology is nothing but an incidental but essential byproduct of the learning. The focus is on headware not hardware

Giving them a real life problem fosters personal ownership of learning. The problem becomes their issue not ours plus it provides role-playing opportunities and gives the chance to play different roles to people with little or no previous experience in solving real world problems.

The teacher's task is to add value to the content and the experience. The teacher's task is to craft problems that provide a framework on which to hang the information - the content - the standards - that must be learned but it allows that content to be learned from a far broader context.

Learning is based on the 4 Ds of problem solving

The process Ted has developed for his students is called the 4Ds. It is based on the structured thought process found in systems analysis and design, and it has proven to be effective in virtually every area of human endeavor. This process involves 4 distinct steps that lead to effective solutions to problems. The process begins with a carefully crafted problem. Well-designed problems generate questions. Questions lead to shifting ownership from the teacher to the students. Ownership leads to independent learning. Independent learning leads to a culture of autonomy. This process has 4 distinct steps

i) Define

Students must be taught to define a task so the problem is fully understood before the work begins. How many times have you seen someone waste time working on the wrong task? It is imperative that students learn to clearly define the task and then confirm their understanding before proceeding. This is a valuable life skill. In addition, by turning the responsibility for defining a task over to the students, we force them to use a variety of higher-level thinking skills as they determine what is to be done.

In the traditional approach to instruction, teachers do the defining and designing work for their students. Assignments are often presented as something already half-finished, with the questions and the directions for finding the solution already in place. This fosters and maintains a culture of student dependency on the teacher to provide the appropriate materials and information.

There are three critical components in the define stage. First, students must properly define the task in specific performance terms before proceeding. Second, students must know how performance will be evaluated - how they will be rewarded before they begin a task. My observation is that most kids have no idea how evaluation will be done when they start a task. Finally, the task and the evaluation terms must be confirmed before going any further.

Who has power in this model? If the student wants to have power over the teacher, all they have to do is get the teacher to sign off on the student's define.

This is a real-world skill. You'd never agree to take a job before you signed a contract and discussed the terms of reference - how much you would make,

what your responsibilities would be, how your performance would be evaluated. The real world simply doesn't work this way.

ii) Design

Have you ever started a project without carefully thinking through the process? Creating a plan provides you with a guide as you work. Planning in advance prevents wasted effort and ensures a logical strategy for developing a realistic solution to a problem while at the same time allowing you to determine best way to do a task given the constraints of time & money.

At the design stage everything is created twice. First you develop a mental picture of what it will look like then you actually do it. There are 2 types of learning that take place at this stage. First you need to determine what needs to be done and then you have to determine what skills will be needed to do it.

Once a problem has been defined, students must then design a solution. First the actual project is outlined and all the critical steps are established before the work begins, which helps determine the workflow while at the same time providing measurable outcomes/benchmarks for each point of the project.

It's important to emphasize that this is not just about asking the students to do their own thing. Sometimes it involves full frontal lecturing. The difference here is that the students are in control of their learning,

Often this will require students to learn new skills or acquire new information to be able to successfully accomplish the task to be done. The goal in this step is to have the students themselves determine what they need to learn to accomplish the task they have been given. This is a key in fostering independent thinking in students. They will not be able to depend on teachers when they enter the workplace so we need to begin giving the responsibility for learning over to them before they leave us. This means new roles for teachers. If the students are given the job of determining what needs to be learned to accomplish the task they have been given, it becomes the job of the teacher to craft the problems that lead students into the material in the curriculum that needs to be covered. It also means that teachers become guides who point students in the right direction after they have determined what they need to learn.

While the tools & resources might be same as in lecture-based class, the major difference is that the teacher waits for the students to ask them the questions.

This is teaching lazy - this is progressive withdrawal - the responsibility is shifted onto the shoulders of the students where it belongs which ensures that the students will have to pay close attention and begins to build a bridge from traditional teaching to project based 21st Century learning.

Students learn because they've asked for it. They've asked because they need information to complete the project.

This approach presents very different challenges because there are a very different set of skills needed to complete a project than the skills that are needed to take a test.

My yearlong goal is to teach nothing to my students that they don't ask me to teach them. To only teach them what I'm asked to teach them. To teach lazy - to teach to subgroups - it doesn't matter how they learn it - whether they learn from me, whether they learn from a world experience, from the Internet, or their parents - as long as they learn - and learn how to learn.

iii) Do (Develop)

Once a problem has been defined and a plan for its solution has been designed, students must then put the plan into action. At the Do stage, the students apply what's been learned to create an itinerary, dig a ditch, build a house, construct a bridge, write an essay, perform an experiment, make a presentation, create a sculpture, participate in a debate, write a story, build a desk, bake a cake, or creating a multimedia presentation.

Whatever the task, the student must apply the learning that took place in the design step to do some real work - to create a product that communicates the results of their thought processes. It's important to stress that this type of learning is not a linear process. There are always roadblocks. It's very likely the learner will have to go back several times to the design step - that they will have to revise, get feedback, use observation, and reflection.

This is exactly like the writing process, which is nothing more than a structured thought process, the same as 4D's. Students (and teachers) must realize that product is still important - but to improve product you must also focus on process that creates it

iv) Debrief

This is a step that is often overlooked in education. However, determining whether or not you have actually accomplished what you set out to do is an essential part of learning. It provides useful feedback that helps students to do better next time. Continual feedback and performance reviews are just 2 examples of how the Debrief step is built into the procedures of many businesses that are striving for excellence from their employees. It is critical that students get feedback on both the product they have developed as well as the process they followed in creating it if we want them to get used to the environment of continual improvement they will surely face upon graduation.

In the real world, the key to success is a focus on continual improvement - what we call CANI - constant and never ending improvement. In my opinion a continual evaluation of our work is something that is sadly missing in education today. Students shouldn't be able to just hand it in and shift responsibility entirely to the teacher. Learning is a cyclical not linear process - if the project doesn't meet the stated goals at the Design step then back to Define & Design cycles again until the project is satisfactorily completed.

The major problem with our traditional model is that the teachers do all the evaluation. Plus the primary focus is on the end products of learning, not on the process of learning. Students get the idea that problem solving is a linear process that ends when they give a completed product to the teacher, whereupon the responsibility then shifts to teacher.

In real life, the responsibility for work continues long after the production of the initial product is completed. It's critical that we get students involved in the evaluation of their work as this fosters ownership and helps develop an essential real-world skill that is an every day part of the age of the entrepreneur.

The debrief stage provides an opportunity to identify problems that have cropped up - to evaluate the entire project - to assess the end product in terms of original goals set out at the Design stage.

What was learned, how was it learned, what were the challenges and obstacles that were encountered, how could product be improved next time? The teacher's role is to simply validate what the students have done. And I have to emphasize, that this is more than just the end product.

We must also get students to evaluate the process that was followed. Here are two examples:

Two assignments are handed in. Both earn a grade of 89%. One student effectively spaced all of the work over the entire time frame while another student did all the work on the last two days.

Although it's a good product, the second one was created at great disruption to the student's life. Although the product may be good, one student has a serious time management problem that would never be uncovered if the assessment was based only on the end product and not the process.

A second example sees 2 assignments completed. Both receive a grade of 92%. However, one student spent 5 hours on the task, which is average while the other spent 27 hours to complete the same amount of work. One of these students has an efficiency problem. If the focus were just on the end product and not also the process, the real areas of weakness in one of the students would not be detected.

This new model requires a new role for the teacher. To move from being the sage on the stage to being the facilitator of learning. And it also requires a shift in the concept of evaluation. From the teacher having all the responsibility for assessment and evaluation to confirming that student's assessment is valid.

My job as a teacher is no longer just to stand up in front of my students and show them how smart I am. My job is to help them understand how smart they can. My job is to teach lazy. My job is to shift the burden of responsibility for learning from me to them, where it belongs.

The goal here is independence - the students should no longer need us when they leave the school system.

And beyond this, there are new factors to consider- I give marks for Initiative, Independence, Problem Solving & Positive Attitude. As Tom Peters writes, "what gets measured, gets done - and conversely what doesn't get measured doesn't get done."

The missing link is the fundamental policy of progressive withdrawal. But progressive withdrawal can't be invoked all at once. It's like child learning to walk - we have to take baby steps at first. But if we want them to become independent thinkers and learners - if we want them to develop 21st Century fluency skills - we must stop solving problems for them. We must help them become problem solvers - this involves critical thinking, decision making, leadership, communication, organizational, negotiating, stress management, time management skills and all the rest. These skills are harder to teach but must persist because we are living in complex, exponential times.

This means that our students must learn to deal with incomplete information. This means that they must move from problems with predetermined predictable solutions to problems with unpredictable solutions.

And it is critical that the learning in every stage of the 4Ds approach involve real world relevance. Students quickly see the worth in applying their problem solving skills to real world tasks. This fosters ownership of the problem solving process and leads to a culture of autonomy. Repeated and systematic application of the 4Ds empowers independent thinkers. When students are consistently taught to learn through this problem solving approach, they enter the real world knowing what to do when they encounter the problems they are certain to face.

While we cannot expect students in Kindergarten to have this set of skills, it's reasonable to expect them from all students by the time they reach Grade 12. Developing this set of process skills should be a curriculum goal applied through a combination of repeated practice together with a policy of progressive withdrawal. Using this approach, teachers first walk younger students through the process step by step. But as students get more experienced in applying the 4Ds to problem solving, teachers progressively withdraw from supporting students, expecting them to do more and more of the work independently. By the time these students reach

Grade 12, they should have the necessary skills to allow them to work through real life problems independent of their teachers.

As we mentioned, graduates of the traditional school system find themselves steeped in a culture of dependency. From Kindergarten to Grade 12, they have been in a system that has reinforced the idea that content and memorization taught by rote learning is more important than thinking itself. When we take this system away from our students at graduation, we shouldn't be surprised to see they are not able to stand on their own. As we begin to make the transition from traditional teaching methods to a problem solving approach for all students, we must learn to gradually let go. It's like watching small children learning to walk. They fall often, but eventually they are able to move around on their own. When it comes to these problem solving process skills, we must equip students with an understanding of the 4D approach and then let go of them so they can fall and make mistakes. In that way, we can provide guidance and feedback to help students become better problem solvers while they are still with us.

Role-playing is a critical element of this model

It's a process that can be applied across all human endeavors. How did you get better at anything? By practicing it! And if we want students to be ready for modern workplace, curriculum, we must have real world links.

Plus they need the chance to fail. In the book "In Search of Excellence" by Peters and Waterman they wrote that the essence of innovation is the pursuit of failure. That there is no success without failure, there is no big success without big failure - that failing is good.

We have fall to learn. In school we hold tight. Students need the chance to fall while they're still with us - it's like a skinned knee - failure is not a crime - only failure to learn from failure is a crime.

A friendly warning

Because of our personal experiences, if it hasn't happened already, this model will be highly disorienting for you at first. You'll feel like you've lost control. Don't worry - the idea that we have control is only an illusion anyway. You can't have students become independent without letting go and losing some control. Anyone who has teenagers knows exactly what I mean. As parent it's hard to let go, but you know you have to.

You'll need time to think about the concepts, to tinker with ideas, and to properly reflect and prepare for a move to this model. If you jump into this overnight without adequately preparing your students, this approach is guaranteed to fail. Your students & your colleagues will be equally frustrated. This especially applies at the high school level where students have finally figured out how school works based on years of experience. High school students will be incredibly thrown off balance if the rules are suddenly changed.

But here's the big question:

What would happen if...

What would happen if students were taught like this for 12 months? What would happen if they were taught like this for 13 years? What if this was the norm? And what different skills would be in their skills toolbox at graduation if they were taught this way? And how can we get beyond TTWWADI? (That's the Way We've Always Done It)

Transcendental teachers at work

Transcendental teachers use a structured approach; they teach the 4Ds of problem solving (Define, Design, Develop, Debrief) and the 5As of information fluency: (Asking the right questions, Accessing the data, Analyzing and authenticating the information, Applying what has been learned, and Assessing both the process and the product.) *For more details on the 5As see the It's Not the Internet, It's the Information and Born to Be Wired handouts at <http://www.ianjukes.com> as well for sections from the NetSavvy: Building Information Literacy in the Classroom book.* These principals are used as the foundation for all learning.

What are the characteristics of teachers who teach this way?

Transcendental teachers teach students to work with incomplete information incrementally; they progressively introduce informational disorder and uncertainty as the norm. They model interpretation and extrapolation of information from a variety of sources; they walk what they talk, rejecting strategies that inhibits creativity and individuality or promotes a culture of dependence. Transcendental teachers consistently use the strategy of progressive withdrawal to create a culture of autonomy. They distinguish between covering and learning curriculum - they practice the poorly rule which states that "if it's worth doing, it's worth doing poorly in the beginning" - they encourage productive or useful failure and model the

independent thinking, problem solving and information fluency skills that they want their students to develop. Transcendental teachers understand that kids do what you do, not what you say; and in particular, they understand that what's modeled by the teacher carries powerful implicit messages. Such teachers work to shift ownership/responsibility of learning to their students by explaining the relevancy of what is being taught by providing materials in the classroom that reflect the real world. How do they make all this happen in their classrooms?

The Seven Layers of Learning

Transcendental teachers make connections to the 7 layers of learning. The 7 layers are:

- to content
- to process skills
- to tool (technological) competencies
- to real life/world/career/workplace situations
- to communities and community resources
- to parents
- to qualitative and quantitative assessment

An Elementary Example

Scenario: I have owned a pet shop for many years and made a small fortune selling cats and rate, dogs and frogs, guppies and puppies ...you get the picture. But I'm an over the horizon thinker and I'm beginning to realize that the real money is in exotic pets. I'm putting a proposal out for tender to several groups in my class. I have now hired you as consultants, and I need you to come back in 7 days with recommendations at to how I should expand my pet shop and turn it into an exotic pet shop. You will need to create an expansion budget as well operational budget. You need to advise me as to what types of creatures I should be adding to my store - and if you recommend spitting cobras, or Komodo dragons, or giraffes, or elephants or whatever, you need to in each case be able to tell me how much they will cost, what will be needed to house them, what will be needed to take care of them, to feed them - and are there any special considerations that need to be taken into account? Applying the 4Ds and the 7 layers, let's ask some questions?

(Please note: We only have room for a quick overview here - for complete details, check out the recommended resources provided below)

Are there content connections?

1. Science - characteristics of different animal - behavior - handling...
2. Math - calculating living area, feed requirements, estimating expansion and operating budget...
3. English - writing reports, communication skills, writing proposals...
4. Could you and your students make connections to other areas SS, Music, Art, Home Economics, PE...?

Do they learn processes?

Could critical information processing, critical thinking, decision making and problem solving opportunities be introduced in a structured manner?

1. critical thinking
2. problem solving
3. decision making
4. information literacy
5. technical reading
6. technical writing
7. working in teams
8. learning in teams
9. other process skills?

Do they learn how to use tools (notice we didn't say technology)?

Is the use of the tools contextualized, with a focus on the task rather than just the tool, so that learning about the technology is just an incidental but essential by-product of the learning?

1. could they learn how to use a tape recorder, not to learn the tool, but to use for interviews?
2. could they use a video camera to collect information?
3. could they use a network, CD, Explore, e-mail or other software for research?
4. could they use Word for report writing?
5. could they use PowerPoint or Keynote for presentations?
6. could they use Excel to create budgets?
7. any other software that might work?

Are there workplace connections?

Who in your community could you call on to provide additional expertise above and beyond that held by the teacher? Could you contact and work with:

1. pet store owners

2. veterinarians
3. accountants
4. contractors
5. builders
6. how about the virtual experts available on-line?
7. how about one or more of the more than 1400 virtual zoos or 300 virtual aquariums?
8. how about on-line societies such as the World Wildlife Foundation or Greenpeace?

Are there community connections?

Who in your community has a vested interest in the fact that you are considering bringing spitting cobras into town? Could you contact and work with:

1. city government - bylaw enforcement
2. other that are competition or partners to your businesses
3. the media
4. senior citizens
5. community activists
6. humane societies
7. animal rights organizations

Are there connections between home and school?

How can we go beyond just informing and communicating with our parents about what is being studied in school?

1. could we gain access to personal expertise from parents and specialist contacts they might have
2. could parents provide structured guidance with practice in interviewing, doing research and making oral presentations
3. are there ways to extend the learning beyond the traditional 9 to 3

How about assessment?

1. is it project-based?
2. does it allow for contextualized learning?
3. is there a means of authentically assessing learning?
4. is there a means for summative, formative, qualitative, and/or quantitative, measurements of learning that would align with state standards?

A critical question

If they forget content, will anything else of substance be learned? And the answer is the process and problem solving skills that have been learned by applying content within context of real time, real world tasks

A Secondary Example

Scenario: I live in a town that has been growing dramatically for the past several years. In fact, it has grown so quickly that the existing water system has been completely overwhelmed. A bond has just been passed to upgrade the current water system but it will be 3 to 5 years before this will take place. I have hired groups of students in my class as consultants. Their task is to create a presentation for City Council outlining an interim plan to manage the existing water supply while effectively informing the community of the current situation and the steps they need to take in the meantime to conserve the existing water supply until the new system is in place.

(Please note: We only have room for a quick overview here - for complete details, check out the recommended resources provided below)

Are there content connections?

1. Physics - creating water pressure
2. Biology - controlling water quality, protecting the existing water table
3. Math - calculating water volume and flow
4. English - creating effective information pamphlets, writing reports and proposals, making presentations
5. Social Studies, Music, Art, PE...
6. Could connections be made to other areas SS, Music, Art, Home Economics, PE...?

Do they learn processes?

Could critical information processing, critical thinking, decision making and problem solving opportunities be introduced in a structured manner?

1. critical thinking, problem solving, decision making skills
2. research skills
3. information analysis
4. speaking and listening
5. technical reading and writing
6. working and learning in teams

7. other process skills?

Do they learn how to use tools (notice we didn't say technology)

Is the use of the tools contextualized, with a focus on the task rather than just the tool, so that learning about the technology is just an incidental but essential by-product of the learning?

1. would they use Explorer and e-mail for research?
2. WP for report writing?
3. Science probes?
4. graphing tools?
5. Power Point for presentations?
6. publishing tools for creating effective newsletters?
8. any other software that might work?

Are there workplace connections?

Who in your community could you call on to provide additional expertise above and beyond that held by the teacher? Could you contact and work with:

1. city planners
2. water engineers
3. well drillers
4. geologists
5. testing agencies
6. hospitals
7. bottling companies
8. waste recycling agencies
9. virtual experts?

Are there community connections?

Who in your community has a vested interest in the water supply in your community? Just about everyone!! Could you contact and work with:

1. recreation organizations
2. environmental agencies
3. environmental activists
4. Sierra Club
5. businesses
6. realtors
7. senior citizens

Are there connections between home and school?

How can we go beyond just informing and communicating with our parents about what is being studied in school? Could we gain access to personal expertise from parents and specialist contacts they might have? Could parents provide structured guidance with practice in interviewing, doing research and making oral presentations

are there ways to extend the learning beyond the traditional 9 to 3

How about assessment?

1. is it project-based?
2. does it allow for contextualized learning?
3. is there a means of authentically assessing learning?
4. is there a means for summative, formative, qualitative, and/or quantitative, measurements of learning that would align with state standards?

And now, once again, the critical question

If they forget content, will anything else of substance be learned? And the answer is... the process and problem solving skills that have been learned by applying content within context of real time, real world tasks.

SOME RESOURCES TO SUPPORT THIS MODEL

CURRICULUM and LEARNING

Teaching for Tomorrow: Teaching Content and Problem-Solving Skills

by Ted McCain

Although I may seem a bit biased in that he co-authored *Windows on the Future* with me, I truly believe that Ted McCain understands the big picture in education better than just about anyone out there. And if you've ever got the opportunity to hear him speak, you'll know exactly what I'm talking about.

This said, if you're frustrated with the direction education appears to be heading - if you feel an overwhelming need to reconsider the relevancy of what you teach - or if you want to discover how to get students to develop "real-world" problem-solving skills, you'll definitely want to read Ted's new book *Teaching For Tomorrow: Teaching Content and Problem-Solving Skills* (2005, Corwin Press)

Through first-hand experience, Ted concisely lays out the argument for preparing students for their world, guiding them to become independent and successful critical thinkers. *Teaching for Tomorrow* brings everyday life encounters and situations as text to the classroom, challenging students to engage more deeply in their learning and teachers in their teaching. By eliminating the typical stand and deliver approach, Ted hopes educators will now focus on using instruction that allows students to create knowledge for themselves.

Major components of the book include:

1. Role-playing scenarios
2. Mapping out 6 changes to teaching that enable teachers to use problem-solving, project- based instruction effectively
3. The outline of the 4 D's (Define, Design, Do, and Debrief), a step-by-step process for student work and for problem solving applicable to virtually any field

By gaining real-world skills rather than just "school" skills, students are engaged in thoughtful work, learning to collaborate, taking responsibility for their own time and tasks, and becoming creative problem solvers in the classroom and for life beyond. This book is **HIGHLY** recommended.

The World Is Flat: A Brief History of the Twenty-first Century

by Thomas L. Friedman

Thomas Friedman is not so much a futurist, which he is sometimes called, as a presentist. His aim, in his new book, *The World Is Flat*, as in his earlier, influential *Lexus and the Olive Tree*, is not to give you a speculative preview of the wonders that are sure to come in your lifetime, but rather to get you caught up on the wonders that are already here. The world isn't going to be flat, it *is* flat, which gives Friedman's breathless narrative much of its urgency, and which also saves it from the Epcot-style polyester sheen that futurists--the optimistic ones at least--are inevitably prone to.

What Friedman means by "flat" is "connected": the lowering of trade and political barriers and the exponential technical advances of the digital revolution have made it possible to do business, or almost anything else, instantaneously with billions of other people across the planet. This in itself should not be news to anyone. But the news that Friedman has to deliver is that just when we stopped paying attention to these developments--when the dot-com bust turned interest away from the business and technology pages and when 9/11 and the Iraq War turned all eyes toward the Middle East--is when they actually began to accelerate. Globalization 3.0, as he calls it, is driven not by major corporations or giant trade organizations like the World Bank, but by individuals: desktop freelancers and innovative startups all over the world (but especially in India and China) who can compete--and win--not just for low-wage manufacturing and information labor but, increasingly, for the highest-end research and design work as well. (He doesn't forget the "mutant supply chains" like Al-Qaeda that let the small act big in more destructive ways.) Friedman tells his eye-opening story with the catchy slogans and globe-hopping anecdotes that readers of his earlier books and his *New York Times* columns will know well, and also with a stern sort of optimism. He wants to tell you how exciting this new world is, but he also wants you to know you're going to be trampled if you don't keep up with it. His book is an excellent place to begin

A Whole New Mind: Moving from the Information Age to the Conceptual Age by Daniel Pink

We live in left brain society - a society that has long honored linear, logical, left to right, top to bottom beginning to end, piecemeal content recall-based knowledge and thinking. This is the world and the mindset of No Child Left Untested.

The role of the right side of the brain, which handles pattern analysis, big picture thinking, intuition and the like, has long been undervalued and misunderstood in our right-brained society. In fact, at one time the right brain was considered to be the 2nd rate side of the brain.

But as Pink points out, just about anything that requires right brain thinking can be automated, turned into software, or outsourced to the third world. Pink talks about our emerging world where critical thinking, problem solving, and a deep level of information fluency - in other words using the whole new mind - is increasingly more highly valued than simple content recall. Just as information workers surpassed physical laborers in economic importance, Pink claims, the workplace terrain is changing yet again, and power will inevitably shift to people who possess strong right brain qualities.

His advocacy of "R-directed thinking" begins with a bit of neuroscience tourism to a brain lab that will be extremely familiar to those who have read Steven Johnson's *Everything Bad is Good For You*, but while Johnson was fascinated by the brain's internal processes, Pink is more concerned with how certain skill sets can be harnessed effectively in the dawning "Conceptual Age." The second half of the book details the six "senses" Pink identifies as crucial to success in the new economy - design, story, symphony, empathy, play and meaning - while "portfolio" sections offer practical advice on how to cultivate these skills within oneself.

Everything Bad Is Good for You: How Today's Popular Culture Is Actually Making Us Smarter

By Steven Johnson

In his new book *Everything Bad Is Good for You: How Today's Popular Culture is Actually Making Us Smarter*, social critic & technologist Steven Johnson argues the plots of today's video games, movies & TV challenge young viewers to think like grown-ups, follow intricate narratives & analyze complex social networks. Johnson, a regular contributor to *Wired* magazine, points out despite popular belief that

electronic media is "dumbing down" society, IQs in the developed world have risen three points a decade for the past 100 years.

For Johnson, pop culture is like algebra class. Whether you remember the quadratic equation as an adult is less important than whether you learned the analytic thought processes that solving equations teaches. Likewise, for Johnson, what matters about pop culture is not its message but whether it forces you to engage in complex thought, analysis & reasoning.

His conclusion: it does, & shockingly well. Today's pop culture, he writes, builds on rules established by earlier pop culture (as, say, *The Simpsons* complicated the sitcom genre). And new formats such as DVDs make audiences more receptive to complex creations that reward repeat viewing or playing. A traditionalist could say that new media are simply good at teaching children to use new media, but Johnson argues persuasively that they also force children "to think like grownups: analyzing complex social networks, managing resources, tracking subtle narrative intertwining, recognizing long-term patterns."

If you are struggling to understand *Digital Children*, this is a great read!

Understanding by Design

by Grant Wiggins, Jay McTighe

McTighe and Williams successfully expound on a subject often mired in philosophical debate: how to assess understanding and evaluate true learning. It is an outstanding framework for developing curriculum intent on extending beyond traditional methods of teaching and preaching to students. The authors contend that true understanding can be assessed by measuring performance against six facets of understanding: explanation, interpretation, application, perspective, empathy, and self-knowledge. These facets are vital to developing curriculum and the authors do an outstanding job of presenting the material in charts, and exercises, making a difficult topic easier to understand. Comparing and contrasting covering material and uncovering knowledge serves to help teachers think like assessors, rather than activity planners. Helpful design tools are included throughout the book and teachers are instructed to evaluate the effectiveness of their teaching with thoughtful and probing questions.

Understanding by Design will serve as my guide for evaluating my own effectiveness as a teacher. I expect to rely on it to gauge my own competency in

developing and executing lessons. Examples throughout the book illuminating the practical applications of each of the six facets are well organized and easy to follow. I found the use of keywords and charts especially helpful in furthering my own understanding of how to uncover knowledge. I am confident that if I remain faithful to the tenets of this book, I will be able to put into practice what I believe constitutes effective strategies for learning: student-centered activities which call upon students to question assumptions, draw upon past knowledge, and advance understanding through incremental learning. A series of field books are also available.

Results: The Key to Continuous School Improvement

by Mike Schmoker

A terrific book that tangible, measurable results are the key to school improvement. Under the right conditions, schools can bring about incremental, even dramatic results. Author Mike Schmoker examines these conditions and the theory behind them, using examples from schools to show that virtually any school can begin to successfully replicate the conditions. Meaningful teamwork, when combined with setting clear, measurable goals and regularly collecting and analyzing a wide variety of contextualized qualitative and/or quantitative performance data, constitutes the foundation for results. Schmoker emphasizes the importance of principals and practices that are simple, supported by research, and relatively few in number. Such principals have enormous but under-used potential. As the many schools described in this book demonstrate, educators can immediately provide a better education for all students by focusing unwaveringly on better results and the conditions that promote them. A field book is also available.

As the Future Catches You: How Genomics and Other Forces Are Changing Your Life, Work, Health and Wealth

by Juan Enriquez

In *As the Future Catches You*, Juan Enriquez of the Harvard Business School attempts to capture the trajectory of technological progress and understand the forces shaping our social and economic futures. Enriquez argues that February 2, 2001--the date that anyone with Internet access could contemplate the entire human genome--is akin to 1492 and Columbus's discovery of America. Instead of a new continent however, Enriquez sees the alphabet of DNA (A, adenine; T, thymine; C, cytosine; and G, guanine) and predicts that it will be the "dominant language and economic driver of this century." While none of the ideas presented here are entirely new, *As the Future Catches You* stands out because of Enriquez's

ability to view and connect trends--genomics in particular--in a way that just about anyone can understand. Eye-popping typography and graphics coupled with a compact and almost poetic writing style make this thought-provoking book one to savor. Highly recommended.

Edutopia: Success Stories for Learning in the Digital Age

by George Lucas (Foreword), George Lucas Educational Foundation (Corporate Author), Sara Armstrong (Editor), Milton Chen (Editor)

Here's a tantalizing glimpse into the classrooms of innovative educators who are using technology to connect with students, colleagues, the local community, and the world beyond. *Edutopia* offers a unique perspective on education in which technology is employed to make schools more exciting and dynamic for everyone involved -- students work on real-world projects and consult with the best outside experts; teachers learn by tapping into the best people and practices in their field; and classrooms regularly connect with the rich resources of their communities and the world beyond.

A lively resource that teachers and parents will want to refer to again and again, *Edutopia* is filled with more than forty full-color photos, has a useful resource section, and comes with a unique CD-ROM that contains more than seventy minutes of video footage of these classrooms in action.

Playing the Future: What We Can Learn from Digital Kids

by Douglas Rushkoff

Three years after the original publication of *Playing the Future: What We Can Learn from Digital Kids* in 1996, this breathlessly polemical defense of the techno-savvy youth culture of the '90s already reads like a document from another era. Back then the Internet was still a strange new force, instinctively embraced by kids who'd grown up playing video games, instinctively distrusted by the grownups who ran the mainstream media. Standing up for the emergent digital culture--loosely associated with suspicious activities like raves, role-playing games, and piercing--took nerve and optimism.

And Douglas Rushkoff here supplies both in abundance. His argument: contemporary "screenagers," as he calls them, aren't being warped by new technologies, they're adapting to them. Their relationship to play, work, spirituality, and politics all reflect the contours of a new world shaped by the liberating logic of digital networks and chaos theory. It's a better world, Rushkoff assures us, and if the grownups know what's good for them, they will stop looking askance at the ways of digital youth and start trying to learn from them instead.

Ultimately, Rushkoff seems a lot more interested in making his argument than in making it stick. He flies from one loose logical connection to another--the secret link between fractal math and snowboarding, the parallel between Web browser interfaces and Federal Reserve notes--and he alternates between near-brilliance and utter implausibility as he goes.

But even nowadays, when the heated rhetoric that met the first wave of digital culture is generally giving way to more nuanced analysis, there's something contagious about Rushkoff's passionate faith that the kids are all right. He may not convince you, but after this intellectual joy ride is over, that may not matter. Like any good child of the '90s, you'll want to believe.

Information Anxiety 2

by Richard Saul Wurman, David Sume, Loring Leifer

Information might want to be free; but why should we free it? We've got enough trouble keeping track of all the petabits that already run around untethered, and risk a computer counterrevolution if we let the situation get much crazier.

Information architect Richard Saul Wurman swept the field clear in 1989 with his groundbreaking book that foresaw the problems of data clutter and proposed a

radical new means of organizing and presenting knowledge humanistically; for the new century, he has revised it substantially as *Information Anxiety 2*. This book is sparkingly clear and readable--it'd better be, after all--and offers insight not only to designers, educators, and content developers, but also to anyone who needs to communicate effectively through dense clouds of facts. If Wurman occasionally indulges in New Age-y pop psychology, his analysis is never muddy, and the more hardheaded reader will forgive him soon enough. The discussion alternates between describing the deeply stressful task of absorbing poorly organized data and exploring solutions that require a bit of rethinking, but that reward such an investment with improved understanding and, maybe, a state change from information to wisdom. We could do worse--if we don't pay attention to Wurman and his colleagues, we almost certainly will.

The Tipping Point: How Little Things Can Make a Big Difference

By Malcolm Gladwell

"The best way to understand the dramatic transformation of unknown books into bestsellers, or the rise of teenage smoking, or the phenomena of word of mouth or any number of the other mysterious changes that mark everyday life," writes Malcolm Gladwell, "is to think of them as epidemics. Ideas and products and messages and behaviors spread just like viruses do." Although anyone familiar with the theory of memetics will recognize this concept, Gladwell's *The Tipping Point* has quite a few interesting twists on the subject.

For example, Paul Revere was able to galvanize the forces of resistance so effectively in part because he was what Gladwell calls a "Connector": he knew just about everybody, particularly the revolutionary leaders in each of the towns that he rode through. But Revere "wasn't just the man with the biggest Rolodex in colonial Boston," he was also a "Maven" who gathered extensive information about the British. He knew what was going on and he knew exactly whom to tell. The phenomenon continues to this day--think of how often you've received information in an e-mail message that had been forwarded at least half a dozen times before reaching you.

Gladwell develops these and other concepts (such as the "stickiness" of ideas or the effect of population size on information dispersal) through simple, clear explanations and entertainingly illustrative anecdotes, such as comparing the pedagogical methods of *Sesame Street* and *Blue's Clues*, or explaining why it would be even easier to play Six Degrees of Kevin Bacon with the actor Rod Steiger.

Although some readers may find the transitional passages between chapters hold their hands a little too tightly, and Gladwell's closing invocation of the possibilities of social engineering sketchy, even chilling, *The Tipping Point* is one of the most effective books on science for a general audience in ages. It seems inevitable that "tipping point," like "future shock" or "chaos theory," will soon become one of those ideas that everybody knows--or at least knows by name.

Secrets of the Teenage Brain: Research-Based Strategies for Reaching & Teaching Today's Adolescents

by Sheryl Feinstein

Let's face it—the weather is more predictable than the average teen. Suddenly, even the brightest and most cooperative students become argumentative and distracted. The good news is there are ways you can navigate these abrupt shifts and still be an effective teacher. Recent neuroscience findings have revealed that the teenage brain is actually undergoing developmental changes that can cause extremely erratic behavior. Although you can't change these behaviors, this book demonstrates ways you can adapt your teaching style to effectively reach and teach teens.

The first chapter of this lighthearted but informative book, explores the biology of the teenager's brain. Then, chapters two through six answer questions about specific characteristics of the teenage brain that seem most puzzling to teachers and parents—changes in cognition, the need to socialize, difficulty communicating ideas and feelings, building a self-identity and why some teens engage in risky behavior. You'll be entertained by the accounts of real-life experiences (you might recognize these teens from your classroom!) and then enlightened by the research-based teaching strategies for managing their everyday difficulties, conflicts and crises. With the proper tools, teaching teens has never been more rewarding!

What Video Games Have to Teach Us About Learning and Literacy

By James Paul Gee

James Paul Gee begins his new book with "I want to talk about video games--yes, even violent video games--and say some positive things about them." With this simple but explosive beginning, one of America's most well respected professors of education looks seriously at the good that can come from playing video games. Gee is interested in the cognitive development that can occur when someone is trying to escape a maze, find a hidden treasure and, even, blasting away an enemy with a high-powered rifle. Talking about his own video-gaming experience learning and

using games as diverse as Lara Croft and Arcanum, Gee looks at major specific cognitive activities:

- * How individuals develop a sense of identity
- * How one grasps meaning
- * How one evaluates and follows a command
- * How one picks a role model
- * How one perceives the world

This is a groundbreaking book that takes up a new electronic method of education and shows the positive upside it has for learning.

Mind Wide Open: Your Brain and the Neuroscience of Everyday Life

By Steven Johnson

Using a mix of experiential reportage, personal storytelling, and fresh scientific discovery, Steven Johnson describes how the brain works -- its chemicals, structures, and subroutines -- and how these systems connect to the day-to-day realities of individual lives. For a hundred years, he says, many of us have assumed that the most powerful route to self-knowledge took the form of lying on a couch, talking about our childhoods. The possibility entertained in this book is that you can follow another path, in which learning about the brain's mechanics can widen one's self-awareness as powerfully as any therapy or meditation or drug.

In *Mind Wide Open*, Johnson embarks on this path as his own test subject, participating in a battery of attention tests, learning to control video games by altering his brain waves, scanning his own brain with a \$2 million fMRI machine, all in search of a modern answer to the oldest of questions: who am I?

Along the way, Johnson explores how we "read" other people, how the brain processes frightening events (and how we might rid ourselves of the scars those memories leave), what the neurochemistry is behind love and sex, what it means that our brains are teeming with powerful chemicals closely related to recreational drugs, why music moves us to tears, and where our breakthrough ideas come from.

Johnson's clear, engaging explanation of the physical functions of the brain reveals not only the broad strokes of our aptitudes and fears, our skills and weaknesses and desires, but also the momentary brain phenomena that a whole human life comprises. Why, when hearing a tale of woe, do we sometimes smile inappropriately, even if we don't want to? Why are some of us so bad at remembering phone

numbers but brilliant at recognizing faces? Why does depression make us feel stupid?

To read *Mind Wide Open* is to rethink family histories, individual fates, and the very nature of the self, and to see that brain science is now personally transformative -- a valuable tool for better relationships and better living.

How People Learn: Brain, Mind, Experience, & School

By National Research Council (Corporate Author), John Bransford (Editor), Ann L. Brown (Editor), Rodney R. Cocking (Editor)

Learning is such a natural thing for humans. In a matter of months, the typical human baby goes from being unable to make a sound to being able to understand & use language. After a few years, the neurological connections in their brains are largely completed & all of their senses become active. Many if not most of the basic sensations have been experienced & recorded. However, beyond the universal aspects of human learning, it becomes a very individual experience. The kind of learning that is done in school appears to be beyond what humans are genetically & physiologically designed to do, which means that it cannot be applied en mass. Unfortunately, that is what the public education strategy has been since it was implemented. The development of the factory, where workers had to be punctual, reliable & able to follow detailed instructions, meant that workers had to be interchangeable. Therefore, a public education was designed to be one that tried to mold everyone into the same final product using a standard approach to learning.

That strategy was actually very successful for almost a century, where the United States & other developed countries went from limited to almost universal literacy. However, in the last several decades, with the rapid development of new knowledge & specialties, that approach has proven inadequate. It is time to consider new ways of learning, & that begins with learning the different ways that humans learn.

The first step, described in detail in the book, is to understand that a newborn baby possesses more ability to learn than was ever realized before. Once experiments were developed that made it possible to measure feedback from infants, it was learned that they were far more aware of their world than previously thought. This is important, in that it demonstrates an important aspect of fundamental patterns of learning.

From much of the research cited in the book, it is clear that in our modern society, the standardized curriculum is counterproductive & standardized tests to measure the value of that curriculum are invalid. When the goal is to pass a standardized test, especially when there are penalties for failure, students & teachers alike naturally fall into a basic mindset to prepare for the test. This tends to create an emphasis on rote memorization, stifles learning, & prevents the development of an agile mindset. There is an enormous amount of research, much of which is cited in this book that strongly suggests that the best education is one where people are forced to resolve situations & problems that present a bit of uniqueness. Environments that are varied & present new situations on a regular basis lead to a greater amount of intellectual stimulation & smarter creatures. This holds for all animals, from rats to humans.

While technology can be a tremendous aid, it is not a cure-all. Like all strong medicine it must be administered in intelligent doses. That point is also covered very well in the book. One other very interesting point dealt with cultural differences. A speech-language pathologist was working in an Inuit school & one-third of the class was considered to be in need of assistance by a non-Intuit principal, "because they did not talk in class." However, the "problem" was resolved when the pathologist consulted an Inuit teacher, who cleared it up by saying, "Well-raised Inuit children should not talk in class. They should be learning by looking & listening."

This is a very important book for all people involved in education. The educational tactics that served us well in the past are no longer appropriate. By reading & studying the research findings summarized in this book, all stakeholders in education can learn how to more efficiently transfer knowledge into those who want it & need it.

How Students Learn: History, Mathematics, & Science in the Classroom

By Suzanne Donovan & John Bransford

This book has its roots in the report of the Committee on Developments in the Science of Learning, *How People Learn: Brain, Mind, Experience & School* (National Research Council, 1999, National Academy Press). That report presented an illuminating review of research in a variety of fields that has advanced understanding of human learning. The report also made an important attempt to draw from that body of knowledge implications for teaching. A follow-on study by a second committee explored what research & development would need to be done, &

how it would need to be communicated, to be especially useful to teachers, principals, superintendents, & policy makers: *How People Learn: Bridging Research & Practice* (National Research Council, 1999). These two individual reports were combined to produce an expanded edition of *How People Learn* (National Research Council, 2000). I refer to this volume as HPL.

In the present book, the goal is to take the HPL work to the next step: to provide examples of how the principles & findings on learning can be used to guide the teaching of a set of topics that commonly appear in the K-12 curriculum. As was the case in the original work (1999), the book focuses on three subject areas: history, mathematics, & science. Each area is treated at three levels: elementary, middle, & high school. Distinguished researchers who have extensive experience in teaching or in partnering with teachers were invited to contribute the chapters. The committee shaped the goals for the volume, & commented-sometimes extensively on the draft chapters as they were written & revised. The principles of HPL are embedded in each chapter, though there are differences from one chapter to the next in how explicitly they are discussed.

Taking this next step to elaborate the HPL principles in context poses a potential problem that we wish to address at the outset. The meaning & relevance of the principles for classroom teaching can be made clearer with specific examples. At the same time, however, many of the specifics of a particular example could be replaced with others that are also consistent with the HPL principles. In looking at a single example, it can be difficult to distinguish what is necessary to effective teaching from what is effective but easily replaced. With this in mind, it is critical that the teaching & learning examples in each chapter be seen as illustrative, not as blueprints for the "right" way to teach.

We can imagine, by analogy, that engineering students will better grasp the relationship between the laws of physics & the construction of effective supports for a bridge if they see some examples of well-designed bridges, accompanied by explanations for the choices of the critical design features. The challenging engineering task of crossing the entrance of the San Francisco Bay, for example, may bring the relationship between physical laws, physical constraints, & engineering solutions into clear & meaningful focus. But there are some design elements of the Golden Gate Bridge that could be replaced with others that serve the same end, & people may well differ on which among a set of good designs creates the most appealing bridge.

To say that the Golden Gate Bridge is a good example of a suspension bridge does not mean it is the only, or the best possible, design for a suspension bridge. If one has many successful suspension bridges to compare, the design features that are required for success, & those that are replaceable become more apparent & the requirements that are uniform across contexts, & the requirements that change with context, are more easily revealed.

The chapters in this volume highlight different approaches to addressing the same fundamental principles of learning. It would be ideal to be able to provide two or more "HPL compatible" approaches to teaching the same topic (for example, the study of light in elementary school). However, we cannot provide that level of specific variability in this already lengthy volume. Nevertheless, we hope that common features across chapters, & the variation in approach among the chapters, are sufficient to provide instructive insights into the principles laid out in *How People Learn*. Substantial parts of the books can be downloaded from <http://lab.nap.edu/nap-cgi/discover.cgi?term=how+students+learn&GO.x=18&GO.y=5&restric=NAP>

How the Brain Learns, 2nd Edition (Text & Manual)

by David A. Sousa

David Sousa's practical and powerful bestseller on brain research and education enters the 21st century with a valuable updated edition, incorporating the previously published main text, the companion manual, and the latest discoveries in neuroscience and learning. *How the Brain Learns* has always focused on the information that can help teachers turn research on brain function into practical classroom activities and lessons. The second edition still includes basic brain facts that can help students learn, insights on how the brain processes information, and tips on maximizing retention using "down time." And now Sousa takes it further, building on the latest information available to provide:

An updated Information Processing Model that reflects new terminology regarding the memory system
Exciting new research on how the brain learns motor skills
A whole new chapter on the implications of the arts in learning
An expanded list of primary sources for those who wish to review the core research

All the newest information and insights are included. It's a vital tool for school leaders, staff developers, teacher educators, and administration education faculty—as well as any educator who wants to help students learn.

How the Brain Learns to Read

by David A. Sousa

How the Brain Learns to Read presents what scientists have uncovered about how children develop spoken language and use spoken language abilities when learning to read. Best-selling author David Sousa explores source material on brain research and provides scores of practical reading strategies for the K-12 classroom.

Complete with relevant brain diagrams and informative tables, this exciting new book examines critical concepts including:

- Understanding language acquisition and its relationship to reading
- Incorporating modern research findings in your classroom
- Overcoming reading problems, including early intervention programs
- Content area reading with strategies to improve vocabulary and comprehension
- Developing successful reading programs that encourages teachers to be researchers

Reading is essential for success in our society. With this guide to cutting-edge reading research, you'll find the keys to unlocking reading success in your students!

How the Special Needs Brain Learns

by David A. Sousa

Now from the author of the best-selling *How the Brain Learns* comes a new book dealing with special needs students. *How the Special Needs Brain Learns* helps you turn research on the brain function of students with various learning challenges into practical classroom activities and strategies.

David Sousa shows how the brain processes information and examines both simple and complex learning strategies that can be adapted and taught to your students. The first step for students with learning disabilities is helping them to build self-esteem by teaching them how to work in groups and giving them strategies for engagement and retention. This book focuses on the most common challenges to learning for many students, especially for those who are often the first candidates for special education referral, and emphasizes lifelong independent learning, increased retention, and cognitive flexibility for all. Sousa builds on the latest brain research to discuss teaching strategies for students challenged by:

- ADHD/ADD
- Speech disabilities
- Reading disabilities

- Writing disabilities
- Math disabilities
- Sleep disorders
- Emotional and behavioral disorders
- Autism
- Asperger's Syndrome

Today's classrooms embrace students of all abilities, and Sousa's latest work provides the most up-to-date information and insight on how to work effectively with each one of them. Offering real strategies for real classrooms, *How the Special Needs Brain Learns* is an indispensable tool for all educators, school administrators and teachers, staff developers, pre-service educators, and even parents who want to better understand the way their children process and retain information.

Becoming a "Wiz" at Brain-Based Teaching

by [Marilee Sprenger](#)

Through the clever analogy of *The Wizard of Oz*, Marilee Sprenger provides invaluable information about cognitive research and shares simple tactics for implementing these ideas in the classroom. Learn proven tools for coping with "the Lion's stress, the Tin Woodsman's need for emotional intelligence, and the Scarecrow's desire for higher level thinking."

This user-friendly guide effectively discusses expert findings about brain growth, structure, and functions to help teachers and administrators foster a love of learning in all students. By creating an enriched, brain-compatible environment as outlined in this book, educators can effectively counter such existing negative influences as stress, sleep deprivation, poor nutrition, and a genetic predisposition to disorders in order to cultivate successful lifelong learning.

Key features include:

1. Straightforward discussion about memory pathways, learning styles, and multiple intelligences
2. Extensive examples from real school situations where brain research has been applied
3. Tactics for immediately putting brain-based information to work in the classroom
4. Concrete techniques for using music, teams, rapport building, and brain-state changes to stimulate student learning

For further reading (in no particular order):

1. *Learning and Memory: The Brain in Action* by [Marilee Sprenger](#)
2. *Completing the Puzzle: The Brain-Compatible Approach to Learning* by Eric Jensen
3. *Bowling Alone: The Collapse and Revival of American Community*, Robert Putnam, Touchstone Books, 2001, ISBN: 0743203046
4. *Diffusion of Innovations, 4th Edition*, Everett Rogers, Free Press, 1995, ISBN: 0029266718
5. *Information Anxiety 2*, Richard Saul Wurman, Que Publishing, 2000, ISBN: 0789724103
6. *Minds, Brains, and Learning, Understanding the Psychological and Educational Relevance of Neuroscientific Research* by James P. Byrnes, Guilford Press, 2001, ISBN: 1572306521
7. *Taming the Beast: Choice and Control in the Electronic Jungle* by Jason Ohler, Technos Press, 2000, ISBN: 0784298735
8. *Growing Up Digital: The Rise of the Net Generation* by Don Tapscott, McGraw-Hill, 1997, ISBN: 0070633614
9. *Who Moved My Cheese? An Amazing Way to Deal With Change in Your Work and in Your Life* by Spencer Johnson & Kenneth Blanchard, Penguin USA; 1999 ISBN: 0399144463
10. *How the Brain Learns*, by David Sousa, Corwin Press, 2001, ISBN: 0761977651
11. *How the Special Needs Brain Learns*, by David Sousa, Corwin Press, 2001, ISBN: 0761978518
12. *How People Learn: Brain, Mind, Experience, and School*, by John D. Bransford (Editor), Ann L. Brown (Editor), Rodney R. Cocking, John B. Bransford (Editor) National Academy Press, 1999, ISBN: 0309065577
13. *Schools That Learn: A Fifth Discipline Fieldbook*, Peter Senge editor, Doubleday, 2000, ISBN: 0385493231
14. *A Schema-Theoretic View of Basic Processes in Reading Comprehension Handbook of Reading Research*, by Anderson, R.C., & Pearson, P.D. (1984). (Pearson, Ed.) Longman, New York, NY:
15. *Nature's Mind*, by Gazzaniga, M., Basic Books, 1992, New York, NY:.
16. *The Owner's Manual For the Brain*, Howard, P.J., Bard Press, 2000, Austin, TX:
17. *Introduction to Brain-compatible Learning*, Jensen, E., The Brain Store, 1998, Del Mar, California:

18. *Completing the Puzzle: The Brain-compatible Approach to Learning*, Jensen, E. The Brain Store, 1997, Del Mar, California.
19. *Inside the Brain*, Kotulak, R., Andrews McMeel, 1996, Kansas City, MO.
20. *Classroom Instruction That Works*, Marzano, R.J., Pickering, D.J. and Pollock, J.E, ASCD, 2003, Alexandria, VA.:
21. *A Theory-based Meta-analysis of Research on Instruction*, Marzano, R. 1998, Mid-continent Regional Educational Laboratory Aurora, CO.
22. *Dimensions of Learning*, Marzano, R.J. et al, 1992, ASCD, Alexandria, VA
23. *A Different Kind Of Classroom: Teaching With Dimensions Of Learning*, Marzano, R.J., 1992, ASCD, Alexandria, VA
24. *A Framework For Understanding Poverty*, Payne, R.K. 2001. Aha! Process Inc., Highlands, Texas:
25. *How The Brain Learns: New Insights Into The Teaching/Learning Process*, Sousa, D. 1997, Audiotape. National Association of Secondary School Principals, Reston, VA:
26. *How The Brain Learns*, Sousa, D., 1995, National Association of Secondary School Principals, Reston, VA.
27. *Learning And Memory: The Brain In Action*, Sprenger, M., 1999, ASCD, Alexandria, VA:
28. *Becoming A Wiz At Brain-Based Teaching*, Sprenger, M., 2002, Corwin Press, Thousand Oaks, CA.
29. *What Every Teacher Should Know About Learning, Memory And The Brain*, Tileston, D.W., 2004, Corwin Press, Thousand Oaks, CA
30. *Ten Best Teaching Practices: How Brain Research, Learning Styles, And Standards Define Teaching*, Tileston, D.W., 2000, Corwin Press, Thousand Oaks, California.

Journal Articles

1. *Digital Natives, Digital Immigrants Part 1* by Mark Prensky, *On the Horizon*, September/October 2001, Volume 9, Number 5
2. *Digital Natives, Digital Immigrants Part 2* by Mark Prensky, *On the Horizon*, November/December 2001, Volume 9, Number 6

Online Articles

1. *Wnt 2 txt? Or r u j/c? The Evolving Lexicon of Wired Teens*, The Christian Science Monitor, Society and Culture, December 12, 2002 online edition
<http://www.rdr.sbml.cc/Click?q=e5-9Z-0QayD>
2. *TeenSites.com: A Field Guide to the New Digital Landscape*, The Center for Media Education, 2001, <http://www.cme.org>
3. *Teenage Brain: A work in progress*, by National Institute of Mental Health, 2001, <http://www.nimh.nih.gov/publicat/teenbrain.cfm>
4. <http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/work/How People Learn, Executive Summary>, John D. Bransford, Ann L. Brown, and Rodney R. Cocking, editors, National Research Council, 1999,
<http://www.nap.edu/html/howpeople1/es.html>
5. *In Search of Brain-Based Education*, by John T. Bruer, 1999, Kappan,
<http://www.pdkintl.org/kappan/kbru9905.htm>
6. *Understanding the Brain - Towards a New Learning Science*, Organization for Economic Cooperation and Development, 2001
http://www.oecd.org/home/0,2605,en_2649_201185_1_1_1_1_1,00.html
7. *Memory: How Do We Remember What We Know*, by Analysis by Richards J. Heuer, Jr., Psychology of Intelligence, 1999 (updated 2004),
<http://www.odci.gov/csi/books/19104/index.html>

FOR MORE DETAILS CONTACT:

Ian Jukes - The InfoSavvy Group

Cell: 250-462-0767

Fax: 250-490-4969

E-mail: ijukes@mindspring.com (Ian Jukes)

Check out the Committed Sardine Blog at:

<http://homepage.mac.com/iajukes/blogwavestudio/index.html>

Web sites

<http://www.infosavvygroup.com>

<http://www.ianjukes.com>

<http://www.thecommittedsardine.net>

Office Manager

Lori Anderson

Office: 250-717-0998

Fax: 250-717-0999

E-mail: ijukes@shaw.ca (Lori Anderson)

Ted McCain, Associate Director

Thornburg Center For Professional Development

Phone: 604 462-8586

Email: tmccain@shaw.ca

Web site: <http://www.tcpd.org>

Copyright Policy:

This handout, and materials published on The Committed Sardine web site may be duplicated in hard copy format for educational, non-profit school district use only and must include this copyright policy. All other uses, transmissions and duplications are prohibited unless permission has been expressly granted.

© The InfoSavvy Group and Cystar, 2007