

# Beyond Technology to the New Literacy/Shifting Gears

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Note: this presentation is a combination of the Beyond Technology to the New Literacy and the New Visions for Student Learning in the 21<sup>st</sup> Century presentations

## **Synopsis:**

The world has changed and continues to change. Today, we are operating under a completely different set of rules. These changes have turned many of our assumptions about learning upside down. What does it really mean to be literate in an age of computers, networks, e-mail, multimedia communications, blogs, wikis, social networks and an enormous variety of new and emerging digital tools? What are the new basics that all students need to have in an electronic age? How do we get beyond literacy to fluency?

This presentation examines several faulty assumptions related to the effect of technology on learning and outlines how we can move beyond technology to the new literacy by changing the focus from LOTS (lower order thinking skills and lots of information) to HOTS (higher order thinking skills). How do we move on the continuum from a primary focus on literacy based technology activities through activities that simply integrate technology into our long standing assumptions about how teaching and learning should take place to activities that truly transform learning experiences and focus on 21st Century literacies, not just technical skills.

For teachers, coordinators and administrators who are struggling to address issues related to state standards, curriculum and technological usage, this presentation is for you. Co-developed with Ted McCain.

## **We're frustrated!**

For 25 years we have been waxing effluent, talking about the great promise new technologies hold for transforming education. All these years on, we're still waiting for things to start happening. With an estimated \$160,000.000.000 spent during the past 20 years including a projected \$16 billion in '05-06, we have to ask a simple question - where is the long-awaited technological revolution in education?

There remains a fundamental abyss of misunderstanding about the role that new technologies could and should play in learning. Twenty-five years on, despite enormous efforts, many are still questioning the value and place of technology.

### **What the research shows**

Over the course of the past few years, there have been dozens of studies about the effectiveness of new technologies in enhancing learning. These studies show consistent results. The bottom line is that the vast investments in technology have been largely ineffective - there has been little if any demonstrated effect on student learning based on way it's being used today. (The key part of the sentence being *based on the way it's being used today*.)

### **So what's the problem?**

The problem lies not with tools but with use of tools. When used appropriately as tool of discovery, new technologies can profoundly transform learning. Unfortunately, this hasn't generally happened. The use of technology is still on periphery of education. Even after years of use, there has been very little discussion about the real role of new technology in learning, as well as deep levels of misunderstanding about the role technology can and should play in education and about its potential to transform the learning cycle.

### **Now the honeymoon is over**

Not surprisingly, accountability is rearing its head. Taxpayers and decision-makers are no longer willing to accept our word that spending the money will change things. Leap of faith and subjective interpretations of the effect of technology on learning just won't cut it any more. There is an increased call for technological standards tied to improved test scores nationwide. External sources seek an immediate and direct cause-effect link between investment in new technologies and improved student test scores.

Unfortunately, unless the use of technology in the classroom is directly related to measurable student learning, there is no such thing! Many politicians, administrators and other decision-makers just don't understand this, which poses a real danger to sustaining funding and momentum

### **Some teachers applaud this**

They feel that purchases of new technologies are robbing classes of programs, books, materials, and even staff. They don't get it either. There's no going back to

the imagined perfection of days gone by. Living in a technology rich society is a reality. Preparing kids to live in this world isn't an option. Consequently, the place of technology is a great challenge to education as an institution.

### **Right now, it appears that we're chasing our tails**

Discussions continue to focus on the tug-of-war between pro-tech nerds, and the educational reactionaries who still think it's 1963. To now, there has been little meaningful discussion about the purpose of education or the important role new technologies can and should play

Outside education, new technologies are having pervasive and transformational imprint on institutions and on learning. It is an undeniable fact that the world has changed. This is seen in such areas as businesses, training centers and universities who are increasingly using on-line, interactive smart learning systems.

Public education is lagging well behind the changes that are happening outside education. Many educators are unable/unwilling to accept that technology can positively change instructional delivery. Even when it is used, there is a primary focus on getting and installing the technology instead of using it to reinvent learning. Many schools are stuck at the immature stage of implementation

### **It's time to deal with this**

Before the window of opportunity closes, it's time to get beyond the technical issues and move the conversation about the role of technology in education to higher level. Moving it beyond TECHnology to TEACHnology and LEARNology. That's the intent of this handout.

### **Moving beyond technology to the new literacy**

So what are the real issues? They're not just those related to hardware and software, network and bandwidth or even the meta issues related to curriculum, staff development, authentic assessment, strategic teaching and learning. Each of these is important in their own way, but none of them address the primary issue.

Before addressing the how, we must first deal with the why. Unless we deal with the broad philosophical issues related to the use of technology, then the motivation to change will be external. This is in large part why technology gathers dust. If the person behind the vision is providing the external motivation for using

technology moves on, there is no internal commitment to continue. Before we address these issues, we must first move to the deeper questions.

### **Should new technologies be used in schools?**

Many don't typically address this question. Others continue to struggle to answer the question. If this question isn't resolved first, it results in a ready, fire, aim approach to the use of technology which results in under utilized equipment and a perception by many that money is being wasted.

### **Is learning technology a specialized thing?**

Should it be taught in computer classes or should it systematically introduced to all students in all subjects throughout school? If this is not addressed, people will comfortably avoid dealing with this and continue to teach the way they've always taught.

### **How should technology affect instructional delivery?**

What is the proper role of technology in learning? Should it replace teachers? Should it change the role of the teacher in classroom? Should it change what students study? There is no general agreement yet although there are many, many perspectives Thornburg, Davis, McKenzie all say yes! Oppenheimer, Postman, Stoll say no! Naisbitt, Wurman, Ohler say maybe. This is completely understandable and very healthy. It's the start of the real discussion that must happen so we can successfully move forward. We'd like to add our two cents worth to the conversation.

### **Let's take a closer look at the real issues**

Much of the discussion about the role of new technologies in education is based around false foundations. We must first tackle several assumptions and controversies that have created the myths so that the discussion about the role of technology can be based on a reasoned, balanced foundation.

### **So where do we begin?**

Let's start by looking at five myths, assumptions and beliefs that many educators hold when discussing technology and that filter perspectives and shade conversations.

### **Myth 1: Computers will replace teachers and schools**

New technologies have led to instantaneous anyone, anytime, anywhere access to information. The rise of the Web has led to virtual schools and on-line learning. It's estimated that today, there are more than 2700 on-line degrees that are available over the Web, and which requires little or no physical attendance. This is just beginning! Hence, there's an assumption by many that it's only a matter of time before this leads to the wholesale replacement of teachers and schools.

These folks don't get it either. Teaching is and will long remain a human task. New technologies are not a substitute for teachers and education - the new technologies are just augmentative tools, used to amplify learning opportunities.

### **What is a real education?**

Life isn't lived as facts learned in isolation from the rest of our world. Life is the acculturation of the individual, social learning, working/learning in teams, communicating, solving problems, appreciating others' ideas and adjusting own's thinking

Learning is more than full frontal lecturing or simple recall of raw data. Learning is the synergy that happens from the interpersonal interaction that occurs between students and a teacher who understands and values higher level thinking. A real education involves critical thinking, problem solving, information processing, a love of learning, and an appreciation of the aesthetic, esoteric, moral and ethical.

Real educators add a value, and a perspective that can't be replicated by technology alone. Educators have an understanding of children and learning that allows us to do far better job than technology alone. New technologies aren't a substitute for people with higher level thinking skills and personal experience. They are simply powerful tools to *support* and *stimulate* education - to improve effectiveness of teachers and learners. But, this can work both ways

### **Amplification and leverage**

The desire to be more than we already are has always been with us. In the old days, levers were used to lift something that couldn't be lifted by human effort alone. Now most levers plug into walls, use motors, or require batteries. Consider, for example, a guitar amplifier. An amplifier is merely an updated version of lever, designed to take advantage of modern power sources. What happens when you give

a bigger amplifier to a good guitar player? It's magical because the amplifier magnifies the skills of the player.

Conversely, what happens when you give a bigger amplifier to a bad guitar player? Not pretty is it. The amplifier simply magnifies the skills, for better or worse.

In the same way, what happens when English teacher takes class into lab of computers? The approach amplifies the effect of the technology. Let's compare a product approach with a process approach.

### **The product approach**

Regardless of whether they use technology or not in their lessons, a teacher who focuses on the end product will have students use technology as little more than a glorified typewriter to produce a nice, neat, final copy. Whereas an English teacher who teaches the writing process will use different tools to enhance student understanding of the planning, drafting, revision, proofing stages of the writing cycle to produce better writers and writing.

Technology simply amplifies the difference in approach. The perspective we choose to teach from is primarily a question of vision and will instead of ability. This is a universal statement, which is valid whether technology is used in the class or not. The real issue is teaching and learning, not technology.

Technology can't and won't replace real teachers, but the reality is, outside public education, new technologies are already replacing some of the traditional things that teachers have always done. Prepared or not, new technologies are already transforming traditional educational thinking and practices.

Many businesses, institutions, college training programs, even public schools are already replacing low-level talking heads holding textbooks and handouts with new smart systems that do the very same thing, This is happening

So if you or your colleagues are feeling threatened or uncomfortable, it's time to reevaluate what you're doing in your classrooms. The reality is; we all must continuously be rethinking our roles because any teacher that can be replace my new technologies deserves to be and should and will inevitably be replaced. We're absolutely deluding ourselves if we can't accept that computers will replace at least part of what we currently do. The reason for this is that, despite all the propaganda generated, we continue to work in system that primarily focuses and

values LOTS (lower order thinking skills and lots of information, not HOTS (higher order thinking skills). As educators, our greatest challenge is to step outside our traditional thinking about teaching and learning, to reconsider what and how we do our job, and then step beyond the comfort of the traditional to reconstruct our role. This will be a gut wrenching experience, but an absolutely necessary one if education is to survive as a public institution.

### **Myth 2: Using computers replaces the need to read**

Despite growing power and amazing capabilities, users still must know how to read. Even if multimedia machines are dazzling, it doesn't mean that alphabet and language are outdated. We have yet to develop a computer that doesn't depend on letters, words and sentences. In the technological world we live, understanding letters, words and sentences are more important than ever.

This should be apparent to anyone who's learned to use a new piece of software or hardware device from a manual or screen. We live in an increasingly complex world, so using any aspect of technology demands (& will continue to demand) excellent reading skills. As technology continues to seep into our lives, computers will become the basis of using even the simplest manual tool. Everything from drill presses, welders and saws to complex information systems, microwaves, VCRs, cell phones and computers will require the ability to read.

Increasingly in this world, laborers and learners must use their minds more than hands. In the Information Age, reading for understanding will be a critical skill. High literacy rates will separate countries, states and communities that can aggressively move forward from other nations that get left behind.

Literacy is more than just recall of information - it's more than just the T<sup>3</sup> (teach, test, turf) approach to learning - it's more than a focus on LOTS. The difference between data and knowledge is that knowledge requires processing data using higher-level skills

Technology amplifies the difference between LOTS and HOTS. New technologies allow learners to move beyond a focus on information recall (data) to information processing (knowledge)

### **The two faces of literacy...**

Let's compare the product and the process approach. Consider a Social Studies teacher who brings her class to lab to access the WWW. If the teacher focuses simply on using the tools for information recall, then the quantity of data and the speed, which it can be accessed and compiled, is more important than its credibility or corroborating the sources. This is a product-based; LOTS approach to learning.

If, however, the teacher focuses on using the tools to develop research skills in students that allow them to create knowledge, then the ability to learn how to ask good questions, then access, analyze and apply the data is more important than finishing the essay by next Tuesday. This is a process-based, HOTS approach to learning.

Be honest with yourself, where do you place more focus and value? Do you place it on a student's score on a multiple-choice test next Wednesday, finishing a topic so you can move on to next subject; and covering the curriculum?

Or are you more concerned with how well your students understand the material that's presented to them; with critical thinking and problem solving skills; with the ability to apply what they've learned? Do you focus on LOTS or HOTS?

### **Myth 3: Computers will replace writing**

New technologies make it easier to write, move text, check spelling and grammar, edit thoughts, publish ideas and distribute information, but new technologies don't and won't replace writing. For the new work force, knowledge workers, business people and professionals, writing will remain the primary means of recording and communicating information. Even if multimedia provides the ability to integrate and communicate all 4 flavors of information (sound, text, graphics, video), even as we move from paper-based to video-based media, text must still be written - that's basis of the Web today.

More than ever, there's a need for information presented in readable formats. It will be a long time before films, computer screens, web sites, manuals or computer designs are generated without wealth of accompanying text. Even when ideas are not written, the speaking process still requires a deep understanding of and rigor for the writing process. Further, combining images with written and spoken words requires excellent grasp of entire communications process

We're at a pivotal point in time. Widespread use of voice recognition, while still in its infancy, holds the prospect of significantly altering the means for creating written documents as we move from the writing process to the speaking process, which again amplifies the need for process skills not just mechanics.

Despite the sudden emergence of powerful, portable communications devices, it will be a long time before business, research, reports and presentations lose all vestiges of writing. It's safe to assume that writing is a skill that even our great grandchildren will need.

While the tools may change, while the way information is presented may evolve over time, the foundational thought processes behind the use of the tools and information will never change. In an increasingly technological world, writing will be more important than ever.

Let's again compare the product and the process approach. Consider a teacher with a Journalism class. If the teacher concentrates on the appearance of the end product, with a primary focus on desktop publishing tools, techniques and tricks of trade, and if this is seen as more important than content to be communicated, it results in the National Enquirer (& most web sites today). While it may be visually appealing, it likely has little intellectual substance. This is the same as students who produce reports with color pictures and fonts but whose writing is poor - or student who uses multimedia tools with no ability to write. Doing this is like telling a joke without a punch line. Expectation without ability to deliver is a product-based; LOTS approach to learning.

Compare this with a teacher who focuses on the entire writing process, including the complete editing cycle for content, combined with introducing the principles of graphic design to enhance communication of content. When the focus is on how to shape the way information is delivered and where understanding the principles of effective communication is considered more important than just having good looking product, it becomes a natural extension of writing process. This is a process-based, HOTS approach to learning.

Regardless of new technological developments, the ability to produce clear, concise, high quality, written materials that work together and that effectively communicate regardless of the medium, will remain a primary skill forever.

#### **Myth 4: Technology makes numeracy skills less important**

Numeracy is essential. It is so basic in a high tech society that the need should be plain to everyone. Even the most pedestrian tasks, such as counting change from purchases, require numeracy skills. It will remain so even when money becomes electronic cash. But to have meaning, numbers must be able to relate to the physical world. We need numbers to count, track time and measure distance. When using a calculator, the difference between 10 and 1000 is a keying error, nothing more. It's easy to differentiate between \$10 and \$1000. It's much harder to differentiate between 100 and 1000 millimeters or 10 and 1000 microfarads, yet if such difference went undetected, errors could completely invalidate statistical analysis, destroy a research project or turn new product to trash.

Unless people learn to do math in their minds at an early age, numbers are just numbers. They must be more than that. They're numeric representations of the world around us. Calculators are only tools. Like any other tools, they simply amplify what the focus of teaching is upon. The use of the technology can be a good thing, or it can be a bad thing.

Consider a math teacher using a set of calculators. If the focus is on learning the features of the calculator or simply getting the right answer, then the calculator just undermines the goal of the teacher for the students to learn generic mathematical processes that can be applied to other problems. The calculator replaces simple numeracy skills. This is a product-based; LOTS approach to learning.

But, if the focus is on the application of mathematics to solve real life problems, then the calculator becomes a tool to facilitate solutions across all subjects and all areas of endeavor. This is a process-based, HOTS approach to learning.

We can't use a calculator effectively without good numeracy skills. In unskilled hands, calculators become fraught with problems, simply amplifying existing math abilities (or lack thereof). Like all technologies, calculators don't replace the ability to think. In earlier times, you were limited without the ability to estimate.

Estimation hasn't changed in centuries.

Calculating a budget, estimating costs, figuring out how much gas will be needed, determining which is the best buy all require mental skills. Calculators and computers are just tools to help you, but they won't do it for you. They won't make the decision about whether you can afford to take a trip.

Making a decision based on the information available, estimating how much money you'll have, how much you'll need, how much you can save, upcoming expenses - all require a mental ability based on more than just numeracy. It's about math skills applied to all human endeavors - business, personal, retirement, and investment

In previous times, teaching math focused on numeracy skills and the acquisition of technical math skills. Teachers didn't spend much time making real world links. Today we are seeing a shift in skills. Consider how my father and I address the tedium of calculation. I'm no smarter than Dad is, but I have access to tools combined with an understanding of how to use them. This understanding allows me to take things further - to make connections to other issues not tied to calculation. But, this can only happen if I have ability to apply HOTS to gain sense of bigger picture.

### **Myth 5: Technology is a curriculum or subject**

Let's consider how technology is introduced to students today. Typically this happens in two ways. For senior students, it's taught as a curriculum such as Computer Science, Computer Studies, Business Education or Desktop Publishing.

With younger students, it's primarily introduced as keyboarding, word processing, or 'doing' computers. It's not often used as a tool other than to make a product look better. Technologies simply amplify the focus of the teacher.

Consider an elementary teacher teaching keyboarding. If the focus is on the mechanics of keyboarding because it's required in the curriculum, it has very little effect on improving student writing. This is a product-based LOTS approach to learning. But, if the focus is keyboarding as vehicle to enable students to better and more quickly compose, edit, revise and communicate then the technologies used to facilitate better writing. This is a process-based HOTS approach to learning.

Beyond this, the first teacher may view new developments such as voice recognition

as a threat to what and how they teach, while the 2nd teacher sees this as natural extension of what they're doing, and thus empowering students to go further

### **So what's our point?**

Computers aren't the answer. Computers can't be focus. Teaching and learning for measurable results must be focus. This should not be a surprise - it's the basic issue we must address

*Any problem schools cannot be solved without computers, cannot be solved with them*

Alan Kay

Again, we face the same issues and problems. As the great American philosopher Yogi Berra once said, "it's déjà vu all over again."

### **The same old problem**

What have librarians long been complaining about? They sit in enormous repository of information that we call the library. A library is just a tool. Librarians complain that students cannot use that tool of library effectively. Just knowing the mechanics of how to access information doesn't translate data into knowledge and wisdom. To do this, students need an understanding of HOTS

And THAT is the real problem. The school system has persistently focused on LOTS of information instead of taking a HOTS approach. So now we have new technology Internet, WP, multimedia, graphics, DTP, SS, DB - big deal - they're just tools. Technology is just the latest amplifier of the good, the bad and the ugly of teaching. To use new technologies effectively, is no different from what's needed to use a library effectively. We need a sustained focus on HOTS.

HOTS haven't changed since Bloom's taxonomy. In a technology and information age, we face the same basic challenge we've always had. The same basic challenge we claim to striven to address, while managing to avoid. Look at the focus of state exams if you don't believe us. The issue isn't about technology. It's that we've never taught HOTS on wholesale basis

Every once in awhile, we see brief outbreaks of HOTS instruction but typically they disappear as we shift our focus to whatever happens to be the trend du jour. Meanwhile, the primary focus remains on content and information recall.

Therefore, most of the time is spent teaching to the test, with a focus on T<sup>3</sup> - (teaching it, testing it and then turfing it) because we have a curriculum to cover.

This is an approach that is so boring that inevitably, a large amount of time is spent on classroom management.

Anyone who knows anything about classroom management knows key isn't about controlling students but on cultivating engaging methodology with focus on TEACHnology not TECHnology

The bottom line is, if you haven't figured it out - if you haven't gone beyond technology to new literacy - if you haven't figured how to teach higher level thinking skills, problem solving, writing process, independent thought do you really think Internet is going to help?

### **To do this**

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

### **How can we do this?**

The way we should be - another one-act play. What would the curriculum look like? Focus, once again, on what is being valued.

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 guys, let's go. Each group has been given an outline of the problem, the resource guides, the self & 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 - 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 will shortly be receiving a phone call from Svern Mikkelsen, the president of IT Pacific Shipping,

they're one of our biggest clients. Your job will be to prepare a complete itinerary for 5 IT executives who will be traveling to the Kansai region of Japan on May 1st for two weeks. They will need 3 days each in Osaka, Kyoto, and Kobe where they will be looking for new business

IT Pacific will provide you with the dates they'll need to be in each city. IT also wants you to build in 5 days of holidays for them during the trip - be sure to arrange some good holiday & rest & relaxation experiences. They'll definitely want to slip in some sightseeing if possible. They've indicated that 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 I don't think their boss will pay for the trip to the Geisha house Sam! And no, it won't help you or your group to get a better grade

Remember that their boss is very price conscious so don't even think about sending them first class! Yes, Marion, 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. You need to keep a log of your time and be ready to provide IT Pacific with a detailed bill. And you will also need to invoice me for your grade. The problem is written up in detail in your assignment envelope. I'm available for each group as & when you need me. Just call out my name if you need help.

### **What's different here?**

How is this different? Who owns the learning? Will the students discover the content covered in the previous lesson using the traditional teaching we watched previously? Possibly. The difference here is that the content is learned within the context of a specific problem to be solved, which allows for a much greater chance of long term recall. Context is the key here. Here things are learned and taught. The learning is driven by the context of the problem. Who owns 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 (in role) and sits down. Initially most students will sit there, waiting to be told what to do. The teacher (in role) may now stand up and say "it's worth 400 marks and it's due on Monday - do you have any questions?"

Giving the students the problem fosters the personal ownership of the learning. It becomes the learner's issue, not the teacher's. Plus it provides role-playing opportunities for people with little if any 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 far broader context. The teacher is the one who shapes the learning so that 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 they will get in the way of a mark if they accomplish all of the criteria.

### **Learning is based on 4 D's 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 4 steps are:

#### **i) Define**

Students must be taught to define a task so that the problem is fully understood before work begins. How many times have you seen someone waste time working on the wrong task? Thus, it is imperative that students learn to clearly define the task to be done and then confirm their understanding before proceeding any further. 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 needs 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. The real world simply doesn't work this way and by teaching in this manner, we prevent students from learning to think independently.

### **ii) Design**

Once a problem has been defined, students must then design a solution. 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.

### **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. This could mean participating in a debate, writing a story, building a desk, writing an essay, baking a cake, doing an experiment, or creating a multimedia presentation. Whatever the task, the students must apply the learning that took place in the design step to do some real work.

### **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.

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 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

Do students learn content? Yes, of course they do. But if the content is forgotten, what else is learned? It's the process skills that can be used again and again because they are learned within the context of real time, real world tasks.

### **What would happen if:**

Students were taught like this for 12 months? Students were taught like this for 13 years? 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, Determine) and the 5As of information fluency: (Asking the right questions, Accessing the data, Analyzing 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 rats, 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 as 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 & 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 Inspiration 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 & communicating with our parents about what is being studied in school?

1. could we gain access to personal expertise from parents & specialist contacts they might have
2. could parents provide structured guidance with practice in interviewing, doing research & 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 & 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 & flow
4. English - creating effective information pamphlets, writing reports & proposals, making presentations
5. Social Studies, Music, Art, PE...
6. 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, problem solving, decision making skills
2. research skills
3. information analysis
4. speaking & listening
5. technical reading & writing
6. working & 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 & 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 & communicating with our parents about what is being studied in school? Could we gain access to personal expertise from parents & specialist contacts they might have? Could parents provide structured guidance with practice in interviewing, doing research & 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 & problem solving skills that have been learned by applying content within context of real time, real world tasks

## **SOME GREAT RESOURCES**

### **Analyze and Apply** ([www.analyze-apply.com](http://www.analyze-apply.com))

Another commercial products with about 5 feet of paper-based materials - incredible resources - they cost about \$10 per student - to get an idea of how comprehensive they are, go out to [www.analyze-apply.com](http://www.analyze-apply.com) and download some of the grade specific sample lessons. There are 306 instructional units (each having multiple lesson plans) for teachers that change the context and pedagogy for core curriculum instruction, reflect the proficiencies students need in an information rich learning and work environment. There are:

- Grades 1-5 - 96 units
- Grades 6-8 - 72 units
- Grades 9-12 - 138 units

The activities integrate adult roles into the classroom and in doing so, connect the curriculum with the workplace by developing units that focus on cooperative, interdisciplinary, problem solving based learning. The materials include extensive authentic assessment standards and promote community partnerships. The 8 core SCANS proficiencies that students need to operate in an information rich learning & work environment are embedded into the lesson plans, thus changing the context & pedagogy for core curriculum instruction

### **Units by grade level and subject areas**

- Grade 1/2 - 12 Language Arts and Math units for each grade level
- Grade 3-8 - 24 Language Arts, Math, Science, and Social Studies units for each grade level
- Grade 9 - 36 Communications Arts, Math, Science, Civics, Algebra 1 and Biology units
- Grade 10 - 48 Communications Arts, Math, Science, Algebra II, Geometry, Earth Science, Chemistry, & World Geography units
- Grade 11 - 30 Communications Arts, Service, Learning and Law, US History & Sociology/Psychology, Trigonometry units
- Grade 12 - Communications Arts, Math, Calculus, Physics, Economics, and Government

This resource is well worth considering! Go out to the web site, identify a grade level and download a sample lesson.

## **Learn and Live** ([www.glef.org](http://www.glef.org))

- is inspired by George Lucas
- Learn and Live includes a 1-hour documentary hosted by Robin Williams shows innovative schools around the country that are integrating technology into teaching and learning and involving parents, business, and the community
- it also has a companion 300-page resource book describing how education is changing nationwide which helps connects readers to experts and information
- the entire video as well as the support materials are available at the web site or you can contact them at 1-888-4RKIDS! Cost if you order the video and book - \$20

### **How do educators typically respond to this kind of instructional model?**

Yabbut - yabbut - yabbut - yabbut. Give me a break!!!! How long will this take? What about the tyranny of the school calendar and the curriculum guide? What about all other stuff I have to teach? What about getting students ready for the test? How will I measure learning? Does this mean I'll have to change?

### **Getting beyond excusitis**

It's easy to be yabbutts - it's easy to make excuses as to why it can't be done. If this is the approach of a colleague, then they are truly part of the problem rather than part of the solution. This doesn't have to happen overnight. You aren't expected to go zero to sixty overnight. Start with baby steps. How do you eat an elephant? One bite at a time!

### **Where do you start?**

Declare war on old ways of doing things. Reject pureed, homogenized, predigested, formatted materials filtered through someone else's eyes. Stop reinforcing a curriculum that's a mile wide but only inch deep. Reject a system: that teaches and tests then turfs and that rewards the accumulation of vast amounts of useless, theoretical, obsolete information or that continues to emphasize and reward memorization and regurgitation. Reject a system that collectively leads to students suffering from informational anorexia and intellectually starved students.

### **Shift gears to:**

A critical thinking, problem solving focused curriculum where process skills are transparently embedded into relevant content and which allows relevant content and processes to be internalized simultaneously.

New technologies are an every day part of life but will forever remain a tool of mankind. They will never replace human spirit, skills and perseverance. We could have a state of the art everything, everywhere but if that's all we addressed, the only thing that would change would be that the power bill would be a great deal higher. If technology is the answer, then we have to ask what the question is. While new technologies are powerful, it's beyond science fiction to believe that they will replace real teachers, or that they will make reading, writing and numeracy outdated. New technologies will not preclude need for new basic skills

On the contrary, the need for people to have solid foundation in new basics is heightened. Computers, the WWW, and all the new digital wonders are powerful tools, but these devices can't think for themselves.

Technology is everywhere! Cars, trains, planes, electricity, telephones, satellites and so on penetrate our lives. No nation can operate in a 21st century economy without a 21st century infrastructure embracing computers, data communications and other new media. But, this requires a population as familiar with highly complex new technologies and informational infrastructure as it was with cars, roads, highway, trains and the transportation infrastructure of industrial period.

Hence, we are at a great crossroad. Computers have already changed our world. They have already helped mankind achieve much. They will be central to our future progress, but we must guard against being seduced by the technologies and in doing so, miss point. As we enter an age of unprecedented technological sophistication, the need for highly skilled people will be enormous. Education is the foundation of our society.

When living in a high tech global marketplace, a nation's ability to compete rests solely on skill and dedication of citizens. There are many factors that determine success in global arena, but if new basic skills and dedication are missing, the rest is trivial.

### **So what is the new literacy?**

It's more than reading, writing, Arithmetic, simple skill acquisition, or being able to use a calculator or word processor. The new literacy is the ability to use any tool guided by HOTS to solve real world problems

But to get there, we must shift gears. There has been a long and traditional focus on LOTS in schools because it worked for Industrial Age workers who needed to memorize procedures. However, in the Communication Age, workers will only survive if they can get beyond LOTS and use HOTS to create new knowledge

If we can do this, and in doing so capture the interest of our children, keep them in school longer, and engage them more while they are there, it will not only change our educational establishment, it will also change our world and our lives

*We are beginning to grasp that although power can be contained in a boiler, mastery exists only in the brain: in other words, that it is ideas, not locomotives that move the world. To harness locomotives to the ideas is good; but do not let us mistake the horse for the rider.*

Hugo, Victor. (1862). Les Misérables

#### **FOR FURTHER INFORMATION CONTACT:**

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<http://web.mac.com/iajukes/iWeb/thecommittedsardine/Blog/Blog.html>

Web sites

<http://web.mac.com/iajukes/iWeb/thecommittedsardine/Home.html>

[www.infosavvygroup.com](http://www.infosavvygroup.com)

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