

21st Century Learning and Learners

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21st Century Learning and Learners

Sharon Friesen & David Jardine

The only difference between me, the 95% student, and that guy sitting in the back of the room, is I have learned how to remember, recall and regurgitate and he hasn't, can't or won't.

Grade 12 student

Let me tell you what school is like for me. Blah blah, blah blah, test Friday.

Grade 12 student

21st Century Learners Speak Out On 21st Century Learning

We want to do work that makes a difference to me and to my world.

We don't want to remember, recall and regurgitate

We don't want to learn for the sake of tests

We don't want learning made easy; rather, they want it to mean something.

We want to learn with the media of our times.

We want to do work that is relevant, meaningful and authentic.

We want to be engaged intellectually

We want stronger relationships with their teachers, with each other and with their communities locally, provincially, nationally and globally

We want teachers to know how we learn, to take into account what we understand and what we misunderstand and use this knowledge as a starting place to guide our continued learning.

We want to be able to work with others in the classroom, online and in our community.

We want to be able to pick up our information anywhere, anytime

We want indepth learning.

We need feedback in time to help us learn and in time do something about it.

Introduction

People learn. Learning is fundamental to human beings. It is the specialization that we use to become fully human (Fischer & Immordino-Yang, 2008, p.xvii).

The problem of keeping knowledge alive, of preventing it from becoming inert...is the central problem of all education. (Whitehead, 1967 [1929], p. 5)

As the world changes, the expectations placed upon education shift to meet these changes. It is important for those in education to remember that this, in fact, is not a problem but is rather indicative of how education, as a living practice, is alert to issues of what is called for by this enterprise. The ability of education and educators to remain responsive to such shifts in circumstance and necessity is a sign of vigorousness and health. Moreover, because of education's inevitable relationship with the young and the newness of the demands they bring with them and that shape their lives, such responsiveness is itself part of the nature of education as a living, intergenerational project. "Keeping knowledge alive" (see Doll, 2009) is therefore in the very nature of education itself. Understanding curriculum and curriculum development with an eye to this inevitability is the key to our current undertaking of understanding 21st century learning and learners.

It is fashionable to be fairly critical of the current public education system. Much of this criticism is levelled at our current *factory model* of schooling. Before we examine the assumptions that underpin this model of schooling, we want to acknowledge that it was propelled by a technological innovation—the assembly line—that was revolutionary in and right for its time. With its beginnings in the late 19th and early 20th century, the schooling system that emerged to meet the needs of the industrial society provided a common experience and a common heritage for the diverse immigrant children of the people seeking refuge and the hope of a new beginning in the Americas. This standardized public education system with its common, standardized curriculum "equipped the young for the responsibilities of freedom, insured universal equality and guaranteed prosperity for the years to come" (Greene, 2007, p.1). That is, these schools provided an accessible, uniform model of education that met the needs of the masses at that time. Factories, assembly lines, scientific management, and industrial capitalism dominated in this industrial age society. And, it is important to remember that industrial societies are not egalitarian. Rather, they are hierarchical, bureaucratic and highly segmented. Schools created to meet the needs, hopes and desires of this society had to ensure that everyone had enough education to enable them to find useful employment—that is, students needed to be able to take their appropriate place, manager or worker, on the factory room floor. Looking back, it is also important to remember that the hallmark of effective and efficient assembly lines was homogeneity and standardization, both of the materials used and the workers assembling those materials. Moreover, if one company had multiple factories (think e.g., MacDonalds)

there would be standardization between the different sites of work. These are the foundations upon which a factory model of schooling are built.

To the extent that education becomes “stuck” in ways of responding to the world that were once adequate to its demands, to that extent, it gradually becomes counter productive to the very responsiveness that is at its core. We contend that “what began with such enthusiasm and hope around a century ago in the organization and imagining of schooling has simply worn out” (Jardine, Clifford & Friesen 2008, p. 14). Recently, it has become increasingly evident that the factory model of schooling we inherited no longer serves our contemporary 21st century knowledge society. Today our society requires that more young people enter post-secondary institutions. This requirement is in sharp contrast to 1950 when only 2% of all Canadians aged 15 and over had university qualifications. By 2001, this number was up to 15%¹. And while the number of students entering post secondary institutions has continued to grow, there is widespread agreement that a high school education is no longer sufficient for the new demands of the 21st century.

From within school and classroom structures and processes designed to meet the needs of the industrial past, we are once again called upon to invent an education system that effectively addresses the needs of our time. And that is a challenge of the same scale as educational reform 150 years ago. A century and more ago, what had been up to then incremental improvements to existing structures and practices of teaching and learning and the taken for granted limitation of education to the elite and powerful were no longer adequate to the scale of change required by the Industrial Revolution. An entirely new system of education needed to be invented. We are currently facing a similar situation. Efforts to improve what are quickly become obsolete practices and structures are actually likely to make things worse (Gilbert, 2005; Fullan, Hill & Crevola, 2006). Many teachers, students and administrators understand this issue first hand. Schools seemed to be continually accelerating, continually differentiating and multiplying the tasks that are asked of them, while, at the same time, attempting to leave in place the structures and practices that were responsive and responsible ventures over one hundred years ago. Exhaustion is the rule of the day. The good news is, however, that we are poised, according to Michael Fullan (2007), for a genuine breakthrough in public education.

Background

We are always educating for a world that is or is becoming out of joint, for this is the basic human situation, in which the world is created by mortal hands to serve mortals for a limited time as home. Because the world is made by mortals it wears out; and because it continuously changes its inhabitants it runs the risk of becoming as mortal as they. To preserve the world against the mortality of its creators and inhabitants it must be constantly set right anew. The problem is simply to educate in such a way that a setting-right remains actually possible, even though it can, of course, never be assured. Our hope always hangs on the

¹ 2001 census data from Statistics Canada. <http://www12.statcan.ca/english/census01/products/analytic/companion/educ/canada.cfm>

new which every generation brings; but precisely because we can base our hope only on this, we destroy everything if we so try to control the new that we, the old, can dictate how it will look. (Arendt 1969, pp. 192-3).

In the past 30 years, there has been a wide array of ventures in reforming education. A quick look at just a few gives an initial shape to this array: *The Kinds Of Schools We Need* (Eisner 1998), *The Meaning Of Educational Change* (Fullan 1982), *The Predictable Failure Of School Reform: Can We Change Course Before It's Too Late?* (Sarason 1990), *A New Model: The Professional Learning Community* (Dufour & Eaker 1998) *Schools That Learn* (Senge 2000), *What Schools For The Future?* (OECD 2001), *Against Schools: How Public Education Cripples Our Kids And Why* (Gatto 2003), *Bringing Classrooms Into The Knowledge Age* (Bereiter 2003), *Teaching In The Knowledge Society: Education In The Age Of Insecurity* (Hargreaves 2003), *Literacy And The New Media* (Kress 2003), *Back To The Basics Of Teaching And Learning: Thinking The World Together* (Jardine, Clifford, & Friesen, 2008), to name but a few.

Talk of educational reform has been a recurrent theme in Canadian education frequently stimulated by changes outside of Canada (see Pinar 2008). Most efforts at reform have amounted to little more than tinkering around the edges, such as lengthening the school day or adding courses students can take. Most recently education has stumbled through the *Excellence Movement* of the 1980's which called for an intensification of existing practices to the *Restructuring Movement* of the 1990's with its emphasis on site-based reform (Dufour & Baker, 1998; Dufour & Eaker, 1998; Fullan, 2007). These reform efforts and numerous reports from the Hall-Dennis report with its 258 recommendations in the 1960's in Ontario, to the Alberta Commission on Learning report in 2006, the major features of schools remain largely as they were in the early 1900's.

If there is anything to be learned from these reform efforts it is perhaps that it is much easier to change educational policy and curriculum frameworks than to change the ways in which schools actually function. However, it is also possible to change educational policy and curriculum frameworks without interrupting factors that undermine the intent of that change.

Although the assumptions of industrial models of schooling remain dishearteningly pervasive in education today, the demands of a knowledge era are starting to signal that perhaps educators' efforts towards genuine reform might not be so Sisyphean this time. As educators turn their attention to the shifts that are being felt worldwide, this time driven by changing global forces and new discoveries in learning, it is becoming:

more difficult to entertain the desiderata of teacher-proof curricula, or the use of a check-off observation schedule for evaluating teaching, or a Betty Crocker recipe for advancing teaching effectiveness. The new paradigms, I believe, contribute to more generous and more realistic educational policy affecting how teachers are to function (Eisner, 1998, p.111).

In the texts mentioned above, and dozens of others that have surrounded them, there have been many things that have been proposed as the panacea to various crises in educational theory and curricula development: creativity, critical thinking skills, making it personal, constructivism, and so on, have all been proposed as ways to begin modernizing curriculum development and teaching practice. Working in groups, classroom conversations, along with parallel ventures in assessment such as authentic assessment, anecdotal reporting, narrative assessment, and the like have been proffered as the handmaidens of such proposed curriculum reforms. Each of these has met with varying degrees of success and, for the most part, eventual exhaustion and replacement with the next in a series of what many teachers skeptically call “the latest bandwagon.” In all of these efforts there is what could be called a “future wanting to emerge”: each is a genuine and well intended effort at making the difference that will make the difference in the lives of teachers and students in schools. To this can be added what is becoming an unavoidable reality. Students have become intimate and familiar with new technologies, new sources of communication and information in ways that have already outstripped many of their elders. As we’ve witnessed, as one student was coloring in a map of Canada in his classroom for the purpose of understanding the borders of Canada, another has found an on-line site where a then-contemporary dispute between Denmark and Canada over the sovereignty of Han Island is being described and discussed. Sad to say, since Han Island wasn’t “in the curriculum” (as the teacher put it), the coloring continued.

There is a malaise, here, that is becoming frequently repeated. It has many faces and forms. It arises as an all too familiar pull back into old forms and old ways, either as a cynical response to efforts at reform, or as a retrenchment after the promises of reform are broken, or as a reactionary response to how new proposals leave behind traditional values and ways. This is very often accompanied by an equally familiar move wherein old practices and their familiar outcomes are understood to be more “basic” and therefore in need of being done first: once you color in the map and memorize the names of the provinces, *then*, if we have time, you can look at that website.

We contend that there is an underlying set of assumptions about the nature of knowledge and thereby the nature of curriculum content, which each of these reform ventures either implicitly or explicitly leaves undisturbed and which silently drives reactionary responses to reform. Left in place, this underlying set of assumptions serves to undermine and sideline our ability to pose the question of what might constitute a 21st century learner. We believe that it is an unearthing of the deeply buried effects of this set of assumptions that must guide the nature of any future curriculum development if it is not to slide back into what constitute responses to late 19th century and early 20th century circumstances (circumstances which no longer exist) and therefore cause any proposed efforts at reform to simply join the bandwagon parade.

In order to move forward to 21st century curriculum development, it is essential to return to the foundational underpinnings of 20th century curriculum development and orientations. The reason for going back to these outdated underpinnings is that their effects on contemporary efforts at envisaging the 21st century learner are often ubiquitous and hidden at the same time.

20th Century

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The Man Behind the Scenes: Introducing Frederick Winslow Taylor

F. W. Taylor's thinking so permeates the soil of modern life we no longer realize it's there. (Kanigel 2005 p. 7).

"In the past," F. W. Taylor wrote, "Man has been first. In the future the system must be first." It was not sufficient to have physical movements standardized; the standardized worker "must be happy in his work," too, therefore his thought processes also must be standardized. Scientific management was applied wholesale in American industry in the decade after 1910. It spread quickly to schools. (Wrege & Greenwood 1991)

There is a central historical figure behind the intransigent assumptions that have served to undermine many attempts at educational reform in the past 30 years: Frederick Winslow Taylor. This is not an especially familiar name in educational circles, nor is it the name of an educator or curriculum specialist. However, it was his work that helped shape education's responses to early 20th century demands and it is that shape that we still operate within in our current efforts to understand the 21st century learner.

In the late-19th and early 20th century industrial world of the East Coast United States, from work with Bethlehem Steel Company (circa 1899) and later with Henry Ford (Kanigel 2005, p. 498), Frederick Winslow Taylor (1856-1915) instituted what was later to be called "the efficiency movement" (Callahan 1964). This movement arose out of Taylor's observations on the shop floors of various industries and his development of what he called time and motion studies. In order to make such industries more efficient and less wasteful of time, materials and energy, Taylor broke down any particular task into its component parts and laid out ways in which the organization, management and sequencing of that task could be more efficiently organized. This required regimes of standardization, surveillance, sequencing, and many other now-familiar consequences. It led to shop managers being able to assess any finished product, target any errors in production, and precisely assess and locate the source of such errors. Its most pristine cultural image is that of Henry Ford's assembly line: each worker has placed in front of them an isolated, repeated task to be done with singular, standardized procedures and invariant materials. The task for workers is simply to learn by rote and repetition the efficient accomplishment of this one, isolated task.

This prospect of efficiency swept through all facets of then-contemporary life, from mayor's offices to hospitals to, of course, schools. Under the pressures of early 20th century immigration, coupled with burgeoning needs for workers in every-expanding industrial facilities, the promise of efficiency was irresistible: "educators needed little prompting" (Dufour & Esker, n.d.) in adopting aspects of Taylor's work. Given the burgeoning numbers of immigrant children into large East Coast American cities, and the equally burgeoning need for minimally educated workers in industry, schools had become overwhelmed early in the 20th century, and the prospect of a more

manageable, efficient organization of schooling became irresistible. It should be noted that “as in the U.S., the factory model—the curriculum conceptualized as a mass production assembly line—was accepted by many” in the early 20th century Canadian settings as key to then-“modern” educational reform (Pinar 2008, p. 7).

By the time of the publication of Taylor’s *The Principles of Scientific Management* in 1911 (perhaps not incidentally, this book is still in print), the clarion of efficiency had become a widespread public fad and fancy (see Gatto, 2006; Callahan, 1964). The promise of “the one best way” (Kanigel, 2005) in Taylor’s work and ideas had moved from the limits of industrial production to any form of organization whatsoever. Articles were published regularly in both scholarly journals and popular magazines touting the significance of this new phenomenon of “efficiency” and supporting its willy-nilly application to any and all social ills:

Taylor’s system of management efficiency was being formally taught at Harvard and Dartmouth by 1910. In the next year, 219 articles on the subject appeared in magazines, hundreds more followed: by 1917 a bibliography of 550 school management-science references was available from a Boston publisher. As the steel core of school reform, scientific management enjoyed national recognition. It was the main topic at the 1913 convention of the Department of Superintendence. (Wrege & Greenwood, 1991)

Specifically with regard to education, we have, for example, the words of Ellwood P. Cubberley, Dean of the School of Education at Stanford, from his book *Public School Administration*, originally published in 1916 (cited here from Callahan, 1964, p. 97; see also Cubberley, 1922). In this text he considers that “schools are, in a sense, factories in which the raw products (children) are to be shaped and fashioned” and that “it is the business of the school to build its pupils according to the specifications laid down.” In order to accomplish this, a principle of Taylor’s work is essential: a “complete standardization of all details and methods is not only desirable but absolutely indispensable” (Taylor 1903). Thus we witness some schools going as far as scripting teachers’ and students’ work (as mandated by parts of the *No Child Left Behind* policy and practiced by a number of schools in Canada), requiring multiple classrooms to “be on the same page” as the year progresses, and issuing identical, standardized assessment procedures Province wide, coupled with the “insist[ence] that it shall be done within the time allowed” (Taylor 1903). In the name of efficiency, any materials, interactions, movements, debates, questions, collaborations, assessments, or actions that did not fit this regime was to be expunged.

This is one of the central points of the effects of Taylor’s work that has been forgotten: any aspect of school work that could not be done under this regime of standardization and surveillance was to be considered as extraneous to that work. Such matters are simply, to use the common educational put-down, “frills.” It is important to emphasize that this is where, for example, 20th century debates regarding “core curriculum” are often waged. It is most often around the issue of whether what is being learned can be standardized and surveilled in ways that are industrially efficient and manageable.

Over and above these issues of fragmentation, the sequenced assembly of the fragmented parts, and the temporal and material standardization of such procedures, there is another all too familiar aspect to Taylor's work that is easily recognizable by teachers and students alike:

"Every day, year in and year out, each man should ask himself over and over again, two questions," said Taylor in his standard lecture. "First, 'What is the name of the man I am now working for?' And having answered this definitely then 'What does this man want me to do, right now?' Not, 'What ought I to do in the interests of the company I am working for?' Not, 'What are the duties of the position I am filling?' Not, 'What did I agree to do when I came here?' Not, 'What should I do for my own best interest?' but plainly and simply, 'What does this man want me to do?'" (cited in Boyle, 2006)

From a June 4th, 1906 lecture (cited in Kanigel, 2005, p. 169):

In our scheme we do not ask for the initiative of our men. We do not want any initiative. All we want of them is to obey the orders we give them, do what we say, and do it quick.

"His declared purpose was to take all control from the hands of the workman (whom he regularly compared to oxen or horses) and place it in those of management" (Kanigel, 2005, p. 19).

In its educational manifestation, teachers and students alike are subjected to this loss of control: both do what they are told, in the sequence they are told to do it, and are assessed by those who will measure the efficiency of such work:

In 1903, *The Atlantic Monthly* called for adoption of business organization by schools and William C. Bagley identified the ideal teacher as one who would rigidly "hew to the line." Bagley's ideal school was a place strictly reduced to rigid routine; he repeatedly stressed in his writing a need for "unquestioned obedience." (Wrege & Greenwood, 1991)

"What does this man want me to do?" is echoed in "I have a curriculum to cover" and teacher and students often commiserate that they wish they could do otherwise, but they cannot without being somehow irresponsible. Under regimes of efficiency, students and teachers are not required to be thoughtfully engaged in teaching and learning. In fact, thoughtful engagement with a living discipline of knowledge comes to be seen as precisely one of those "frills" mentioned above. Many teachers and students have said to us that they would love to have such discipline-based, substantive conversations in their classrooms, but this is "an exam year" and, in the work of the assembly-line of schools, "time is always running out" (Berry, 1983, p. 76). Thus, ironically, schooling itself became subjected to a profound form of anti-intellectualism (Callahan, 1964, p. 8). "What [Taylor] really wanted working men to be [and what is wanted from students and teachers when these matters are transferred to schooling] [is] focused, uncomplicated and compliant" (Boyle 2006). Coupled this with how many teacher-education programs become geared towards such uncomplicated, assembly-line delivery of fragments of

knowledge and we end up with teachers who, despite their voiced desires to participate in such conversations, have not cultivated in themselves the ability to make sound judgments about the intellectual quality of such conversations. Braverman (1974) coined the term “deskilling” for this process whereby the need for professionalism, experience and cultivated judgment is drained from the nature of work. Because the ability to make professional judgments about a complex classroom conversation cannot be standardized and efficiently managed, in many schools, such conversations are considered as simply the subjective exchanging of opinions to be allowed if there is time (and there rarely is because, central to Taylor’s work is the filling of time to the brim in order to make work more effective). Taylor’s effect, then, is to shape how we come to understand any sort of judgment, assessment, or classroom practice other than those fitting Taylor’s demand for “large scale” (Leiby, 1991, p. 158) standardization. Any knowledge, teaching practice, classroom activity or assessment vehicle that could not be applied in a standard way on a large scale was ruled out in advance. For example, the criteria within mathematics that make for a vigorous, knowledgeable and mathematically sound conversation get replaced by criteria of efficient production and surveillance and a teacher’s knowledge “of” mathematics as a living discipline gets substituted by knowledge of delivery methods and the “pieces” that will be on the test. What then occurs is that teachers who are deeply knowledgeable about mathematics as a living discipline learn to hold such knowledge at bay. We end up, then, with something the authors witnessed, where the former head of a University mathematics department visited a local high school mathematics classroom and said that he recognized nothing of his discipline in the work he saw being done.

There are two final turns in this silent legacy of F.W. Taylor’s work.

First, Taylor’s image of industrial assembly fit perfectly with a logic of fragmentation borne from a since-outdated version of the empirical sciences in the early 20th century. This dovetailed perfectly with the then-emerging (and since outmoded by contemporary learning theories) Behavioral Sciences (via the work of Thorndike [see Pinar 2008]) to produce *an image of knowledge itself* as built up one “basic” bit at a time (“the basics,” in fact, became identified with those not-further-divisible “bits” out of which any knowledge was assembled, and “back to the basics” came to mean back to a version of standardized knowledge-assembly right in line with Taylorian principles [see Jardine, Clifford & Friesen 2008]). A direct line can be drawn from Thorndike’s work to names more familiar in education: Franklin Bobbitt, Ralph Tyler and Madeline Hunter.

This leads to the second consequence. Any type of knowledge production or dissemination, any type of learning or display or demonstration of learning, any form of assessment procedure, that did not fit with these rules of standardization were *erased from consideration*. In its most extreme form, if a student has a question, that means, under Taylor’s regime, that they have a problem, and that problem then needs to be fixed so that there will no longer be any questions but simply obedience and compliance and its resultant productivities. Moreover, the sort of lively work and conversations that make, for example, mathematics as a living discipline have no place in the efficient running

of a mathematics classroom. *Mathematics itself as a living discipline of knowledge becomes rendered by Taylorian principles into something that can be efficiently assembled according to rules that are not part of that living discipline but part of the “principles of scientific management” that guide standardized industrial replication.*

This is the assumption than so many of the efforts at educational reform have left uninterrupted and unaddressed. **Our very understanding of the disciplines of knowledge that have been entrusted to teachers and students in schools has been formed and shaped by the fragmentation inherent in Taylor’s efficiency movement.** Curriculum, consequently, has been understood as a “a rutted course [one of the etymological origins of the term]. . . . Vast numbers of learning objectives, each associated with pedagogical strategies, serve as mile posts along the trail mapped by texts from kindergarten to twelfth grade.” (Bransford, Brown & Cocking, 2000, p. 139). Knowledge becomes scoped and sequenced and students either pass to next station (picture Ford’s assembly line), or, if they do not pass, they are then shipped off to the special classes to be remediated or accelerated. Thus, a familiar pattern emerges that is right within the legacy of Taylor’s work:

- Knowledge is a collection of facts about the world and procedures for how to solve problems
- The goal of schooling is to get these facts and procedures into the student’s head.
- Teachers know these facts and procedures and their job is to transmit them to students.
- Simpler facts and procedures should be learned first.
- The way to determine the success of schooling is to text the students to see how many facts and procedures they have acquired.

(Sawyer, 2006, p.1)

In all these cases, the assembly line image (and its premise of fragmentation and isolation) stays in place and is simply replicated in ESL classes, special needs classes, gifted programs and the like. When curriculum is organized as an assembly line premised on standardization, diversity, different learning styles or tempos of learning, multiculturalism, and multilingualism, become problems, because they don’t fit the standards requisite of the assembly line’s organization. It is precisely this standardization that made the assembly line efficient. In an unconscious effort to keep Taylor’s regime in place, what has been occurring in the late 20th and early 21st century is a proliferating of multiple assembly lines, each one produced in order to attempt to respond to the newly emerging circumstances (increased immigration and ESL, new special needs assessments and so on), but each one keeping in place precisely the regime of efficiency that renders “difference [into] a problem to be solved and subsumed under a condition of mastery and explanation” (Smith, 1999, p. 139).

Not only does difference and diversity become a problem to be subsumed under standardization through the proliferation of new assembly lines each geared to “accommodating” the differences it encounters. The “standard” line of schooling—most schools, most teachers, most students, all standardized school subjects—is affected as well. There are only one way that the assembly line regime of schooling can cope with increasing demands from an ever-changing world, and its way of coping is familiar far beyond the bounds of schools themselves: if demands increase, all the assembly line can do is *accelerate*.

It is important, given the hiddenness and near-unaddressability of the underlying assumptions that schools have inherited from Taylor’s work, to give thought to what happens if the assumption of fragmentation and isolated tasks has tossed into it some current reform efforts. We will only provide one example in the current context. Constructivism speaks of how individuals each “make sense” of the world in his or her own ways, and, if we reach back to the work of Jean Piaget (1971, p. xii; see Jardine, 2005), we get statements that picture knowledge as “imposing cosmos on the chaos of experience,” a statement that leaves behaviourism-like fragmentation in place and puts the onus for the patterns and disciplines of knowledge at the willful discretion of students. Piagetism presumes that what comes to meet you is chaotic and contextless and his work simply adds into this mix an active agent—each child constructing his or her own knowledge out of the fragmented bits. Given that knowledge is understood to be thus “constructed” out of isolated, disassembled fragments whose relations to each other have been erased, teachers lose track of how to interrupt students’ constructions without simply imposing their own constructions. Recourse to the interrelated, living discipline that houses such fragments has been cut off as a way to proceed. Since the alternatives are now teacher constructions or student constructions, classrooms become “student centered,” students become “left to their own devices” (Arendt 1969, p. 196). Such efforts are important and well meaning. After all, there is a hint here of trying to put the initiative and involvement of individual students, which Taylorism had effaced, back into the educational mix. However, if the presumption of curriculum as constituted by isolated fragments is left in place, such efforts eventually collapse and such student-centredness becomes replaced with its seeming opposite: teacher centered classrooms or variations on “back to the basics.”

Two of the major frameworks of learning theory in the 20th century—behaviourism and constructivism—thus rest on *the same assumption of fragmentation*. Neither refers to a living discipline that needs to be taken into account when we understand a theory of learning. Therefore, what seem like two pendulum extremes are in fact, at base, the same, and we find ourselves, as some reform documents have called it, “riding the pendulum” (Stahl, 1990) between the hidden but common fulcrum of Taylor’s legacy.

A False Hope: The Acquisition of *Generic Skills*

One predominate thrust of late 20th and early 21st century reform is centered around the phrase “21st-century skills.” This term is *de rigueur* in education policy discussions these days, from staff rooms, news media and ministries of education. It is, in its own way, an attempt to insert into the standardization and initiative-draining regime of Taylorism a sense of agency, a sense of the active work of students and teachers in the work of learning. It is, in its own way, a move against Taylor’s insistence that “In the past, Man has been first. In the future the system must be first” (cited in Wrege & Greenwood, 1991).

“21st century skills” is generally defined as a set of skills from critical-thinking, analytical thinking, creative thinking, collaboration and teamwork, and communication. In addition, some experts argue will be in high demand as the world increasingly shifts to a global, entrepreneurial, and service-based workplace. A number of organizations have forwarded what they believe are the skills needed to survive in the 21st century. Here are a few examples:

The following skills should be considered within the context of rigorous academic standards. They are a bridge to authentic, intellectually challenging work by students.

Example One

Digital-Age Literacy

- Basic, scientific, economic, and technological literacies
- Visual and Information literacies
- Multicultural literacy and global awareness

Inventive Thinking

- Adaptability, managing complexity, and self-direction
- Curiosity, creativity, and risk-taking
- Higher-order thinking and sound reasoning

Effective Communication

- Teaming, collaboration, and interpersonal skills
- Personal, social, and civic responsibility
- Interactive communication

High Productivity

- Prioritizing, planning, and managing for results
- Effective use of real-world tools
- Ability to produce relevant, high-quality products

(enGauge 21st Century Skills, 2009, p. 5

Example Two

Learners use skills, resources, and tools to:

1. Inquire, think critically, and gain knowledge
2. Draw conclusions, make informed decisions, apply knowledge to new situations, and create new knowledge
3. Share knowledge and participate ethically and productively as members of our democratic society
4. Pursue personal and aesthetic growth

(Standards for the 21st Century Learner, 2007)

Example Three

Core Subjects and Interdisciplinary Themes

- English, reading or language arts
 - Foreign Languages
 - Arts
 - Mathematics
 - Economics
 - Science
 - Geography
 - History
 - Government and Civics (including 21st century themes of Global Awareness, Financial, Economic, Business and Entrepreneurial Literacy)
1. Learning and Innovation Skills
 - Critical Thinking and Problem Solving
 - Creativity and Innovation
 - Communication and Collaboration
 2. Information, Media and Technology Skills
 - Information Literacy (accessing information efficiently and effectively, evaluating information critically and competently, and using information accurately and creatively)
 - Media Literacy (a framework to access, analyze, evaluate and create messages in a variety of forms, builds an understanding of the role of media in society, as well as essential skills of inquiry and self expression necessary for citizens of a democracy)
 - Information communication and technology (ICT) Literacy (skillful use of information sources, but also a deep understanding of the “grammar” of technology)
 3. Life and Career Skills
 - Flexibility and Adaptability
 - Initiative and Self-direction

- Social and Cross-cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

(Partnership for 21st Century Skills)

Example Four

Four Models of the 21st Century Learner

The Collaborator uses networks of people, knowledge, skills and ideas as sources of learning. The emphasis is on social interactions. The Collaborator-learner:

- Seeks out and maintains links and networks
- Negotiates and exchanges ideas
- Uses new technology to support collaborative work
- Contributes and adds value to cooperative learning processes
- Exploits and derives value from them
- Is a team player, able to reach ‘win-win’ agreements

The Free Agent makes full use of continuous, open-ended and life-long styles and systems of learning, and is:

- Flexible, able to keep pace with change, to take advantage of it
- Able to cope with changing requirements of an unstable job market and of employers who are not certain and often ambiguous about necessary qualifications of graduates
- More concerned with personal transferable skills than those relating to particular occupations (not bound by an occupation)
- Conversant with new technology and therefore not constrained by place and accessibility to instructors
- Independent, self-reliant, using new combined courses of study, rather than those which are profession-related
- Able to take advantage of modularity, credit transfer, and arrangements for accumulated learning

The Wise Analyzer gathers evidence of effective activity, scrutinises it and applies its conclusions to new problems and new contexts, and is:

- Reflective and critical
- Skilled at the processes of research, testing of validity and the application of findings
- Close to the world of work and opportunities for action research
- Able to argue judgments securely
- Able to apply and adapt arguments to new contexts and to use them in the management of change

The Creative Synthesiser connects across themes and disciplines, cross-fertilises ideas, integrates separate concepts and creates new vision and new practice. This learner:

- Has new ways of seeing the world
- Puts aside ideas that learning is linear and confirms to us that everything is interrelated and complex
- Is able to create, investigate and to seize opportunities for development and change

All learners need:

- Keen perception of new social trends and change
- Skills in self-reliance, the ability to take, survive and profit from risks
- Ability to develop and maintain value of their “portfolio”, to adapt goals in the face of changing circumstances, and to seek out and manage, and not to fear career transitions
- Underlying confidence and sense of self-worth

Support towards responsibility in learning

(Four Models of the 21st Century Learner)

Example Five

Finally, these are the findings of 21st century literacy:

- Is multi-modal – more than text and verbal forms of communication; includes interpreting layers of meaning in sound, music, still and moving images, and interactive components at once
- Includes creative fluency as well as interpretive facility – along with reading and writing well, and also the ability to articulate and create ideas in these new forms, and understand layers of meanings they may convey
- Means learning a new grammar with its own rules of construction – tools that make multimedia easily accessible; may be intuitive to young people who are/are becoming digital natives
- Lends itself to interactive communication – while print-based authoring is largely one-way communication, written authoring in ICT lends itself much more to interaction, even in its most formal forms, with real-time immediacy as an important dimension
- Implies the ability to use media to evoke emotional responses – the ability to understand the power of media communication tools of imagery and sound, as it relates to evoking emotion, to recognize it, and to manipulate it is at the heart of this new literacy

- Has the potential to transform the way we learn – Humans are wired to learn, and when it is pleasurable, learning happens more rapidly. The vocabulary and tools of the 21st century are appealing to young people, and can be used to engage learners in powerful new ways, and to encourage their brains in ways to take advantage of exciting new pathways to learning.

(The Report on the 21st Century Literacy Summit)

We recognize that each of these efforts has its strengths and that, in and of themselves, each one offers compelling images and ideas regarding 21st century “skills.” However, we must note a fundamental absence from each and every one of these efforts. In no instances is there any talk about *what is being learned*. In no instance is any credence or attention given to the living, interrelated, patterned disciplines of work *within which*, for example, one might apply “critical thinking skills.” In none of these instances is any attention given to how a living field of work might make substantive demands on what it means to think critically in that field. Recall the effects of Taylor’s efficiency movement: the specific rules and organizations that are indigenous to a field are replaced by disassembled fragments whose reassembly is according to generic rules of management and surveillance. “Thinking skills,” generically understood, can be inserted into these fragments as a well-intended way to recover what has been lost.

What is missing in this generic thinking skills movement is that, for example, “thinking critically” is *not* a generic phenomenon that simply is to be aimed at a particular discipline. “To think critically about poetry” and “to think critically about geometry” each draw upon the images, ancestries, histories, and substantive work of their respective disciplines and fields. Each has, as part of its character as a living discipline, specific ideas about thinking creatively, working collaboratively, the ability to make sound arguments and so on (to cite but a few of the generic items listed above). In each of these instances, “skills” and the living content of the discipline are not two things, and thinking of “skills” independently of the living locales in which such skills are housed has the potential to leave Taylor’s effects on education in place.

Something about *what is being learned* (about how we understand *curriculum*) must change if these efforts are to have lasting impact on the theory and practice of education. Curriculum content is not isolated, fragmented, information to which thinking skills are then applied. Curriculum content is constituted by living fields of work which *call for* certain thinking skills and into which teachers and students must be invited to do the work required of that field. When we think of a generic list cited above such as Critical Thinking, Problem Solving, Creativity, Innovation, Communication, and Collaboration, these skills must each be understood as being shaped by the ways that each inhabits and is defined by a living discipline. Without this shift, we slip into an old rut; “educators react[ing] to the debate with weariness, saying it echoes long-standing disagreements about the place of content and skills in education” (Haughey 2006 p.3).

21st Century

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The Post-Industrial Society: Side-Stepping the Legacy of F.W. Taylor

It is to the side-stepping of the legacy of F.W. Taylor that our attention must turn if we are to think through what is meant by learners and learning in the 21st century and if we are to propose initiatives that don't revolve around the hidden assumptions that have scuttled so many well meaning efforts at late 20th century educational reform. There is, as we mentioned above, a future that is struggling to emerge, and it is based on images and ideas that step away from the fragmentation of Taylor's work. This set of ideas and images is emerging on several fronts and, because of the predominance of Taylor's ideas, each one carries a shadow of that legacy:

1. The recent rise of ideas of ecological interdependence, sustainability, living systems and the like provide an analogy for how to understand how knowledge fits into a living discipline and how learners might relate to that discipline. Ecology, offers a way of think about things that does not begin with isolated bits and pieces but with webs of relationships that are not simply contextual of individual things but constitutive of them. That is to say, an earthly thing is not simply "surrounded" by other things in an "environment" but is constituted, formed and shaped by those surroundings, just as in a living discipline any particular piece within that living discipline is constituted, formed and shaped by its placement within that living field of knowledge. In isolation from those surroundings, it is no longer healthy and whole. In response to this emerging understanding of interdependence; however, environmentalism has been inserted into the Taylor framework of curriculum as simply one more assembly line to be covered and tested as part of the science curriculum.
2. New information and communications technologies (ICT) are organized in webs of interrelationships. These new technologies not only make knowledge accessible beyond the boundaries of surveillance that come from schools. Disciplines of knowledge themselves, each in their own way and to their own measure, use these new technologies to create new knowledge in that discipline, to organize communications and disseminations between members of that discipline, to store and sort the ancestral knowledge of those disciplines. These new technologies have also broken open the strictures that have equated knowledge with text. Visual, auditory, multilayered, linked, participatory forms of knowing are supported by such technologies. However, as we have witnessed, this protean new technology has often been utilized as a more efficient delivery system of the same old news. Never before has there been such a gulf between generations when it comes to understanding and utilizing the full array of technological possibilities. However, when students come, say, to chemistry class and no mention is made of how new technologies are central to the life of that discipline; and when, meanwhile, ICT classes are always held "down the hall" in a large lab filled with computers, leaving behind each of the disciplines of knowledge to older ways and means, this "siloiing" of knowledge "of computers" into a separate "lines" again bespeaks Taylor's influence. Sometimes the most we see is computer assisted quizzes or programs that self-correct geometry questions, and the like. There are many educators, politicians and policy makers

who believe that the addition of technology to learning is all that is required to create an education system for the 21st century. However, the research is clear, merely adding technology to 20th century curriculum content, pedagogy and assessment does not, by itself ensure a 21st century education (Bennett, 2002; Cuban, 2001; Peck, et al., 2002; Levin & Arafeh, 2002). A phrase that has been used in this regard is that, if you leave fragmentation in place, ICTs simply provide “ignorance at the speed of light.”

3. New research methodologies such as: design-based research, action research, interpretive research and some of the more rigorous forms of teacher narrative have emerged which are interested in exploring, not on fragmented bits of culled data, but living fields of familiarity, ancestral relatedness, classroom-based experience and observations as ways to understand. Curriculum is cast as a living inheritance that has been entrusted to teachers and students in schools, and research proceeds from this basis (see Jardine, Friesen & Clifford, 2006, 2008).
4. A rising interest in “indigenous knowledge,” which, broadly described, involves a way of living with the interdependencies between a land, its people, its stories and its ancestors. (Friesen, Jardine & Gladstone, in press). Again, a similar potential danger emerges. The simple “addition” of Aboriginal studies to the Program of Studies simply means that there is one more thing to be done in an already rushed and crowded shop floor, and fill-in-the-blank worksheets on “the Potlach” follow the same old patterns.
5. Economic and political convergences, as well as convergences of language, cultures and traditions are driving what has been coined as “globalization.” In this family of new emergences, globalization is an opportunity for moral responsibility to all the citizens of the world—particularly those less fortunate. It is also an opportunity to experience how knowledge can be enhanced through multiple languages, backgrounds and experiences. Moreover, ICTs have immensely expanded our ability to connect, collaborate and converse with others in the world. There is also an “ecological” point here, that “no one tradition can say everything that needs to be said about the full expression of human experience in the world” (Smith, 2006, p. 55) and therefore the mutuality and interdependence portended by a global community is not merely a “frill”. Such matters are not an “add on” to be “celebrated” with foods and costumes. Rather, globalization portends a sort of ecological balancing of the risks that have come from singularity and standardization.
6. The learning sciences forward a “theory of learning ... that leads to very different approaches to the design of curriculum, teaching, and assessment than those often found in schools today” (Bransford, Brown & Cocking, 2000, p.3).

These theories of learning are concerned with developing:

- understanding, which requires that students' initial understandings are engaged in order to grasp new concepts and information. Doing something with what you know in a new situation.
- competence in an area of inquiry.
- “metacognitive” approaches to help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.

(Bransford, Brown & Cocking, 2000, pp.14-19)

New “learning science” investigations are developing new models of how knowledge and memory have to do, not with assembling isolated bits and pieces, but with developing, experiencing and cultivating fields of relations. Even Vygotsky’s idea of the Zone of Proximal Development (1987) which is now reflected in the research on scaffolding (Bransford, Brown & Cocking, 2000; Sawyer, 2006) was an early attempt to hint at this new way of conceiving knowledge and its ways. Many teachers attempt to integrate some of this new information about how people learn, but there is a danger. If an understanding of curriculum—*what* is being taught—is fragmented bits and pieces, such that group discussions, active explorations and the like can become free-for-alls. Many teachers then revert, after “group work,” to simply listing the knowledge to be gleaned from those conversations.

21st century learning introduces knowledge building into the learning landscape. It introduces knowledge building into the learning landscape, but that landscape includes not only other students and the teacher, but the ancestry of the discipline, the work that has been done before, the experts in the field and ways of working within that field that have been honed and cultivated within that field. Therefore, the work of teachers and students is housed within a field, both opened up by the field and limited by the field/taught. The field itself becomes a teacher. (Also see Gardner’s work, *Five Minds For The Future*²).

Clearly, these threads are not separate, but part of a potent and powerful mix of, so to speak, “family resemblances” (Wittgenstein, 1968) that are demanding of education that it no longer begin with isolation and fragmentation, but with a deeper sense of living, interdependent systems.

Each thread tugs on all the others, and this makes for difficult times when our prevailing presumptions are those that equate knowledge with isolation and fragmentation. None of these newly emerging forces emerges untainted by the presumptions we have been carrying for over a century. This list is, admittedly, quite overwhelming. The good news is, however, that, at the core of this emerging future there is an already operating pedagogical response. Classrooms in a wide array of

² Gardner (2006) talks about five “minds” or dispositions that people need to thrive in the coming world. He explains that while they are different from the familiar “multiple intelligences” in that they are more broadly cultivated, they surely involve the exercise or application of those intelligences. Individuals without respect will not be worthy of respect by others and will poison the workplace and the commons

grade levels and disciplines are already exploring the nature of this newly opening place. Most of these classrooms run up against the ways in which Taylor's work still informs curriculum Programs of Study.

Living Fields of Knowledge and the Work of Schooling

As with any new initiative, it is tempting to hear the future that is trying to emerge only in terms of the old categories we have inherited. What is emerging (and what has, as mentioned above, analogies with ecology, new information and communications technologies, new research methodologies, the rise of indigenous knowledge, certain aspects of globalization and new work in learning theory) is an image of curriculum as a place, a landscape, a “topography” (full of “topics”), an “environment” with interdependent features and ways:

Many models of curriculum design seem to produce knowledge and skills that are disconnected rather than organized into coherent wholes. The National Research Council (1990, p.4) note that “To the Romans, a curriculum was a rutted course that guided the path of two-wheeled chariots. Vast numbers of learning objectives, each associated with pedagogical strategies, serve as mile posts along the trail mapped by texts from kindergarten to twelfth grade.” An alternative to a “rutted path” curriculum is one of “learning the landscape” (Greeno, 1991). In this metaphor, learning is analogous to learning to live in an environment: learning your way around, learning what resources are available, and learning how to use those resources in conducting your activities productively and enjoyably (Greeno, 1991, p.175). Knowing where one is in a landscape requires a network of connections that link one’s present location to the larger space. Traditional curricula often fail to help students “learn their way around” a discipline. (Bransford, Brown & Cocking, 2000, p. 139).

We can hear in this passage from the American *National Research Council* a concerted effort to use new language, new images, to understand what is required of the 21st century learner, and how we might imagine curriculum differently in order to enter into this new space. Clearly, the language of “landscapes” is a metaphor that might seem fanciful at first until we realize that picturing knowledge as if it was in a line (despite all the “this is the real world” protestations to the contrary) is *itself* metaphorical. What is being demanded here is that those proposing reform understand that teachers and students in schools have been entrusted with *living disciplines of knowledge* (Jardine, Clifford & Friesen, 2008; Doll, 2009; Pinar, 2007) and as such, teaching and learning must take on the character of inviting students and teachers into the sort of work that is *proper to such living disciplines*. Explorations, conversations, arguments, demonstrations, experiments, various forms of exemplifying knowledge, contact with those who work in these fields, applying these realms of knowledge to real world situations, making one’s findings public, heeding the ancestral knowledge that lives in a living discipline, identifying how such knowledge still lives in the ways of the world—all these things are commonplaces for those who work in a field of knowledge. Such living fields or landscapes of work make demands on those who enter such fields. Poetry requires a very particularly well-trained ear and eye; quadratic equations call for imagining curves on a Cartesian field, physics allows insight into the curves of highway off-ramps and the pull of inertia, history helps us understand documentation, description, detail in ways that are different from other disciplines, and so on. Ironically, in fact, many of the very matters that have been erased in the name of efficiency are

precisely those matters that provide the vigor and life and rigorousness of such living disciplines of knowledge. This idea of a landscape in which one learns to work and dwell, within which the relatedness and interdependence of those things which the field sustains are essential to their well being, in which one's actions are those of obligation to and care for that well-being, in which others have come before us and work has already been done—these matters define how knowledge is in fact organized *in the world*.

In our own work, for example (see Jardine, 1995; Jardine & Friesen, 1997; Friesen, Clifford & Jardine, 1998, 1999, 2003; Friesen & Jardine, in press), we have explored mathematics as an intergenerational, sustaining field of relations that one must *inhabit* in order to understand, along with the perennial pedagogical questions of how to invite *this* class, or *that* particular student, into such “field knowledge.” We want to immediately reiterate that these seemingly subsequent pedagogical questions of invitation arise in a particular way. We are convinced that, as a living landscape or field, that field has within it a great range of diversity, multiplicity, modes, forms and figures. It has an elaborate ancestry of work and works, traces and tracks. As such, as a living field, mathematics is amenable to a wide range of explorers, a wide range of “learning styles” and interests, strengths and forgivable weaknesses, *because this amenability is in the nature of a living field*. A living field *is* diverse and thereby has, in its nature as a living field, a breadth of embrace that shifts how we might discuss issues of diverse learning styles, English as a second language, special needs, multiple intelligences, learning delays, and the like. If we begin with image of mathematics that flows from Taylor's efficiency-fragmentation movement, with its requisite regimes of standardization, such diversity is a problem that must be fixed by multiplying the array of assembly lines to accommodate an ever increasing list of “diversity of learners.” We must simply state here that every teacher knows just how endless and burdensome this list can become if it is read against the background of fragmentation and efficient assembly. Under Taylor's shadow, everything accelerates and proliferates and scatters and everything becomes one more problem to overcome. This is yet another sign that Taylor's legacy has reached its limit and simply tinkering with it will no longer suffice.

There is another, related sense in which these terms “topic” and “landscape” are to be understood in relation to this new way of thinking about curriculum and learners in the 21st century. This second sense is best understood by using a simple example. When a group of Grade One and Two students began exploring the disappearance of grain elevators in Southern Alberta, this led, over the course of a year, to writing letters, interviewing local farmers, visiting local grain elevators, making both artistic and geometrically accurate drawings, learning about grains and weather and seasons, seeking out the histories of small towns, visiting Edmonton and interviewing the premier, and so on. In order to do justice to this multifarious “topic,” a wide array of curriculum areas were required to be brought to bear. Many forms of writing emerged—creative, descriptive, letter-writing, historical documentation. Many threads of mathematics were needed—volume, weight, capacity, and so on. Many aspect of science were explored—growing seasons, animals and their habitats, pulleys and levels found in the elevators. Historical information was required and its forms of documentation were explored. Various artistic forms of portraying their work—poetry, paintings, sketches, as well as a

website that was eventually designed to house all of their—were practiced and used. A wide array of experts in various fields were contacted in order to fill out the social, cultural, economic, and personal histories of grain elevators and their uses. This is but one (see <http://www.galileo.org/schools/district-cbe/princeofwales/stories/index.htm>) of many school based examples that are readily available on line.

Grades	Inquiry-based Study	URL
Elementary Years		
Grades 1/2 and 4 S	Calgary Stampede and Treaty 7 First Nations: A Historical Perspective	http://www.galileo.org/stampedeschool/index.htm
Grade 1/2	What Stories Do We Have To Tell?	http://www.galileo.org/schools/district-cbe/princeofwales/stories/index.htm
Grade 4	Exploring Kainai Plants and Culture	http://www.galileo.org/plants/kainai/
Middle Years		
Grades 3, 6 & 8	History of Cowboy Culture	http://www.galileo.org/cowboyculture/index.htm
Grade 7	Virtual Museum	http://www.galileo.org/initiatives/vmuseum/index.html
Grades 4 & 5	Millarville Archaeology	http://www.galileo.org/schools/millarville/archaeology/index.html
Secondary Years		
Grades 10 & 11	Democracy in Iraq	http://www.galileo.org/secondary/iraq/index.html
Grade 10	Riverrun: Evolution or	http://partner.galileo.org/schools/cody/hum10/riverrun/default.asp

	Genocide?	
Grade 11	Survivor	http://partner.galileo.org/schools/strathmore/survivor/index.html

As these examples show, “landscape,” refers both to the cluster of interdependent ideas that define a particular discipline, and to how living, vital topics in the world call for the knowledge of a myriad of such disciplines if those topics are to be properly understood. Therefore, not only does the idea of “landscape” resist the fragmentation and breakdown *within* any particular discipline. It also resists the fragmentation and breakdown *between* disciplines. This is similar to many efforts at “integrating the curriculum,” but it has as its touchstone the sorts of integration that are *called for* by a vigorous and engaging topic in the world. This sort of curricular integration thus avoids the danger of weakening the rigor of each discipline that occurred in some versions of “curriculum integration” by helping students understand the link between the topic under consideration and what that topic demands of the disciplines of knowledge if it is to be properly and rigorously understood. This is not, as we’ve expressed it (Jardine, 1995), simply putting “math facts on a teddy bear’s tummy” because you are doing a “bear unit.” Rather, curriculum integration involves understanding how topics, as they live in the world, do not necessarily subdivide into the specific curriculum disciplines as outlined in a Program of Studies. Curriculum integration will not occur by artificially blending together curriculum areas in ways that are not authentically called for by the topic under consideration. In the late 20th century, we saw this trying to emerge with talk of “themes” in schools, but these efforts often remained unlinked to a deep sense of curriculum areas as living fields of work.

Landscape, field, topography, a “larger space” of interdependent relations and the slow, cumulative work of coming to know your way around such a field, and how the cultivation of memory is linked in with such matters—this begins to sidestep the exhausting fact that most teacher and students currently understand full well, that time seems to be always running out in classrooms where assembly line fragmentation has taken hold. One of the initial responses we have encountered countless times regarding this new way of imagining the work of the classroom is this: “I don’t have time.” But we have witnessed and documented dozens of examples, from grades K-12 and in all subject areas, that something about time and its passage shifts in such matters and that, in a measured way, time slows down and teachers and students accomplish mandated curriculum requirements with time to spare. That is to say, a great deal of the running out of time is produced by the very arrangement that was intended to save time in the first place. This is what was named as “counterproductivity” in Ivan Illich’s (Illich & Cayley 1992, p. 110) description of what occurs when an institutional structure reaches its limit. It starts to *produce* the problem for which it was designed to be the *solution*.

It is this very sign of counterproductivity that makes all the more urgent the unearthing of the underlying assumptions that have kept in place the structures that were once so full of hope, so responsive to early 20th century concerns, but which have now reached the end of their productive life. The sort of piecemeal tinkering which has

characterized many efforts at reform in the last 30 years is no longer adequate to the task we face.

We end this brief description of the nature of “learning the landscape” by attesting to what we have witnessed in numerous classrooms: once this work begins to take hold, teachers and students alike become more deeply engaged (because engagement and initiative are now characteristics of learning your way around a landscape) and the work of learning, now housed in the real, disciplined work of knowledge in the world, becomes, frankly, more enjoyable. We recall F.W. Taylor’s admonishment of engineering students who were “spoiled by interesting studies” and by “the sheer pleasure of learning”:

They begin to learn the greatest lesson of life, that almost nine tenths of the work that every man has to do is monotonous, tiresome and uninteresting. They then start to develop the character which enables them to do unpleasant, disagreeable things. (cited in Kanigel 2005, p. 139).

This is far too close for comfort for educators when we hear, for example, common high school students’ complains about school itself. This grey image of monotony, tiresomeness and disinterest is, sad to say, more appropriately an image of many schools, and it is one produced of precisely the breakdown and fragmentation that Taylor intended, not as a remedy for such monotony, but as a way to make such things run efficiently. The question that a teacher needs to begin with is “How can I invite my students into the field?” rather than “What piece do I begin with?”

21st Century Learners

We want to begin this section on 21st century learners by providing you with a list generated by secondary school students from across Canada. These students were asked to articulate what they understood school to be and to articulate what they wanted schooling to become. They identified three places: the learning program (what they needed to learn), learning relationships (who they needed to learn from and with) and learning spaces (where they needed to learn).

Learning Program (What we need to learn?)

- The system is too competitive. We want less emphasis on negative motivation, less emphasis on test and more emphasis on performance and application
- Real life skills
- Debating skills
- Basic philosophy
- Raise global awareness
- Self-discovery, self knowledge
- Languages
- Increase communication skills
- Interpersonal skills

- Current events
- Infusing application to coursework
- More collaborative team building
- Authentic real life problems
- Schedule school wide physical activity
- 6 week programs (enriched) focused (modular based)
- am could be a more conventional learning program but pm would be applied, hands on
- staying current with each subject
- working with field experts
- throw out the factory model → we are not likely to work in one
- more technology (maximizing use)
- we need time to learn time management
- learning beyond the curriculum
- purpose of learning made clear
- opportunities to reflect on learning
- 3 step approach (rediscover, learning, application)
- in-depth learning, less lecture
- college, university, polytechnic prep in grade 12
- more opportunities for students to share, discuss
- opportunities to build on knowledge together
- specialized courses, more options, make it match me
- being able to direct your gr 11 and 12 programs
- combining courses, multidisciplinary topics
- survival skills for outdoors
- basic first aid
- comment based assessment with lots of feedback and much less emphasis on letter grades
- 1 on 1 interviews with teachers
- clear criteria
- self-assessment with lots of time to talk it through

Learning Relationships (Who we need to learn with)

- more personal, 1 – 1
- small groups
- table groups
- discussion groups
- more teachers in the classroom
- fewer students (15 – 20)
- multi grade peer teaching
- teacher passion
- stronger relationships with university and post secondary mentors (in the classroom)
- better communication with counselors

- students stay with teacher longer periods (time to develop a trusting relationship also this gives the teacher time to get to know you as a learner)
- interactive, more personal connection
- teaching to different learners
- mutual respect
- encouraging students to give feedback to teachers
- teacher being flexible with students who are involved in various activities
- teacher being open and understanding
- family support—workshops for parents
- community supports
- parent/school relationship—greater collaboration
- family values-school pressure-balance

Learning Spaces (where we need to learn)

- more options for furniture (bigger seats, desks not attached furniture)
- labs
- open areas and windows
- no closed doors (less barriers)
- online and face to face
- campfire, cave and watering hole
- private study areas
- brighter, colourful spaces,
- central space and school built around it
- represents BC
- caring paces
- heating systems that work
- more natural light
- increase technology use
- voice recording of lessons that are available online
- established area for listening to music (maybe classical)

Interestingly enough when the district superintendents and principals saw what the students had written, they said, “That is exactly what we want. What is keeping us from getting there?”

Part of what is keeping us from “getting there” is that we have yet to write a curriculum (Programs of Study) that reveals the living character of the disciplines and that provides an adequate response to the invitations that these students have opened. It is now time for curriculum to step forward, to accept the responsibility of providing a curriculum framework that is responsive to these realities: the students, the new research findings and the new demands that the world is making on education.

Teachers need coherent, supportive Programs of Study that will not only allow, but also encourage, them to understand their work differently than the factory model allows. Their job, in the 21st century, is to introduce students into living fields of knowledge and the ways of living proper to that field. It is to be for students, an example of what it means to be interested in the ways of that place and to support them as they learn to find their way around in it.

Comparison of Industrial Education and Post-Industrial

Industrial (Taylorism)	Post Industrial (Post Taylor)
Follows rules of efficient assembly.	Follows rules indigenous to the living discipline which does not ask for assembly.
Assembly requires disinterest and lack of initiative.	Learning your way around a discipline requires interest (being in the middle <i>inter esse</i> Latin) and initiative.
Scientific management requires uniformity of assembly.	Finding one's way around a living field does not require uniformity. Any sense of "uniformity" is had from remaining within the field (whose locations can be variegated), not from everyone being "in the same place" or "doing the same thing" in that field.
Scientific management treats multiplicity and diversity as things to be eradicated from the system in order to increase efficiency.	Living fields require diverse ways of knowing in order to be treated properly, for example, mathematics is visual, conceptual, symbolic, etc.
Taylorian assessment is premised on uniformity since it is precisely the uniform assembly of an object that is being tested. Assessment is "formal"/generic because efficiency of assessment becomes the issue.	Assessment is substantive, specific and contextual. It relies on a knowledge of the forms of assessment that are linked to how knowledge is assessed within the living discipline in question.

Conclusion

As we consider the transformations required of 21st century education, we can acknowledge two things: (1) As a society, we have been in this place before; and (2) no one is to blame for the current need to change. The world, once again, has changed. And education needs to be, "set right anew."

Today, everyone needs robust, rigorous thinking abilities and skills. Learning is a key feature of knowledge societies. Knowing how to learn, being inspired to continue learning and learning together are essential in today's world, as are the ability to build on other's ideas, collaborate to solve problems, address issues, and pose new problems or questions. Such activities, embedded in a living field of knowledge, fundamentally change what teachers are currently required to spend their time doing under the assembly line model—content delivery. And it fundamentally changes what students are currently required to spend their time doing under that worn-out model—receiving and regurgitating content. Kurt Fischer (2008) of Harvard University's *Mind, Brain and Education Institute* reminds us that "We are not brains disembodied in the bucket sitting in the corner. And likewise, we don't learn by having information stuck into our brains. It doesn't work that way. We have to learn more actively than that. So it is not true that you can plug the world into the brain and thereby know everything. Instead, knowledge has to built" (para. 12). We would like to build on Fischer's idea because it is, once again, too easy to read it without interrupting the assembly-line legacy— more active learning needs to be coupled with and understanding of *what is being learned* as a living field that will limit and teach that activity to be thoughtful, disciplined and careful of what that field demands of it.

This finding has significant implications as educators look for ways to design curricula for the 21st century. When learning is characterized by inquiring, questioning, thinking, organizing and articulating—and when each of these is characterized as inquiring *into something* in the ways proper to living disciplines of knowledge—then students require the capacities and space to explore, challenge, analyze, critique and create always and necessarily within a field of knowledge that helps cultivate those capacities and helps students and teachers alike learn their way around living landscapes of knowing.

Along with this change in how we understand learning and curriculum, a whole array of related educational initiatives will need reconsideration:

1. Assessment
2. Resources
3. Professional Development
4. Teacher Education
5. School and District Leadership
6. Education Policy

Clearly each one of these has been affected by the legacy of Taylorism and will need to be rethought in ways that uproot this legacy.

Curricula for the 21st century have to be designed to address what we now understand about learning and the ways in which learning and teaching, learners and teachers, are always housed within living landscapes of knowledge.

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