Thinking Strategically About Education and Technology: Making Learning Happen Today for Tomorrow’s World

Authors: Riel Miller¹, Janet Looney² and Jim Wynn³
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Promethean Thinking Deeper Research Papers provide sponsorship for global experts to conduct and report on cutting-edge thinking and state-of-the-art global academic/policy knowledge with respect to the role of new technologies (innovative tools and organization) in meeting the challenges of learning in the 21st Century.
Executive Summary

Around the world education and learning in school and throughout society are on the cusp of a major leap in productivity. We are in the midst of a game changing reduction in the cost and equally significant increases in the speed, quality and universality of all kinds of learning. Promethean Thinking Deeper Research papers will report on this transformation by presenting the latest results from cutting-edge researchers and practitioners.

This first paper of the series is divided into three parts:

1. Part 1 is a thought experiment, a story about an imaginary future – a strategic foresight scenario, to provoke new thinking about the learning transformation happening all around us.

2. Part 2 is an introduction and overview of the Promethean Thinking Deeper Research paper series – a roadmap to what we will be exploring in this series.

3. Part 3, takes a deeper dive into one of the specific topics, looking at the changes taking place in the field of assessment and making the link to changing educational productivity.

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Part 3: “Making it Happen: Formative Assessment and Educational Technologies”, by Janet Looney

To learn is to be human and to be human is to learn. This is not new.

What does change is the what, how, when, where and why of learning. It is the context for learning that changes.

So in the world today, unlike the past, what we learn extends well beyond limited sets of already defined know-how, as in how to till the soil, mend torn clothes or recite the times tables.

Equally changed is how we learn, transmission of knowledge now covers a wider range than the traditional conduits of parent to child, older sibling to younger sibling or master to apprentice.

When we learn is different too, the skills we need for a lifetime can no longer be condensed into a few years, or even a decade or two, at the start of a lifespan.

And where we learn has diversified away from one special place such as a school or university or workplace, to become ambient, happening all around us.

Even the reasons why we learn have changed – it is not only to survive or get a job but to enjoy, to better know one’s self and the world of freedom and diversity encountered anew everyday.
Introduction

Transformation – it has happened before
When Henry Ford started selling the Model T no one believed that it could be a mass-market product. Cars were exotic, difficult to use, luxury goods that few could afford. At the time of its first sale in 1908 it cost $850 the equivalent of over $20,400 in 2009 prices. However by 1925 the price had dropped to $290, the equivalent in current prices of around $3,550, roughly four months’ wages for the average worker in one of Ford’s factories. Perhaps even more striking is the fact that Ford’s assembly line reduced the time required to construct a car by a factor of eight, from 12.3 hours per car to 93 minutes. A finished Model T came off the assembly line every three minutes!

We all know what happened next — commuters and shopping malls, sub-divisions and highways. The way people lived and worked changed. The leap in productivity that occurred with the introduction of the assembly line opened up new choices — new ways of looking and acting. Higher productivity also brought higher wages, and not just in automobile assembly, but in many industries that adopted the new methods and tools.

However the conditions that made this leap in productivity doable did not happen all of a sudden. Standard parts, sequencing the production processes for speed, time-motion studies of work, and a workforce ready to take this approach, all took decades to develop. Only then, with all of the different elements in place, could Henry Ford seize the moment. Like Steve Jobs and the iPhone. And only after the Model T breakthrough, an affordable mass-market car and higher wages for factory workers, did it make sense to build suburbs and super-markets.

Today a similar breakthrough is in the making — only this time it is about a leap in the productivity of learning. For decades now different pieces of the puzzle have been falling into place. Obviously the Internet, but also how we use education, the way we understand interactive learning processes and cognition, brain science and evolution, assessment systems and work organisation, each of these elements are important. Taken together we can imagine a leap in education productivity as transformative as the turning point moment of Ford’s Model T.

Learning in 2025, imagine…
Imagine the coming together of a whole set of new ways to: organise learning, share information, produce knowledge, assess achievement, provide feedback, design learning voyages. What if all of these factors allowed the average number of months spent by a young person in school to be reduced from the current average of 120 months to 100 months? This is a major leap in productivity. In 2025 to reach the same level of achievement (quality), as measured for instance by a high school diploma, the average student only needs to spend 10 years instead of 12 in school.

What is a scenario?
A scenario is a “story” illustrating visions of possible futures or imaginary futures. It is perhaps the most emblematic Foresight or future studies method. Scenarios are not predictions about the future but are similar to simulations of future situations or contexts. Scenarios are used both as an exploratory method and as a tool for decision-making, mainly to help reveal and invent aspects of the present that would otherwise be obscured by existing images of the future.

“The scenario method is probably one of the main concepts and most widely used methods in Foresight.

The term “scenario” was introduced by Herman Kahn in the 1950s in connection with military and strategic studies conducted by the Rand Corporation. Kahn used the term to refer to issues related to US public policy, international development and defence.
Scenarios were first used by corporations. They started to be used at corporate level as planning became more complex and sophisticated. The oil company Shell was a pioneer in the field and became the benchmark for corporate scenario planning. Shell’s scenario planning enabled it to anticipate the rise and subsequent fall of oil processing in 1973. Scenarios have since been used by the financial services industry, banks and insurance companies, given their value as a tool for analysing and understanding key competitive decisions.

Both public and private sector organisations have implemented scenarios for a wide array of functions. The public sector relies mainly on scenario methodologies when it has to define planning activities (e.g. it was used in the past for defence planning) and to delineate alternatives for policies. Almost all industries (especially multinational companies) use scenarios to develop their business strategies.”

2025, What is it like? How does it work?
First of all, in 2025 teachers are paid more but the overall cost to taxpayers is less. That is what happens when productivity increases. Given the investment in new tools and new production methods schools now need fewer teachers. But just like in Henry Ford’s factory each teacher adds more value and so they can be paid more while the reduction in the total number of teachers allows overall salary costs to be reduced.

Savings have been further reinforced by the fact that school facilities, buildings and equipment, are distributed across a smaller student population. This has allowed capital budgets to shift focus from the maintenance of crumbling old buildings, which can now be sold off, to investing in new, fully interactive learning spaces. And that is why interactive technology in the classroom and elsewhere leapt from under 10% coverage to over 90%.

Another important change is that teachers are now, on average, more qualified. With higher wages came a greater willingness by both prospective teachers and school management to invest in skill development. And with higher productivity, higher skills and higher wages, it is no wonder that the teaching profession has recovered its social prestige. Here again the leap in productivity of the education process as a whole not only reduced the number of years students are in school, but also made it easier to accelerate the retirement of older teachers. This in turn played a role in the unusually quick jump in the quantity of input to quality of output ratio of the educational system, a leap from one era to the next.

A society wide change
Maybe the most surprising impact of the breakthrough to higher productivity in education was how it created new sources of value added in the world outside the school system. Again, as with the Model T and the advent of the automotive era’s suburbs, super-highways and mass-consumption, most of these related effects were unanticipated. In particular no one expected the magnitude of the economic and social changes that accompanied reducing compulsory schooling by two years. Indeed, initially expectations were just the opposite. Many people were concerned that there would be a lot of trouble. They expected that youngsters would either sit around doing nothing useful, too young to even be classified as unemployed, or end up in university before they were ready, wasting everyone’s time and money.

Expectations were wrong, once again. Similar to the introduction of the Model T, it was not the leap in learning productivity alone that made massive social and economic change happen. What mattered even more were the changes in the way people worked and played, created both economic value and the social fabric. Here the breakthroughs were legion and the most important impact was that learning in everyday life – the learning that occurs with friends, family, and in all kinds of communities – became much easier. This was because learning processes were much more productive. In other words, reducing the cost of this critical input – learning – had a similar impact as the advent of the Model T’s assembly line - the organization of everything from the where and how of work to the what and why of family life - all changed.
The Learning Intensive Society

This leap in the productivity of learning processes enabled what we now call the Learning Intensive Society. The Diagram below is one way of illustrating what this means. Not only is know-who (social networking), know-how (do-it-yourself), and know-what (search, mobile net access) much greater than in the past but most critical of all know-why has skyrocketed. At first it looked like there would be a terrible crisis. People were being confronted with such an overload of choices and there was so much ambiguity, uncertainty and fear. But gradually, through trial and error, using virtual reality and much more fluid and dense social networking over a lifetime, people’s capacity to learn – to gain insight from experiments, from experience became part of a virtuous circle. Faced with more choices, with more practice at learning-by-doing, people are now much more efficient learners and decision makers.

Of course the newly out-of-school youngsters, charged up with the energy and dissidence of adolescence, are leading the way. We call them the ‘you-do’ generation. They are the pioneers of a fluid, project-based organisation of economic and social life. This activity is at one and the same time much more local, rooted in the narrow specificity of places, groups and tasks, but also highly global, linked to worldwide communities that are deeply engaging. Projects cover everything from the ridiculous to the sublime, but the vast majority of these activities are about creating “value” in one way or another. Indeed it is the diversity of such value creation, going far beyond the sectors and supply/demand relationships of the industrial era that helps to sustain engagement and learning.

The “murmuration” – swirling clouds of networked communities

What amazes older generations is the fluidity, openness, verifiability and responsibility of these often short-lived communities of action. And they are also surprised at how implicated they have become – this is not just for young people. Somehow almost overnight a whole new set of “digital native” and “digital immigrant” capabilities appeared. This jump in the general capacity to create new networks reflects a combination of the more interactive and more productive ways that learning is taking place in schools, at home and across a wide range of “productive” communities. It is now commonplace across generations to engage with the “reality” of intensive (serious) play, in many different virtual worlds. But it is not just that higher learning productivity has big knock-on effects. A critical aspect is how the learning takes place.

Initial fears that constant interactivity and so-called multi-tasking would seriously undermine the capacity to concentrate, pay attention and get things done, particularly amongst young people, turned out to be all wrong. Certainly on the surface the gaming and texting and video surfing seem frivolous, distracting and inimical to focusing on serious tasks. But beneath the surface deeper things were happening. People have learned how to better manage their attention so that they are able to balance intense bouts of focus with short breaks where they engage in lower-effort tasks. In this way, they constantly renew their energy and stay engaged.

Advances in understanding the interaction between learning and the environment through research into physiological “brain” and cognitive functioning helped in the development of new approaches to gaining mastery over concentration and relaxation, focused learning and ambient appreciation of the world around us. Now, starting at an early age everyone learns through experience to appreciate the role of contemplation, natural beauty and the advantages for thinking and well-being of physical activities. Back in 2011 it seemed far fetched that the zapping and so called multi-tasking could become part of a more powerful learning environment. Of course this was hard to anticipate, just as it is difficult for someone who is
illiterate to fully understand in advance what it means to be able to explore the worlds opened up by being able to read and write.

**Using learning tools – motivation matters**

What matters when we use tools is the motivation. So it is true that if the goal is to escape boredom, rebel against what is being imposed, and test the waters of human socialising, then regardless of the time or tool (think of Huckleberry Finn) a restless person will zap from one channel to the next. But this is not what we experience now. Expectations of mental decay and frivolity did not take into account how the use of the tool, the motivation for “playing” might change. Today’s “wired cybercitizens” yoke learning tools to the tasks of building their identities, families, communities, knowledge and habitat. They are motivated and engaged by an immense variety of economic and social activities – intergenerational and international. Today’s “you-do” generations have transformed tools for zapping across a million information feeds into highly productive means to concentrate on what they want to do, when and where they want to do it. From grandmas to eco-nomads, everyone is learning all the time.

Three primary sets of activities dominate the projects of young and old, and everyone in between:

- **Identity-based projects.** This type of project is mostly about finding answers to the questions: “who am I?” and “with whom do I identify?” But these are not individualistic quests. On the contrary, what is striking is that such efforts are about shared meaning. Strange as it may seem to older generations, it is the easy familiarity of 2025’s digital natives with multiple avatars and virtual worlds that has allowed them to be both easy “visitors” in many different communities, as they continuously seek to sustain a meaningful identity, and to dig deeper roots once they became more invested in an identity relevant project.

- **Learning-based projects.** Learning through inquiry-based projects take up a large share of economic and social life. They are driven by the desire to satisfy curiosity and a taste for adventure. Here again, one of the critical factors in making this work is the change in the way schooling is conducted now. The drill and test way of teaching is gone, replaced by the approach pioneered at the end of the 20th Century that makes interactive project-driven inquiry, with intensive feedback and assessment, the framework for learning. Since school is about exploratory learning it is only natural to continue once school is over – at the end of the day or after graduation!

- **Eco-habitat projects.** Environmental projects moved steadily to the forefront throughout the “twenty teens”, driven by the growing desire – expressed through personal choices but also governmental policies – to reduce, reuse and recycle. Moving to diversified, largely local co-generation electrical systems required significant investments in the skills and work needed to install, manage and maintain sophisticated and cost effective power. Similar priority was given to projects that altered the design and lifecycle of other products, from housing to digital equipment, to achieve a much lower ecological footprint. Learning is integral and continuous for the projects that are creating today’s green society.

**Learning and societal transformation – who would have guessed?**

Perhaps from the point of view of 2010 it seems strange that learning has become such a critical part of what people do and the creation of economic and social value. In the past there was a tendency to view education as using up rather than creating wealth. The truth is that every time there has been a big leap in productivity there has been a lot of anxiety and incomprehension. When industry started to replace agriculture as the main source of wealth people also wondered how all of the people going to the city were going to find a way to live without vegetable gardens and chickens in the yard. Now that there has been a leap in the productivity of learning, it seems obvious that there is still plenty to do – indeed each person’s quest for identity and community, a sense of meaning in family and friends, near and far, seems to provide an inexhaustible source of learning activity. That is why we call it the Learning Intensive Society.
Why this matters

700,000,000 children are estimated to be attending primary school around the world this year (2010). Almost 72,000,000 below the target set by the Millennium Development Goals. Meeting the target by 2015 will require, by very conservative estimates, an additional 1.9 million teachers. Adding to the more than $1,000,000,000,000 (one trillion dollars) that is already being spent on all official education activities worldwide, including secondary, post-secondary and continuing.

There is no doubt, investment in education is big and it pays huge rewards – for individuals and society. Yet today most people think we need even more education. There is a strong consensus around the world, amongst politicians, academics and citizens: investing in education is one of best ways to create a better future everywhere. The question is how to make this happen?

Making learning happen today for tomorrow’s world is one of the biggest challenges of our time! Increasing the productivity of learning processes is the solution.

The current context

Simply adding more money and time to education’s share of economic and social activity is the obvious answer. However, the competition for resources is very intense and even if the rates of return from investment in education are very high, there are many other pressing and legitimate needs that also must be addressed. This leaves only one alternative, to significantly increase the productivity of learning processes in order to meet our needs even with limited resources.

But knowing the general direction to go in, unleashing a massive increase in the productivity of learning processes, does not mean that we know exactly how to get there. Which approaches make the most sense? What are the best ways to implement productivity-enhancing policies in different places? How best to fit the solution to the context? Practical and credible answers to these questions call for careful and innovative research and analysis. That is the aim of Promethean Thinking Deeper Papers.

Our goal is to explore the many dimensions of the emergent breakthrough in learning productivity including new tools and how they are used, but also what they are used for and how economic and social reorganisation changes the capacity enhancing power of both existing and innovative tools. Much research has already been conducted on the relationship between learning and technology, and not just inspired by recent advances in information processing and communications. Writing and the printing press, textbooks and televisions, just to name a few obviously seminal innovations, all interacted with what and how we learn.

What the research shows

From a research perspective the verdict is clear, there is powerful evidence that technology can make a difference for both the effectiveness and efficiency of all facets of learning. Yet it is important to underscore that a society-wide leap in productivity, like the leaps in productivity related to the introduction of Model T described in Part 1 of this paper, are not exclusively, not even predominantly due to the narrow changes caused by one technological breakthrough or new production method. What really makes the difference is a much broader, much more pervasive transformation of what and how we create.
The research focus – learning tools: effectiveness, efficiency and ease of implementation

As we look at the processes of transformation, the focus will be on a context sensitive understanding of effectiveness, efficiency and ease of implementation of these new techniques and methods of engaging-in and organising learning. Effective spending on education is about the quality of the learning that is taking place – quality that is defined by specific contexts for learning. Efficient spending is about ensuring that any new funding as well as the difficult reallocation of existing funds is targeted to activities that improve on existing practices in specific contexts. In addition, realising these goals depends on identifying solutions that can be implemented in ways that are consistent with stringent credibility and cost criteria. Such ease of implementation – easy access to working tools and techniques at reasonable cost in terms of time and money – is a critical, context specific, dimension of making a leap in learning productivity happen.

The Thinking Deeper series will focus on the role of two sets of technologies in facilitating this society wide leap in learning productivity:

• tools that facilitate interactive learning, particularly in schools; and

• tools that facilitate the creation of a wide variety of learning communities, particularly amongst teachers.

We will report research findings that explain how these tools contribute to meeting the triple challenge of effectiveness, efficiency and implementation. Tools that facilitate interactive learning and learning communities are the focus of the Deep Thinking series for three reasons:

• First, important advances are being made in both the private and public sector with respect to new tools and new ways of using new tools for interactivity and networking (including by companies like Promethean, the sponsor of this paper);

• Second, interactivity and networks are key attributes of knowledge creation in all its forms and applications, the fundamental ingredients of improved learning effectiveness, efficiency and implementation.

• Third, the focus on developments in interactive learning and learning communities relates to key areas of real investment and growing socio-economic activity – big new markets.

The Promethean Deep Thinking Paper Series

Exploring the range of topics, making the connections between innovation and socio-economic transformation, picking out key policy areas, will require a carefully constructed series of research papers. Promethean is committed to sponsoring this work, mobilising the research and policy communities, making a key contribution to the realisation of the leap in learning productivity. This research will be pursued along two intertwined strands. One pertains to the general changes taking place in the context for learning throughout society. The other covers the systemic changes taking place within the educational sphere that are transforming content and processes. These are the inter-dependent strands of the curriculum, decision making within and about schools, teaching methods and skills, collaborative designs and processes, and assessment practices. Together these different elements make up the very different and very dynamic educational systems of today.

Strand 1: The changing context for learning – a strategic perspective

Papers in this strand will address how interactive teaching and learning communities relate to the broad changes taking place in areas such as:

1. socio-economic well-being, beyond the old and discredited definitions of economic growth towards new ways of understanding economic value-creation and systems for accounting for quality-of-life;

2. the breadth and depth of learning activities as the predominant source of value-added, with special attention to the specific attributes and changing nature of the role of STEM (science, technology, engineering and math) skills in different parts of the world and in socio-economic systems experiencing different kinds of change; and

3. the re-composition of daily life through personalisation and collaboration, the fluid and densely networked social systems of the 21st Century.
Strand 2: Systemic changes within educational systems – seeking synergies

Papers in this strand will concentrate on the improvements occurring in existing education systems, partly by rethinking the relationship of these institutions to learning in society as a whole (as developed in the previous strand), and partly by grasping the potential of the new tools, relationships and capacities that are emerging. The research conducted here will give explicit consideration to key performance areas like teacher effectiveness; the supply of specific skill sets – particularly in the so called STEM (science, technology, engineering and math) fields; the mechanisms for the development and use of assessment; and the decision making capacities within and around school systems. Here too the research will pay close attention to the key role of technological, organisational and attitudinal innovations in fostering interactive learning processes and learning communities full of creativity and the discoveries arising from the exercise of collective intelligence.

Papers in this strand will address specific areas (see circle chart above) where technologies and techniques (including institutions, norms, organisational systems, etc. that enable the creation and use of tools) make a difference for interactive learning and learning communities across a range of different aspects of learning supply and demand. Amongst the topics to be covered are:

- Curriculum Development: Focus on the changing impact of STEM on socio-economic systems with the emergence of globalisation and sustainability
- Data driven decision making: Focus on enabling data collection and analysis, sense making, knowledge sharing, and open learning to improve systems
- Teacher effectiveness including professional development: Focus on helping teachers articulate, create and share what they need
- Facilitating 21st Century learning systems: Focus on enabling ensuring that learning resources – interactive and networked – are available and shared where-ever and when-ever in all learning contexts
- Student achievement through differentiated and personalised learning: Focus on ensuring that learners personalise their own paths and learning processes
- Collaborative learning: Focus on enabling the creation and sustainability of diverse learning communities
- Appropriate tools for different contexts: Focus on learners lifestyles and different ways of learning
- Collaboration: Focus on transforming teaching and learning practices from within schools and learning organisations.

Assessment – one of the transversal enablers

Part 3 of this first set of Promethean Deep Thinking Papers provides an in-depth look at one of the key enablers of a breakthrough in educational productivity - assessment. Research shows that recent advances in the way we assess what and how we learn has the potential to transform learning processes and make both the new learning tools and new learning economy reach higher performance levels. This is one of the cornerstones of the transformation of education and society taking place all around us.
1 Riel Miller is one of the world’s leading strategic foresight designers and practitioners. He has almost thirty years of experience co-creating innovation, leadership and transformation in both the public and private sectors around the world. He has worked as a senior manager in the Ontario public service (Ministries of Finance; Universities; and Industry) and for over a decade as a senior researcher at the OECD International Futures Programme (1994-2005). Since 2005 he has been running an independent futures consultancy – xperidox.

2 Janet Looney is an independent consultant specialising in the areas of programme design and implementation, assessment and evaluation, and programme outreach and dissemination. Her work has focused on policies related to education and learning, and community and economic development programmes in the public, private and non-profit sectors. From Autumn 2002 to Winter 2008, Ms. Looney was the project lead for the What Works in Innovation in Education programme at the OECD’s Centre for Educational Research and Innovation. She led the development of two major international reports on formative assessment. Prior to her work with the OECD, Ms. Looney was Assistant Director of the Institute for Public Policy and Management at the University of Washington (1996 – 2002), and Programme Examiner in the Education Branch of the U.S. Office of Management and Budget (1994-1996).

3 Jim Wynn joined Promethean in April 2010 as Chief Education Officer, responsible for the company’s education strategy. Prior to joining Promethean, Mr Wynn led the Public Sector team and Education in the Emerging Markets Public Sector Practice of the Cisco Internet Business Solutions Group. Whilst at Cisco, Jim discussed the opportunity of building an e-learning industry with the Taoiseach, the IDA and others such as RCSI in Dublin and was co-author of a feasibility study which demonstrated that Ireland has the capacity to be a world leader in this area with indigenous companies such as VIP. Previously, Mr Wynn held various positions including Head Teacher of two secondary schools in the UK, where he pioneered the use of ICT, Head of Research at RM Plc, and Partners in Learning lead for EMEA at Microsoft. Mr Wynn holds a first class degree in Mathematics from the University of Hertfordshire. He is a director of the 21st Century Learning Alliance Board in the UK.

4 If we wanted to consider the costs of the Model T using today’s prices we would find that the $850 cost in 1908 is $20,400 in today’s prices using the CPI, $15,200 using the GDP deflator, about $44,000 using the consumer bundle, $89,000 using the unskilled wage, $136,000 using the manufacturing compensation, and $17,000 when comparing using the GDP per capita. At this point the ford was a luxury for most everyone. The $290 in 1925, on the other hand, would be only $5,500 in today’s prices using the CPI, $5,000 using the GDP deflator, $7,500 using the consumer bundle, $12,500 using the unskilled wage, $15,000 using the manufacturing compensation, and $17,000 when comparing using the GDP per capita. By now, the ford was an automobile affordable by all.\footnote{http://www.measuringworth.com/uscompare/} \footnote{http://en.wikipedia.org/wiki/Ford_Model_T}


7 OECD, 2010, Education at a Glance, Paris, ChartD1.1. Total number of intended instruction hours in public institutions between the ages of 7 and 14 (2008) “Students in OECD countries are expected to receive, on average, 6,777 hours of instruction between the ages of 7 and 14, of which 1,554 between ages 7 and 8, 2,467 between ages 9 and 11, and 2,755 between ages 12 and 14. The large majority of intended hours of instruction is compulsory.” p. 364 http://www.oecd.org/dataoecd/45/39/45926093.pdf

8 The point of this scenario is to provoke new ideas and to rethink current ones. Of course the gains in productivity could be used to ensure higher quality achievement by keeping students in school or by reallocating teacher time and cost so that the same level of outcomes is achieved over the same time span but at a lower cost. In other words there are many different combinations that can be invented and used to provoke a rethinking. For the purposes of this exercise the idea is to see what would happen if young people were able to leave the current schooling system two years earlier.

9 Adapted from the European Commission foresight web-site FOR-LEARN: \footnote{http://forlearn.jrc.ec.europa.eu/guide/2_scoping/meth_scenario.htm}


Future teacher recruitment needs vary enormously by region. They are determined partly by current deficits and partly by a complex mix of demographics, enrolment trends and numbers of children still out of school. The UIS has re-estimated the total number of primary education teachers that will be required to achieve the goal of universal primary education by 2015 (UIS, 2009e). The numbers underline the scale of the challenge facing many countries. An additional 1.9 million teachers will have to be recruited to reach universal primary education by 2015. Two-thirds of the additional teachers – around 1.2 million – will be needed in sub-Saharan Africa. The Arab States account for around 15% of the additional teachers required.

The effort needed to close these gaps varies by country (Figure 2.44). Many governments will have to expand recruitment by 4% to 18% annually. For some countries, this means maintaining the rate of increase registered since 1999. Others will need to step up the pace of recruitment and budget for new posts, including Chad, Côte d’Ivoire, Djibouti, Eritrea, Kenya and Uganda.

In addition to increasing recruitment to achieve universal primary education, governments have to replace teachers expected to retire or leave their posts before 2015. Taking into account the need to replace teachers drives up the regional and global recruitment numbers (UIS, 2009e):

- An additional 8.4 million primary teachers will have to be recruited and trained worldwide to replace existing teachers expected to retire or leave their posts before 2015.
- Nearly a quarter of these teachers – around 2.1 million – will be needed in East Asia and the Pacific.
- North America and Western Europe account for 17%, South and West Asia for 19% and sub-Saharan Africa for another 15% of the additional recruitment needed to replace teachers leaving their posts by 2015.

A total of 10.3 million additional teachers will be needed worldwide by 2015, if the 1.9 million new teachers required to achieve universal primary education are added to the 8.4 million needed to replace departing teachers. The number of extra teaching posts that need to be created may seem small compared to the teacher needs resulting from attrition. However, creating new posts requires an increase in the overall budget allocated for teacher salaries. In many countries this requires greater effort than that of filling vacant posts.” EFA, p. 118 http://unesdoc.unesco.org/images/0018/001866/186606E.pdf


Fortunately the pursuit of this research agenda is made considerably easier by the explosion of work into analyzing and understanding learning. This is not an accident – the growth of research into the theory and practice of learning reflects a gradual recognition of the centrality of learning to today’s economic and social systems. The Promethean Deeper Thinking Research Papers will bring together this research, from governmental and non-governmental, national and international, think tanks and universities, from around the world.
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