

[Education Policy Studies Series]

Lee Hysan Lecture Series in Education¹
Faculty of Education
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Education and the Ability to Deal with Change

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Education Policy Studies Series

Education embraces aspirations of the individual and society. It is a means to strengthen human resources, sustain competitiveness of societies, enhance mobility of the underprivileged, and assimilate newcomers to the mainstream of society. It is also a means to create for the populace an environment that is free, prosperous, and harmonious.

Education is an endeavor that has far-reaching influence, for it embodies development and justness. Its development needs enormous support from society as well as the guidance of policies that serve the imperatives of economic development and social justice. Policy-makers in education, as those in other public sectors, can neither rely on their own visions nor depend on the simple tabulation of financial cost and benefit to arrive at decisions that will affect the pursuit of the common good. Democratization warrants the emergence of a public discourse on vital matters that affect all of us. Democratization also dictates transparency in the policy-making process. Administrative orders disguised as policies have a very small audience indeed. The public expects well-informed policy decisions—those that are based on in-depth analyses and careful deliberation. Like the policy-makers, the public and professionals in education require a wealth of easily accessible facts and

views so that they can contribute constructively to the public discourse.

The Hong Kong Institute of Educational Research of The Chinese University of Hong Kong provides the space for rational discourse on important educational matters. From time to time, the Institute organizes "Education Policy Seminars" to address critical issues in educational development of Hong Kong and other Chinese societies. These academic gatherings have been attended by stake-holders in education, including policy-makers, practitioners, researchers and parents. The bulk of this series of occasional papers are the fruit of labor of some of the speakers at the seminars. Others are written specifically as contributions to the series.

The aim of this Education Policy Studies Series is to present the views of selected persons who have new ideas to share and to engage all stake-holders in education in an on-going discussion on educational matter that will shape the future of our society.

EDUCATION AND THE ABILITY TO DEAL WITH CHANGE

Introduction

I am very pleased to be invited to give the inaugural lecture in the Lee Hysan Lecture Series. As an economist I have devoted my career to the economics of education, how we can make schools and society more productive by improving resource allocation in the educational sector. Last year The Chinese University of Hong Kong was kind enough to invite me as the Wei Lun Visiting Professor to give a lecture called: Accelerated Education for an Accelerating Economy.¹ That lecture suggested that global economic forces will push the economy of Hong Kong towards high-valued added products and high productivity workplaces, and that this will require changes in the educational system of Hong Kong.

In this lecture I want to expand that theme by reviewing more closely what is known about how education improves productivity at the level of the individual, the firm, and the society under conditions of change. To do so, I will refer to two relatively recent contributions to the economics literature, education's ability to adjust to disequilibria and what are called endogenous theories of economic growth in which education plays a central role. At the same time I want

to draw upon recent contributions by a major psychologist on successful intelligence, the intelligence to succeed in real-world activities which require adaptation to change. I will complete this presentation by suggesting some specific directions that the schools must consider. If the message sounds similar to that which I delivered last year, we must remember that the circumstances have not changed, but we are one year farther along with the same challenge to pursue. A major initiative has been launched under the Accelerated Schools Project sponsored by the Faculty of Education at The Chinese University of Hong Kong and the Education and Manpower Bureau. I will refer to this effort in my conclusions.

Education has long been viewed as one of the most important strategies for raising the productivity of both individuals and nations. In the past, considerable attention has been devoted to the expansion of enrollments and educational opportunities to improve the labor force. It was assumed that the type of education provided was appropriate, so it was only necessary to expand the number of graduates at each level to accommodate the growth of production and rising productivity needs.

Such an assumption presumed great stability in the types of jobs, occupations, and industries that

characterize the economy, for qualitative changes in education were viewed as largely unnecessary. Although minor adjustments in educational requirements might be made, the existing curriculum and instructional strategies were considered adequate to meet labor force goals. But, in the last decade or so and continuing into the new millennium, the economies of Hong Kong and other countries have been and will be changing at a rapid pace as the revolution in information technology and globalization has created new industries and replaced old ones and transformed jobs and occupations. This has raised the question of whether educational expansion in itself is adequate to increase the productivity and economic output of the labor force or whether more dramatic qualitative changes in education are also necessary to accommodate economic change. The purpose of this presentation is to focus on the issue of education for economic change. It will proceed by reviewing the traditional links between education and productivity and proceed to new insights and understandings from both an economic and educational perspective. It will conclude with a picture of a different type of education that might accommodate change while meeting the more traditional requirements of an educated and productive labor force.

Education and Productivity

At the beginning of the human capital revolution some 40 years ago with its recognition of the special contribution of education to economic growth and productivity, the precise links between what happens in schools and classrooms and productivity in workplaces were largely ignored. Rather, it was just assumed that more educated persons possessed greater human capital and were more productive. Statistical studies of the education of workers and their earnings were highly correlated. The fact that more educated workers earned more in labor markets was convincing enough that something about the educational experience contributed to workplace productivity. Exactly what aspects of education contributed to productivity were unknown and unexamined as long as it appeared that employers were willing to pay more to obtain the services of educated workers. In the competitive marketplace employers have an incentive to provide greater rewards to their more productive workers or risk losing them. Therefore, the higher earnings provided consistently to more educated workers meant that such workers must be more productive.

¹ If there were any single explanation that might be given for this phenomenon, it was that better-educated workers have more knowledge and skills which translate into higher productivity. Thus, studies of what schools

actually produce focused primarily on student achievement as measured by test scores and examinations. Persons with more education not only have higher earnings, but higher test scores, and it seemed logical that the higher test scores reflected levels of skill and knowledge that increased productivity and earnings.

Within this frame of analysis it was enough to know that education increased skills and skills increased productivity and earnings. Workers with greater skills could learn their jobs more quickly and do them more proficiently. They could work more intelligently and with greater precision and could accomplish more within the same time period. Further, their education qualified them to train for more complex job situations. Thus, not only would they be more productive in a given job level, but they were more likely to qualify for more demanding jobs because of their higher levels of trainability. In the early days of the human capital revolution, the pattern of economic returns to educational investments in a more productive labor force and economy were adequate to justify that investment without questioning the precise types of skills that education provided. The economics of human capital investment in education had no specific implications for what should be taught in school and how it should be taught. Whatever the content of

schooling, it was considered to be effective because of the tie between the amount of education received and earnings.²

The only debate about schooling content in these early years raged over whether students should receive a general education at the secondary level or a vocational education when viewing education as an investment in economic growth. Advocates of a vocational education argued that it is the specific know-how about jobs that provides value in production and that this can best be learned in a vocational curriculum. Advocates of a general education argued that technical change in the life of a worker and the need to be continually trainable suggest that a more liberal education be provided with specific training on the job. There was no attempt to open the black box of schooling and no particular reason to do so.

It was not until the seventies that newer insights on the role of education in production began to raise questions about the content of schooling. In 1970 Finis Welch published a paper that went beyond the traditional way of thinking about schools and productivity.³ Welch argued that workers not only carry out a standard set of work tasks, but they can make an important contribution to production by efficiently allocating the resources of the enterprise. Workers have access to specific resources of the firm in their

productive activities. Even how they allot their own time to different tasks can have an important productive effect. And, educated workers are better able to gather and process information that signals the relative costs and productivity of different allocative choices. In an important article, T. W. Schultz, who later won the Nobel Prize in Economic Science, generalized this phenomenon to the ability to deal with disequilibria in production, the situation in which the set of inputs chosen is inefficient in terms of the ratio of their cost to productivity.⁴ Particularly in a dynamic setting where there are continuous changes in input prices and productivity, partially resulting from new technologies and market alignments, traditional methods of resource allocation may be inefficient. What abilities are needed to adjust to such disequilibria and make the firm more productive? More education and higher education, in particular, impart in workers the abilities to master an understanding of their roles in the production process and to tacitly make adjustments to changes in the prices and productivity of inputs. These continuous adjustments allow a return to equilibrium in the economic sense of equating costs and revenues at the margin and maximizing productivity and profits.⁵ Neither Welch nor Schultz addressed which specific aspects of schooling contributed to the allocative abilities of workers.

Parallel developments in labor economics reinforced the importance of allocative decisions by workers. Economists had puzzled on why employment agreements or contracts were often incomplete. That is, although they may specify particular duties of the worker, they also leave a large chasm of ambiguity in what most workers are expected to do, a chasm that grows with higher-level (professional, technical, and managerial) occupations. And, often workers are evaluated and rewarded more on their performance on aspects of their jobs that are not well-specified than the parts that are. Such incomplete contracts are not an oversight. Their purpose is to incorporate provisions for workers to take actions and make decisions that cannot be stipulated in advance, because such actions and decisions will depend upon circumstances that arise--often in an unpredictable fashion.

With this insight it becomes necessary to consider more fully what type of education would best promote this ability to deal with change and uncertainty that workers would face in their lifetimes. A traditional worker might be able to do a highly proficient job by mastering the know-how required for routinized production. But the ability to make allocative choices in behalf of the enterprise requires more than the experience and rules-of-thumb developed in a static work environment. Presumably, higher levels of education require students to process information, locate

the appropriate facts, set out criteria for decisions, and make choices, and these experiences can contribute to making intelligent choices in the workplace. The more education that an individual receives, the more likely that he or she will possess these attributes. Of course, this is not always the case if higher education simply requires more memorization of facts and little emphasis on problem solving. The important point is that more educated workers have a greater ability to acquire the information necessary to understand the facts and to anticipate and address contingencies and uncertainty than less educated workers.

But, with this new focus there must necessarily be greater scrutiny paid to the content of education from the perspective of economic productivity. A focus on memorization and examinations that dominates all levels of education will not contribute much to this type of problem-solving behavior. Can these capabilities be enhanced by a different approach to what schools do? Can they be generalized into a type of education that makes future workers more adaptable to the impacts of large changes in markets, technologies, and prices that have been evident in recent years? Can they lead to workers with both intrapreneurial skills (seeking out and promoting innovation within work organizations) as well as entrepreneurial skills? Before answering those questions, it is important to note two other major developments in the knowledge-base that are pertinent.

Endogenous Growth

Traditionally, the economic growth literature viewed technological advance as being exogenous to the economic system, that is, being determined by factors outside the workings of the economy. However, this has raised serious questions about why technological advance and its economic returns differ among nations when its fruits are largely disseminated and available across national lines. More recent interpretations view both the generation of technological progress in pure and applied forms and its productive adoptions as endogenous in nature, that is determined by the economic system through its overall organization and the incentives, information, and investments that are made in education and research and development.⁶ More to the point, educational investments may generate technological advances through creating more adaptable workers as well as promoting research and development. Through education it is possible to produce more scientists, engineers, and entrepreneurs who capitalize quickly on new knowledge; a higher level of general technical literacy among the population; information flows that provide quick access to the latest developments; and research and inquiry in higher education (and industry) that can generate technical advances. Nations can focus on an educational system that generates new knowledge and ideas and their rapid transmission through the latest information technologies. At the same time the education system

can focus on producing individuals who seek such information to gain competitive edges in production or establish new product and service markets. Such individuals will have great ability to adjust to disequilibria as new knowledge arises. Thus, there is an opportunity for educational systems to consider their internal goals and operations as an instrument of economic policy that provides benefits to the nation as a whole beyond those received by individual workers and firms.

These theories support traditional human capital premises that education increases the productivity of individuals. But, in addition investment in education produces "externalities" by increasing the common stock of knowledge available generally to all individuals and firms and the adaptability of the workforce to change with an impact on economic growth independent of the individual productivity increments from each more educated worker. One explanation is that such an accumulation of educated talent makes possible both the production and use of research and development that is not possible at lower levels of educational accumulation. The precise mechanisms by which all of this works out are presently being debated, but there is increasing empirical support for the importance of educational support for the importance of educational externalities beyond the effects of individual workers.⁷ It is likely that the type of worker who can adjust to disequilibria and make allocative decisions will not only

improve his or her own productivity, but also that of colleagues who benefit from better resource allocation. These types of workers will also adjust more quickly to changes in technology at the societal (e.g. internet) and firm level.

Successful Intelligence

Distinguished psychologist and testing expert Robert Sternberg has spent two decades studying what makes people successful in life, including working life. On the basis of research studies, he has concluded that successful intelligence comprises three components: analytical intelligence, creative intelligence, and practical intelligence.

Analytical thinking is required to solve problems and to judge the quality of ideas. Creative intelligence is required to formulate good problems and ideas in the first place. Practical intelligence is needed to use the ideas and their analysis in an effective way in one's everyday life.⁸

As Sternberg points out, what schools do and what their examinations measure address primarily the dimension of analytical intelligence, and only a small portion of that. Schools focus principally on stylized facts and operations rather than problem-solving and analysis. This is why memorization in itself can be so effective in school success when success is measured by

rote learning devices. Understanding and applying productively the memorized facts and knowledge is not valued highly in much teaching and learning. For this reason Sternberg refers to examination results as “inert intelligence” or inactive intelligence, not to be confused with his three dimensions of successful intelligence.

Note the confluence of ideas that we have presented, even though they emerge from different disciplines and literatures. The ability to adjust to disequilibria and the need for change requires a flexible personality with analytic, creative, and practical insights that enable the individual to respond to contingencies as they arise. These may entail small adjustments and decisions in a daily work environment, larger decisions as major changes take place in the enterprise, and larger conceptual shifts as demands arise for great changes in behavior in response to major and unforeseen events. And, if all or most workers have these characteristics, firms and economies will be adaptable and inventive in raising productivity and developing new products and services capturing the externalities essential to endogenous growth theories.

These dimensions are further reinforced by organizational changes that are occurring in high productivity workplaces. Those workplaces with high value-added require not only workers with the appropriate knowledge to make good allocative

decisions, but also with the personality traits that enable them to use that knowledge and work productively with co-workers. The following list obtained from studies of high productivity workplaces is just a reminder of these traits, but also suggests a high compatibility with the three dimensions of successful intelligence identified by Sternberg.⁹

<u>Initiative</u>	The drive and creative ability to think and perform independently.
<u>Cooperation</u>	Constructive, goal-directed interaction with others.
<u>Working in Groups</u>	Interaction in work-groups directed towards both short-term goals of efficient task or activity accomplishment and the long-term goal of group maintenance.
<u>Peer Training</u>	Informal and formal coaching, advising and training peers.
<u>Evaluation</u>	Appraisal, assessment and certification of the quality of a product or service.
<u>Reasoning</u>	Evaluation and generation of logical arguments including both inductive and deductive approaches.

- Problem-Solving Identification of problems, hypothesis testing on causes, generation of alternative solutions and their consequences, selection of an alternative, and implementation of a solution.
- Decision-Making Employing the elements of problem-solving on an on-going basis in the workplace.
- Obtaining and Using Information Deciding which information is relevant, knowing where to obtain it, obtaining it, and putting it to use.
- Planning Establishing goals as well as scheduling and prioritizing work activities.
- Learning Skills Cognitive and affective skills that facilitate the acquisition of new knowledge.
- Multicultural Skills Understanding how to work with persons from other cultures in terms of language, communication styles, and different values.

This list is neither complete nor does it obviate the need to acquire many of the standard cognitive competencies that the schools have stressed traditionally. What it does suggest is that there exist competencies that the schools need to address to create a workforce qualified for high-value-added workplaces, and that are not addressed by a traditional classroom that is examination-driven and where students are expected to memorize large amounts of facts and subject-matter to the exclusion of other activities. It has also been largely embodied in national policy in the U.S. for improving worker preparation.¹⁰

Isn't World Class Success on Examinations Enough?

In an educational system that has worked long and hard to maximize examination scores and that has done well at this goal and at past economic growth, there is surely skepticism at broadening so radically the goals of schooling. One could argue that Hong Kong has excelled for almost four decades with its existing approaches and that the present Asian economic crisis will pass and things will return to normalcy. After all, Hong Kong has scored among the top countries in the world in international comparisons of achievement. Further, until the "Asian virus" spread from other countries, Hong Kong has had one of the highest sustained rates of economic growth in the world. Isn't this evidence that the educational system as it has been structured to emphasize examination performance has

also succeeded and will continue to support high economic performance?

Why change? As I emphasized in the Wei Lun Lecture, the picture is not so rosy. Recent evidence suggests that the expansion of education and examination results embodied in the Hong Kong labor force were probably less important in accounting for economic growth in Hong Kong than has been popularly believed. Econometric studies have found that about three-quarters of Hong Kong's economic growth since 1960 was due to massive capital investment, a phenomenon that is highly vulnerable in the present Asian crisis and that cannot be sustained in the longer run.¹¹ The remainder was linked to the growth of the labor force. In contrast, over half of the economic growth in the U.S. and Western Europe was linked to other factors including changes in human capital, economic organization, and research and development. The vulnerability of capital flows and the potential of a knowledge-based economy in which there are gains beyond those attributable to the traditional inputs of capital and labor provide a strong case for change. Such an economy must depend on highly-educated workers with the abilities to adjust to change and to employ analytic, creative, and practical intelligence and knowledge to the work situation, not just inert knowledge. Such a transformation is further reinforced

by endogenous growth theories in which benefits of adaptable workers will spillover to the entire society beyond those received by individuals and enterprises.

But, there is additional evidence that examination scores alone will not suffice. Evidence from the U. S. over the last three decades has shown that standardized test scores account for only a small portion of the variance in earnings and productivity of persons with similar levels of education, usually less than 10 percent.¹² That is, 90 percent of the variance in workplace performance of similarly educated persons cannot be explained by differences in the examination scores of different individuals. There is something about more education in itself beyond the test scores that accounts for the powerful relation between education and various indices of productivity.

The limited potential of achievement on standard examinations to create economic success has also been verified internationally. It is obvious that one of the incentives for performing well in international comparisons of educational achievement is the assumption that such advantages will lead to more productive and competitive labor forces and economic advantage. Unfortunately, the evidence does not support this assumption. Mathematics is the most uniform subject taught among all of the countries tested in the international studies of educational achievement. Bear

in mind that students from Singapore, South Korea, Hong Kong, and Japan were the top four performers in mathematics in the 1996 Third International Mathematics and Science Study.¹³ However, when the scores of the 40 countries included in that study were connected statistically to their economic performance, virtually no relationship was found. Nor was there any statistical relationship between scores from past studies and subsequent economic growth.¹⁴

This further reinforces the observation that examination scores seem to play a much smaller role than popularly believed in accounting for the economic growth of a country and that other factors are probably understated. But, even these data apply mainly to the relatively traditional economic systems that have characterized most countries rather than the emerging knowledge-based industries. As shifts are made to industries based upon high-productivity workplace organizations and products and services in such areas as information technologies, biotechnologies, and customized services, it is reasonable to assume that the demands for a worker who is adaptable and more fully prepared for these realities will become more pressing.

Towards Educational Change

I now turn to the theme that I emphasized last year, establishing schools in which enrichment replaces memorization, in which student projects replace drill,

and in which student assessment is based upon what Sternberg has called measures of successful intelligence, not inert intelligence. Robert Sternberg has emphasized the integration of three types of intelligence in the education of every child: analytic intelligence, creative intelligence, and practical intelligence. Analytic intelligence would extend far beyond memorization of facts to analysis and problem-solving. Creative intelligence would be manifested in the solution of problems in non-ordinary ways, seeing the world from a different perspective and utilizing artistic devices and metaphor to address one's creative instincts. Practical intelligence would be reflected in applying analytical and creative intelligence to real world situations.

In my view these approaches can best be satisfied through creating what is normally thought of as gifted and talented instruction. This can be done initially through research and creativity centers that are established in each school, but the approach should be extended more generally to the entire school and all classrooms through powerful learning strategies.¹⁵ This is the approach used by the Accelerated Schools Project which has recently been launched in Hong Kong and is still in its early stages. The idea is to transform schools so that students will meet both their developmental needs and those required for adult life through an integrated system of powerful learning. Powerful

learning is embodied in research projects, artistic endeavors, community studies, and a range of applications where knowledge is applied to real world activities. Many of the workplace competencies identified above can be embedded in each activity (e.g. developing initiative, cooperation, groupwork, peer training, evaluation, communication, reasoning, problem-solving, decision-making, information, planning, learning skills, and multicultural skills). And students can generate authentic ideas, products, artistic performances, and problem solutions that can be assessed directly for quality rather than assuming that examination scores will be adequate assessment instruments.

Such change will not come easy. Most educators and parents are wedded closely to their own previous experiences as the time-honored way of providing education to the young. The Accelerated Schools Project places great weight on a transformation process at each school site that encourages reflection and ideas by the teachers, students, and parents who must engage in change. The process is neither mechanical nor automatic, but requires the building of school communities dedicated to new goals and transformation. The process provides guidelines and tools for transformation and benchmarks to be used in assessment. It also requires a trained coach who will work with the school patiently and support the change

process and will assist the school to trouble-shoot problems as they arise.

Real change is never easy, but it can be exceedingly rewarding. Certainly, the Accelerated Schools process must be adapted to the culture of Hong Kong schools. This means that although its overall structure should probably remain intact--given thirteen years of success in several countries--, it must incorporate and build upon Hong Kong ideals and perspectives. Ultimately, there will be a uniqueness to Hong Kong Accelerated schools that will differ somewhat from the more than one thousand Accelerated Schools in other countries.

But, such deviations must be evaluated carefully to make sure that implementation of the Accelerated School is more than just a mechanical exercise. For this reason we have placed an internal assessment toolkit on our website for schools to use in assessing their progress. Of particular importance are the implementation benchmarks that enable a school to measure its progress in implementing the process. Continuous trouble-shooting by coaches and schools is integral to that process to ensure that strategies are successful.¹⁶

Change will come slowly, even when the most powerful methods are applied to the situation. Patience,

persistence, and a good sense of humor are called for. But, the outcomes of the process will not only be schools that more fully engage students and develop their talents more fully. The fruit will also be an imaginative and talented workforce that will maintain the miracle of Hong Kong's economy for the long run as an inspiration for the rest of the world and as a model for China.

Notes

1. This is available in a publication of the Hong Kong Institute of Educational Research of The Chinese University of Hong Kong.
2. The classic treatise on human capital is the pioneering exposition by Gary Becker, *Human Capital* (New York: Columbia University Press, 1964).
3. Finis Welch, "Education in Production," *Journal of Political Economy*, Vol. 78, No. 1 (January/February 1970), pp. 35-59.
4. Theodore W. Schultz, "The Value of the Ability to Deal With Disequilibria", *Journal of Economic Literature*, Vol. XIII, No. 3 (September 1975), pp. 827-46.

5. The organizational implications of education and adjustment to disequilibria are found in Henry M. Levin, "Improving Productivity Through Education and Technology," In Gerald Burke and Russell Rumberger, eds., *The Future Impact of Technology on Work and Education* (London: Falmer Press, 1987), pp. 191-214.
6. For a survey see Paul M. Romer, "The Origins of Endogenous Growth," *Journal of Economic Perspectives*, Vol. 8, No. 1 (Winter 1994), pp. 3-22.
7. See Norman Gemell, "Reviewing the New Growth Literature," *New Political Economy*, Vol. 3, No. 1 (1998), pp. 129-134.
8. Robert J. Sternberg, *Successful Intelligence* (New York: Plume, 1997), pp. 128-29.
9. This list can be found in Henry M. Levin and Russell W. Rumberger, "Education, Work, and Employment in Developed Countries: Situation and Future Challenges," *Prospects*, XIX (1989), 205-24.
10. See Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor, *What Work Requires of Schools* (Washington, D.C.: U.S. Department of Labor, 1991). Also, Secretary's Commission on Achieving Necessary Skills, U. S.

Department of Labor, *Learning A Living: A Blueprint for High Performance* (Washington, D.C.: U.S. Department of Labor, 1992).

11. Between 1966 and 1990 Hong Kong sustained an average annual increase in capital stock of about 9 percent, an amazing performance, but one that cannot be sustained indefinitely. See Lawrence J. Lau, "The Sources of East Asian Economic Growth: Implications for Building the Future of Hong Kong," Paper presented to the 37th Annual Conference of Rotary International District 3450 (Hong Kong & Macau), Hong Kong (April 11-13, 1997) and available from the author by writing to him at the Department of Economics, Stanford University, Stanford, CA 94305-6072, USA. This paper has been written for a non-technical audience. However, much of the research underlying this paper can be found in articles that have been published by Kim and Lau in economics journals. For example, see J. I. Kim and L. J. Lau, "The Sources of Economic Growth in the East Asian Newly Industrialized Countries," *Journal of the Japanese and International Economies*, 8 (1994), pp. 235-271; and J. I. Kim and L. J. Lau, "The Sources of Asian Pacific Economic Growth," *Canadian Journal of Economics*, 29: Special Issue, (1996) pp. S448-S454. Using different methods, the same conclusions have been reached by others. For

example, see A. Young, "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience," *Quarterly Journal of Economics*, 110, pp. 641-680.

The point on vulnerability of such heavy reliance on capital investment was raised in the well-known and provocative article by Paul Krugman, "The Myth of Asia's Miracle," *Foreign Affairs*, 73, pp. 62-78.

12. Henry M. Levin, "Educational Performance Standards and the Economy," *Educational Researcher*, Vol. 27, No. 4 (May 1998), pp. 4-10.
13. For details on Hong Kong's achievements in Science and Mathematics in the TIMSS study, see Nancy Law (ed.), *Science and Mathematics Achievements at the Mid-Primary Level in Hong Kong* (Hong Kong: TIMSS Hong Kong Study Centre, University of Hong Kong, 1997) and Nancy Law (ed.) *Science and Mathematics Achievement at the Junior Secondary Level in Hong Kong* (Hong Kong: TIMSS Hong Kong Study Centre, University of Hong Kong, 1996).
14. Peter Robinson, "Literacy, Numeracy and Economic Performance," *New Political Economy*, Vol. 3 No. 1 (1998), pp. 143-49.

15. The concepts of powerful learning and examples are found in Wendy Hopfenberg, Henry M. Levin, Ilse Brunner, Christopher Chase, Georgia Christensen, Beth Keller, Pilar Soler, and Gloria Rodriguez, *The Accelerated Schools Resource Guide* (San Francisco: Jossey Bass Publishers, 1993). Additional information on the origins of powerful learning and its five components are found on the Accelerated Schools website: <<http://www.stanford.edu/group/ASP/>>.
16. We have always seen the Accelerated Schools Project as evolutionary in which there is always room for continuous improvement. For specific details on how continuous improvement has been applied to the project, see Henry M. Levin, "Accelerated Schools: A Decade of Evolution," In Andy Hargreaves, Ann Lieberman, Michael Fullan, and David Hopkins, eds., *International Handbook of Educational Change*, Part Two (London: Kluwer Academic Publishers, 1998), pp. 807-830.