

**Assessment for Learning around the World:
What Would it Mean to Be “Internationally Competitive?”**

Linda Darling-Hammond & Laura McCloskey

Stanford University

Since the release of *A Nation at Risk* twenty five years ago, a set of wide-ranging reforms has been launched with the intention of better preparing all children for the higher educational demands of life and work in the 21st century. All 50 states have developed standards for learning and tests to evaluate student progress. The emphasis on using test-based accountability to raise achievement was reinforced by the requirements of the No Child Left Behind Act, passed in 2001, yet the United States has fallen further behind on international assessments of student learning since the law was passed.

On the Program in International Student Assessment (PISA) tests in 2006, the U.S. ranked 35th among the top 40 countries in mathematics and 31st in science, a decline in both raw scores and rankings from 3 years earlier.¹ (Reading scores were not reported, because of editing problems with the U.S. test.) Furthermore, in each disciplinary area tested, U.S. students scored lowest on the problem-solving items. The U.S. also had a much wider achievement gap than the most highly-ranked jurisdictions, such as Finland, Canada, Australia, New Zealand, Hong Kong, Korea, and Japan.

Current policy discussions in Washington often refer to these rankings in emphasizing the need to create more “internationally competitive” standards by benchmarking expectations in the U.S. to those in high-performing nations abroad. Typically, this means looking at the topics that are taught at various grade levels in various countries. These analyses reveal that higher-achieving countries teach fewer

topics more deeply each year; focus more on reasoning skills and applications of knowledge, rather than mere coverage; and have a more thoughtful sequence of expectations based on developmental learning progressions within and across domains.²

It is also important that we examine *how* these topics are taught and assessed – so that we understand how other countries' education systems shape what students actually learn and can do. European and Asian nations that have steeply improved student learning have focused explicitly on creating curriculum guidance and assessments that focus on the so-called 21st century skills: the abilities to find and organize information to solve problems, frame and conduct investigations, analyze and synthesize data, apply learning to new situations, self-monitor and improve one's own learning and performance, communicate well in multiple forms, work in teams, and learn independently.

Curriculum differences are reinforced by sharp divergence between the forms of testing used in the United States and those used in higher-achieving countries. Whereas U.S. tests rely primarily on multiple choice items that evaluate recall and recognition of discrete facts, most high-achieving countries rely largely on open-ended items that require students to analyze, apply knowledge, and write extensively. Furthermore, their growing emphasis on project-based, inquiry-oriented learning has led to an increasing prominence for school-based tasks, which include research projects, science investigations, development of products, and reports or presentations about these efforts. These influence the day to day work of teaching and learning, focusing it on the development of higher order skills and use of knowledge to solve problems.

Smaller countries often have a system of national standards which are sometimes – although not always – accompanied by national tests. Top-ranking Finland, for example, uses local assessments to evaluate its national standards and manages a voluntary national assessment at only one grade level. Larger nations -- like Canada, Australia, and China – have state- or provincial-level standards, and their assessment systems are typically a blend of state and local assessments. Managing assessment at the state level where it remains relatively close to the schools turns out to be an important way of enabling strong teacher participation and ensuring high-quality local assessments that can be moderated to ensure consistency in scoring.

In many cases, these local assessments are designed to complement centralized “on-demand” assessments, comprising up to 50% of the final examination score. The tasks are mapped to the standards or syllabus for the subject and are selected because they represent critical skills, topics, and concepts. They are often outlined in the curriculum guide, but they are generally designed, administered and scored locally, based on common specifications and evaluation criteria. Whether locally or centrally developed, decisions about when to undertake these tasks are made at the classroom level, so they are used when appropriate for students’ learning process and teachers can get information and provide feedback when it is needed, something that traditional standardized tests cannot do. In addition, as teachers use and evaluate these tasks, they become more knowledgeable about both the standards and how to teach to them and about what their students’ learning needs are. Thus, the process improves the quality of teaching and learning.

Like the behind-the-wheel test given for all new drivers in the United States, these performance assessments evaluate what students can actually *do*, not just what they know. The road test not only reveals some important things about potential drivers' skills, it also helps improve those skills as potential drivers practice to get better. In the same way, performance assessments set a standard toward which everyone must work. The task and the standards are not secret: they are transparent, so that people know what skills they need to develop and how they will need to be demonstrated.

Finally, the examination systems in these countries are not used to rank or punish schools, nor are they used to deny diplomas to students. Following the problems that resulted from the Thatcher government's use of test-based school rankings, which caused a narrowing of the curriculum and widespread exclusions of students from school,³ several countries even enacted legislation precluding the use of test results for school rankings. High school examinations are used to provide information for higher education, vocational training, and employment, and students often choose the areas in which they will be examined, as a means of providing evidence of their qualifications. Because the systems are focused on using information for curriculum improvement rather than sanctions, governments can set higher standards and work with schools to achieve them, rather than having to devise tests and set cut-scores at a minimal level to avoid dysfunctional side-effects.

Many states in the U.S. – including Connecticut, Kentucky, Maine, Nebraska, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Wyoming – have developed and used state and local performance assessments as part of their testing systems. Indeed, the National Science Foundation provided millions of dollars for states

to develop such hands-on science and math assessments as part of its Systemic Initiative in the 1990s, and prototypes exist all over the country. Studies have found that the use of such assessments has improved teaching quality and increased student achievement, especially in areas requiring complex reasoning and problem solving.⁴ However, these assessments have been difficult to sustain, especially in recent years under the annual testing requirements of No Child Left Behind, and there is little widespread understanding in the policy community about how systems of assessment for learning might be constructed and managed at scale.

Here we describe the assessment systems of several high-achieving education systems: two of the highest-achieving Scandinavian nations – Finland and Sweden – and a group of English-speaking jurisdictions that have some shared approaches to assessment, as well as some interesting variations: Australia, Hong Kong, and the United Kingdom (whose approaches, we note, are similar to those in Singapore, New Zealand and Canada, though space does not allow us to treat them here). We discuss in particular how assessments are linked to curriculum and integrated into the instructional process, so that they can shape and improve learning for students and teachers alike.

Finland and Sweden

Finland has been a poster child for school improvement since it rapidly climbed to the top of the international rankings after it emerged from the Soviet Union's shadow. It now ranks first among all the OECD nations on the PISA assessments in mathematics, science, and reading. Leaders in Finland attribute these gains to their intensive investments in teacher education – all teachers receive three years of high-quality graduate level preparation completely at state expense – plus major overhaul of the

curriculum and assessment system. Most teachers now hold master's degrees in both their content and in education, and their preparation is aimed at learning to teach diverse learners – including special needs students – for deep understanding, with a strong focus on how to use formative performance assessments in the service of student learning.⁵

Sweden also invests heavily in graduate level teacher education for all teachers, and relies on a highly trained teaching force to implement its curriculum and assessment system.

Over the past 40 years, Both Finland and Sweden have shifted from highly centralized systems emphasizing external testing to more localized systems using multiple forms of assessments. Around 1970, Sweden abolished its nationally administered exit exam that ranked Upper Secondary students and placed them in higher education programs.⁶ Finland followed suit, overhauling its curriculum system in two stages between the 1970s and 1990s, and both nations eliminated the practice of tracking students into different streams by their test scores, offering a common core curriculum to all students. These changes were intended to equalize educational outcomes and provide more open-access to higher education.⁷

Although it may seem counterintuitive to those accustomed to external testing as a means of accountability, Finland's use of school-based, student-centered, open-ended tasks embedded in the curriculum is touted by its leaders as an important reason for the nation's extraordinary success on the international exams.⁸ Policymakers decided that if they invested in very skillful teachers, they could allow local schools more autonomy to make decisions about what and how to teach — a reaction against the highly centralized system they sought to overhaul. The current national core curriculum is a much leaner document, reduced from hundreds of pages of highly specific prescriptions to

descriptions of a small number of skills and core concepts each year. (About 10 pages describe the full set of math standards for all grades, for example.) This guides teachers in collectively developing local curriculum and assessments that encourage students to be active learners who can find, analyze, and use information to solve problems in novel situations.

There are no external standardized tests used to rank students or schools. School-level samples of student performance are evaluated periodically by the Finnish education authorities, generally at the end of the 2nd and 9th grades, to inform curriculum decisions and school investments. All other assessments are designed and managed locally. The national core curriculum provides teachers with recommended assessment criteria for specific grades in each subject and in the overall final assessment of student progress each year.⁹ Schools then use those guidelines to craft a more detailed set of learning outcomes and curriculum at each school, along with approaches to assessing the curriculum benchmarks.

The national standards emphasize that the main purpose of assessing students is to guide and encourage students' own reflection and self-assessment. Consequently, on-going feedback from the teacher is very important. Teachers give students formative and summative reports both through verbal feedback and on a numerical scale reflecting the students' level of performance in relation to the objectives of the curriculum. The teachers' reports must be based on multiple forms of assessment, not only exams.

Assessment is used in Finland to cultivate students' active learning skills by asking open-ended questions and helping students address these problems. In a Finnish classroom, it is rare to see a teacher standing at the front of a classroom lecturing students

for fifty minutes. Instead, students are generally engaged in independent or group projects, often choosing the tasks they will work on and setting their own targets with teachers in specific subject areas, who serve as coaches.¹⁰ The cultivation of independence and active learning encourages students to develop analytical thinking, problem solving, and meta-cognitive skills.

Most Finnish students take a voluntary matriculation exam which asks students to apply problem solving, analytic and writing skills prior to attending university.¹¹ Teachers use official guidelines to grade the matriculation exams locally, and samples of the grades are re-examined by professional raters hired by the Matriculation Exam Board.¹²

Similarly, Sweden implements its nationally outlined and locally implemented curriculum with multiple assessments managed at the school level. A national curriculum and subject matter syllabi are adapted by each school to local conditions.¹³ Teachers design and score school-based assessments based on the objectives outlined in each syllabus, and they assign grades based on syllabus goals and national assessment criteria. They are expected to conduct meetings during each school term with every student and parent(s) to discuss the student's learning and social development, and they use a number of diagnostic materials to assess students' learning in Swedish, Swedish as a Second Language, English, and Mathematics in relation to the goals set by the syllabi.¹⁴

Schools offer nationally approved examinations in year 9 and in the Upper Secondary years in these same subjects.¹⁵ Teachers work with university faculty to help design the tasks and questions, and they weight information from these exams, their own assessments, and classroom work to assign a grade reflecting how well students have met

the objectives of the syllabus.¹⁶ Regional education officials and schools provide time for teachers to calibrate their grading practices to minimize variation across the schools and across the region.¹⁷ Towards the end of their Upper Secondary schooling, Swedish students receive a final grade or “learning certificate” in each area that acts as a compilation of all of these sources of evidence, including projects completed by the student as well as grades awarded for courses.

Swedish assessments use open-ended, authentic tasks asking students to demonstrate content knowledge and analytic skills in grappling with real world problems. This sample question from a grade 5 exam asks students (aged 11-12) to think through a problem that they might have in their own lives:

Carl bikes home from school at four o'clock. It takes about a quarter of an hour. In the evening he's going back to school because the class is having a party. The party starts at 6 o'clock. Before the class party starts, Carl has to eat dinner. When he comes home, his grandmother calls, who is also his neighbor. She wants him to bring in her post before he bikes over to the class party. She also wants him to take her dog for a walk, then to come in and have a chat. What does Carl have time to do before the party begins? Write and describe below how you have reasoned.¹⁸

Upper Secondary exams also frame challenging questions in real world terms, with the expectation that students will show their work and reasoning. For example:

In 1976 Lena had a monthly salary of 6,000 kr. By 1984 her salary had risen to 9,000 kr. In current prices, her salary had risen by 50%. How large was the percent change in fixed prices? In 1976 the Consumer Price Index (CPI) was 382; in 1984 it was 818.¹⁹

Students who experience a steady diet of such challenging tasks requiring thoughtful reasoning and the ability to communicate their thinking are well-prepared for the kinds of problem-solving required in the real world.

Australia, the United Kingdom, and Hong Kong

Whereas smaller countries like Finland and Sweden have national curriculum guidance, in much-larger Australia, each state has its own curriculum and assessment program. At the national level in Australia, the only assessment is a periodic matrix sample-based assessment, rather like the National Assessment of Educational Progress in the U.S. In most states, local school-based performance assessment is a well-developed part of the system. In some cases, states have also developed centralized assessment with performance components. The two highest-achieving states, Queensland and A.C.T., have the most highly developed systems of local performance assessment. Victoria, which uses a blended model of centralized and school-based assessment, also generally performs well on national and international tests.

In **Queensland**, there has been no assessment system external to schools for 40 years. Until the early 1970s, a traditional “post-colonial” examination system controlled the curriculum. When it was eliminated, about the same time as in Finland and Sweden, all assessments became school-based. School-based assessments are developed, administered and scored by teachers in relation to the national curriculum guidelines and state syllabi (also developed by teachers), and are moderated by panels that include teachers from other schools as well as professors from the university system.

The syllabi spell out a small number of key concepts and/or skills to be learned in each course, and what kinds of projects or activities (including minimum assessment requirements) students should be engaged in. Each school designs its program to fit the needs and experiences of its own students, choosing specific texts and topics with this in mind. At the end of the year, teachers collect a portfolio of each student’s work, which includes the specific assessment tasks, and grade it on a 5-point grading scale. To

calibrate these grades, teachers put together a selection of portfolios from each grade level – one from each of the 5 score levels, plus borderline cases – and send these to a regional panel for moderation. A panel of five teachers re-scores the portfolios and confers about whether the grade is warranted, making a judgment on the spread. A state panel also looks at portfolios across schools. Based on these moderation processes, the school is given instructions to adjust grades so that they are comparable to others.

Queensland’s “New Basics” and “Rich Tasks” approach to assessment, which began in 2003, also offers extended, multi-disciplinary tasks that are developed centrally and used locally when teachers determine the time is right and they can be integrated with locally-oriented curriculum. They are "specific activities that students undertake that have real-world value and use, and through which students are able to display their grasp and use of important ideas and skills."²⁰ Rich Tasks are defined as:

...a culminating performance or demonstration or product that is purposeful and models a life role. It presents substantive, real problems to solve and engages learners in forms of pragmatic social action that have real value in the world. The problems require identification, analysis and resolution, and require students to analyze, theorize and engage intellectually with the world. As well as having this connectedness to the world beyond the classroom, the tasks are also rich in their application: they represent an educational outcome of demonstrable and substantial intellectual and educational value. And, to be truly rich, a task must be transdisciplinary. Transdisciplinary learnings draw upon practices and skills across disciplines while retaining the integrity of each individual discipline.

The Science and Ethics task summarized below illustrates these traits.

Science and Ethics Confer

Students must identify, explore and make judgments on a biotechnological process to which there are ethical dimensions. Students identify scientific techniques used as well as significant recent contributions to the field. They will also research frameworks of ethical principles for coming to terms with an identified ethical issue or question. Using this information they prepare pre-conference materials for an international conference that will feature selected speakers who are leading lights in their respective fields.

In order to do this students must choose and explore an area of biotechnology where there are ethical issues under consideration and undertake laboratory activities that help them understand some of the laboratory practices. This enables them to:

- A) Provide a written explanation of the fundamental technological differences in some of the techniques used, or of potential use, in this area (included in the pre-conference package for delegates who are not necessarily experts in this area).
- B) Consider the range of ethical issues raised in regard to this area's purposes and actions, and scientific techniques and principles and present a deep analysis of an ethical issue about which there is a debate in terms of an ethical framework.
- C) Select six real-life people who have made relevant contributions to this area and write a 150-200 word précis about each one indicating his/her contribution, as well as a letter of invitation to one of them.

This assessment measures research and analytic skills; laboratory practices; understanding biological and chemical structures and systems, nomenclature and notations; organizing, arranging, sifting through, and making sense of ideas; communicating using formal correspondence; précis writing with a purpose; understanding ethical issues and principles; time management, and much more.

A bank of these tasks now exists across grade levels, along with scoring rubrics, and moderation processes by which the quality of the tasks, the student work, and the scoring can be evaluated. Research indicates that the system has offered a successful tool for school improvement. Studies have found stronger student engagement in learning in schools using the Rich Tasks. On traditional tests, New Basics students scored about the same as students in the traditional program, but they performed notably better on assessments designed to gauge higher order thinking. The Singapore government has employed the developers of the Queensland system to focus the new school improvement strategies upon performance assessments. High-scoring Hong Kong has also begun a process of expanding its already-ambitious school-based assessment system in collaboration with Queensland assessment developers.

In **Victoria**, a mixed system of centralized and decentralized assessment combines these kinds of school-based assessment practices with a set of state exams. Guided by the Victoria Essential Learning Standards, the AIM assessment program provides an indication of how well the literacy and numeracy skills of students are developing at years 3, 5, 7, and 9. The results provide information used to plan new programs and a useful source of feedback and guidance to students, parents and teachers. Assessment tasks include extended open-ended writing tasks, as well as some multiple-choice responses.

The Victoria Curriculum and Assessment Authority establishes courses in a wide range of studies, develops the external examinations and ensures the quality of the school-assessed component of the VCE. VCAA conceptualizes assessment as “of,” “for,” and “as” learning. Teachers are involved in developing assessments, along with university faculty in the subject area, and all prior year assessments are public, in an attempt to make the standards and means of measuring them as transparent as possible. Before the external examinations are given to students, teachers and academics sit and take the exams themselves, as if they were students. The external subject-specific examinations, given in grades 11 and 12, include written, oral, and performance elements scored by classroom teachers.

In addition, at least 50% of the total examination score is comprised of classroom-based tasks that are given throughout the school year. These required assignments and assessments – lab experiments and investigations on central topics as well as research papers and presentations – are designed by teachers in response to syllabus expectations. These required classroom tasks ensure that students are getting the kind of learning

opportunities which prepare them for the assessments they will later take, that they are getting feedback they need to improve, and that they will be prepared to succeed not only on these very challenging tests but in college and in life, where they will have to apply knowledge in these ways.

An example of how this blended assessment system works can be seen in the interplay between an item from the Victoria, Australia biology test, and the classroom-based tasks also evaluated for the examination score. The open-ended item describes a particular virus and how it operates, then asks students to design a drug to kill the virus and explain how the drug operates (the written answer is to include diagrams), and then to design and describe an experiment to test the drug. In preparation for this on-demand test, students taking Biology will have been assessed on six pieces of work during the school year covering specific outcomes in the syllabus. For example, they will have conducted “practical tasks” like using a microscope to study plant and animal cells by preparing slides of cells, staining them, and comparing them in a variety of ways, resulting in a written product with visual elements. They also will have completed and presented a research report on characteristics of pathogenic organisms and mechanisms by which organisms can defend against disease. These tasks link directly to the expectations that students will encounter on the external examination, but go well beyond what that examination can measure in terms of how students can apply their knowledge.

The tasks are graded according to criteria set out in the syllabus. The quality of the tasks assigned by teachers, the work done by students, and the appropriateness of the grades and feedback given to students are audited through an inspection system, and schools are given feedback on all of these elements. In addition, the VCAA uses

statistical moderation to ensure that the same assessment standards are applied to students across schools. The external exams are used as the basis for this moderation, which adjusts the level and spread of each school's assessments of its students to match the level and spread of the same students' scores on the common external test score. The result is a rich curriculum for students with extensive teacher participation and a comparable means for examining student learning.

United Kingdom. As in Victoria, assessments in Great Britain use a combination of external and school-based tasks based on the national curriculum and course syllabi. Throughout the school years, classroom-based tasks scored by teachers are used to evaluate student achievement of curriculum goals. A mandatory set of assessments at year 9 (age 14) includes both teacher-created and administered assessments and, for students who have reached a certain level of achievement, national exams and tasks.²¹

While not mandatory, most students take a set of exams at year 11 (age 16) to achieve their General Certificate of Secondary Education (GCSE). Students may take as many single-subject or combined-subject assessments as they like, and they choose which ones they will take based on their interests and areas of expertise. Most GCSE items are essay questions. The math exam includes questions that ask students to show their reasoning behind their answers and foreign language exams require oral presentations. About 25 to 30% of the final examination score is based on class work coursework and assessments developed and graded by teachers. In many subjects, students also complete a project worked on in class that is specified in the syllabus.

Wales and Northern Ireland allow students to participate in the GCSE exams at the high school level on a voluntary basis, but both broke from the more centralized

system introduced in England under the Thatcher administration (later modified during the Blair administration as described above) and opted to abolish national exams.²² Much like Finland and Sweden, during the primary years, Welsh schools have a national school curriculum supported by teacher-created, administered, and scored assessments.²³ Northern Ireland, which has recently climbed significantly in international rankings, especially in literacy, is implementing an approach called “Assessment for Learning.” This approach emphasizes locally developed, administered and scored assessments and focuses, as in Finland, on students and teachers setting goals and success criteria together, teachers asking open-ended questions and students explaining their reasoning, teachers providing feedback during formative assessment sessions, and students engaging in self-assessment and reflection on their learning. Optional externally graded assessments also focus on how students reason, think, and problem solve.²⁴

Hong Kong. In collaboration with educators from Australia, the UK, and other nations, Hong Kong’s assessment system is evolving from a highly centralized examination system to one that increasingly emphasizes school-based, formative assessments that expect students to analyze issues and solve problems. The government has decided gradually to replace the Hong Kong Certificate of Education Examinations, which most students sit for at the end of their 5-year secondary education, with a new Hong Kong Diploma of Secondary Education that will feature school-based assessments. In addition, the Hong Kong Territory-wide System Assessment (TSA), which provides assesses lower-grade student performance, in Chinese, English, and mathematics, is developing an on-line bank of assessment tasks to enable schools to assess their students and receive feedback on their performance on their own timeframes. The formal TSA

assessments, which include both written and oral components, occur at Primary Grades 3 and 6 and Secondary Grade 3 (the equivalent of grade 9 in the U.S.).

As outlined in Hong Kong's "Learning to learn" reform plan, the goal of the reforms is to shape curriculum and instruction around critical thinking, problem-solving, self-management skills, and collaboration. A particular concern is to develop meta-cognitive thinking skills, so students may identify their strengths and areas needing additional work.²⁵ By 2007, Curriculum and Assessment Guides were published for four core subjects and 20 elective subjects, and assessments in the first two subjects – Chinese Language and English Language – were revised. These became criterion-referenced, performance-based assessments featuring not only the kinds of essays previously used on the exams, but also new speaking and listening components, the composition of written papers testing integrated skills, and a school-based component that factors into the examination score. Although the existing assessments already use open-ended responses (see the example of a Physics examination in Appendix A), the proportion of such responses will increase in the revised assessments.

Like the existing assessments, the new assessments are developed by teachers with the participation of higher education faculty, and they are scored by teachers who are trained as assessors. Tests are allocated randomly to scorers, and essay responses are typically rated by two independent scorers.²⁶ Results of the new school-based assessments are statistically moderated to ensure comparability within the province. The assessments are internationally benchmarked, through the evaluation of sample student papers, to peg the results to those in other countries. Many of the new assessments are

also to be scored on-line, which the Examinations Authority notes is now the common practice in 20 of China's mainland provinces, as well as in the UK.

To guide the process of assessment reform, the Education Bureau has implemented a School Development and Accountability Framework which emphasizes school self-evaluation, plus external peer evaluation, using a set of performance indicators. The Bureau promotes the use of multiple forms of assessment in schools including projects, portfolios, observations, and examinations, and looks for the variety of assessments in the performance indicators used for school evaluation.²⁷ For example, the performance indicators ask: "Is the school able to adopt varied modes of assessment and effectively assess students' performance in respect of knowledge, skills, and attitude?" and "How does the school make use of curriculum evaluation data to inform curriculum planning?"²⁸ This practice of examining school practices and the quality of assessments through an inspection or peer review process is also used in Australia and Great Britain to improve teaching by using standards as a tool for sharing knowledge and reflecting on practice.

Conclusion

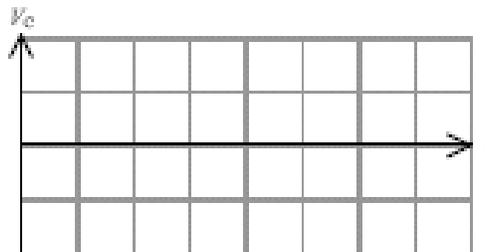
The design and use of standards, curricula, and assessments in high-achieving nations around the world is significantly different from the way tests are designed and used in the United States. Most testing in the U.S. emphasizes externally-developed, machine-scored instruments that enter and leave the school in secret, offering little opportunity for teacher engagement with the evaluation of standards and little opportunity for student production of analyses, solutions, or ideas.

By contrast, assessment abroad involves teachers in developing and scoring intellectually challenging performance tasks that are embedded in and guide instruction, providing grist for feedback, student self-evaluation, and learning. The integration of curriculum, assessment, and instruction in a well-developed teaching and learning *system* creates the foundation for much more equitable and productive outcomes. Teachers and students come to understand the standards deeply, and they work continuously on activities and projects that develop skills as they are applied in the real world, as well as on the examinations themselves.

The tasks common in these assessment systems reflect what people increasingly need to know to succeed in today's knowledge-based economy: the abilities to find, analyze, and use information to solve real problems; to write and speak clearly and persuasively; to defend ideas; and to design and manage projects. While the U.S. accountability efforts have focused attention on achieving higher test scores, they has not yet developed the kind of teaching and learning systems that could develop widespread capacity for significantly greater learning. A new vision for assessment will be critical to this goal – and to the possibilities of success for our children in today's and tomorrow's world.

(ii) Find the energy stored in the inductor at the steady state. (2 marks)

(iii) If switch S is now opened, sketch the time variation of the p.d. V_C across the capacitor. (2 marks)



(c) State how you would modify the circuit so as to demonstrate that a large induced e.m.f. is produced across the inductor when switch S is suddenly opened. Explain briefly. (3 marks)

¹ Institute for Education Sciences (2007). Highlights from PISA 2006: Performance of U.S. 15-year-old students in science and mathematics literacy in an international context. Washington, DC: U.S. Department of Education. Retrieved on 4/1/08 from <http://nces.ed.gov/surveys/pisa/index.asp>.

² See for example, W.H. Schmidt, H. C. Wang, and C.McKnight (2005). Curriculum coherence: An examination of US mathematics and science content standards from an international perspective, *Journal of Curriculum Studies*, 37 (5), 525-559; G.A. Valverde & W. H. Schmidt (2000). Greater expectations: Learning from other nations in the quest for 'world-class standards' in US school mathematics and science, *Journal of Curriculum Studies*, 32 (5): 651-687; P. Fensham (1994). Progression in school science curriculum: A rational prospect or a chimera? *Research in Science Education*, 24 (1), 76-82.

³ Rustique-Forrester, E. (2005). Accountability and the pressures to exclude: A cautionary tale from England. *Education Policy Analysis Archives*, <http://epaa.edu/epaa/v13n26/>

⁴ For a summary see L. Darling-Hammond and E. Rustique-Forrester (2005). The Consequences of Student Testing for Teaching and Teacher Quality. In Joan Herman and Edward Haertel (eds.) *The Uses and Misuses of Data in Accountability Testing*, pp. 289-319. Malden, MA: Blackwell Publishing.

⁵ R. Laukkanen (2008). Finnish strategy for high-level education for all. In N. C. Soguel and P. Jaccard (eds.). *Governance and Performance of Education Systems*. 305–324. Springer, at p. 319. See also F. Buchberger & I. Buchberger, Problem solving capacity of a teacher education system as a condition of success? An analysis of the “Finnish case,” In F. Buchberger and S. Berghammer (eds.): *Education Policy Analysis in a Comparative Perspective*, pp. 222-237. Linz: Trauner.

⁶ European Commission. (2006/2007). “Eurybase, The Information Database on Education Systems in Europe, The Education System in Sweden.”

⁷ M.A. Eckstein & H.J. Noah. (1993). *Secondary School Examinations: International Perspectives on Policies and Practice*. New Haven: Yale University Press, p. 84.

⁸ Finnish National Board of Education. (November 12th, 2007). “Background for Finnish PISA Success.” Retrieved on September 8th, 2008 from <http://www.oph.fi/english/SubPage.asp?path=447,65535,77331>; Lavonen, J. (2008). “Reasons behind Finnish Students’ Success in the PISA Scientific Literacy Assessment.” University of Helsinki, Finland. Retrieved on September 8th, 2008 from http://www.oph.fi/info/finlandinpisastudies/conference2008/science_results_and_reasons.pdf.

⁹ Finnish National Board of Education. (June 10th, 2008). “Basic Education.” Retrieved on September 11th, 2008 from <http://www.oph.fi/english/page.asp?path=447,4699,4847>.

¹⁰ Korpela, Salla. (December 2004). “The Finnish school – a source of skills and well-being: A day at Stromberg Lower Comprehensive School.” Retrieved on September 11th, 2008 from <http://virtual.finland.fi/netcomm/news/showarticle.asp?intNWSAID=30625>

¹¹ The Finnish Matriculation Examination. (2008). Retrieved on September 8th, 2008 from <http://www.ylioppilastutkinto.fi/en/index.html>

¹² Kaftandjieva, F. & Takala, S. (2002). “Relating the Finnish Matriculation Examination English Test Results to the CEF Scales.”

¹³ Swedish National Agency for Education. (2005). “The Swedish School System: Compulsory School.” Retrieved on May 31st, 2008 from <http://www.skolverket.se/sb/d/354/a/959>

¹⁴ Eckstein and Noah, 1993, p. 83-84; Qualifications and Curriculum Authority (2008). “Sweden: Assessment arrangements.” Retrieved on September 11th, 2008 from <http://www.inca.org.uk/690.html>. O’Donnell (December, 2004). International Review of Curriculum and Assessment Frameworks. Comparative tables and factual summaries – 2004. Qualifications and Curriculum Authority and National Foundation for Educational Research, p. 23. Retrieved on 9/11/08 from <http://www.inca.org.uk/pdf/comparative.pdf>.

¹⁵ Swedish National Agency for Education (2005).

¹⁶ Eckstein and Noah, 1993; O’Donnell, 2004).

¹⁷ Eckstein and Noah, 1993, p. 230.

¹⁸ Petterson, A. (2008). The National Tests and National Assessment in Sweden. Stockholm, Sweden. Stockholm Institute for Education. PRIM gruppen. Retrieved on May 31st, 2008 from http://www.prim.su.se/artiklar/pdf/Sw_test_ICME.pdf

¹⁹ Eckstein & Noah, 1993, pp. 270-272.

²⁰ Queensland Government (2001). “New Basics: The Why, What, How and When of Rich Tasks.” Retrieved on September 12th, 2008 from <http://education.qld.gov.au/corporate/newbasics/pdfs/richtasksbklet.pdf>

²¹ Qualifications and Curriculum Authority. (2008). “England: Assessment arrangements.” Retrieved on May 27th, 2008 from <http://www.inca.org.uk/1315>.

<http://education.qld.gov.au/corporate/newbasics/html/richtasks/richtasks.html>

²² Archer, J. (December 19th, 2006). “Wales Eliminates National Exams for Many Students.” *Education Week*. Retrieved on 9/11/08 from <http://www.edweek.org/ew/articles/2006/12/20/16wales.h26.html?qs=Wales>

²³ Welsh Assembly Government. (2008). “Primary (3-11).” Retrieved on September 12th, 2008 from <http://old.accac.org.uk/eng/content.php?cID=5>; Welsh Assembly Government. (2008b). “Secondary (11-16).” Retrieved on September 12th, 2008 from <http://old.accac.org.uk/eng/content.php?cID=6>

²⁴ Council for the Curriculum Examinations and Assessment. (2008). “Curriculum, Key Stage 3, Post-Primary Assessment.” Retrieved on September 12th, 2008 from <http://www.ccea.org.uk/>;

Council for the Curriculum Examinations and Assessment. (2008). “Qualifications.” Retrieved on September 12th, 2008 from <http://www.ccea.org.uk/>.

²⁵ Chan, J.K., K.J. Kennedy, F.W. Yu, P. Fok. (2008). "Assessment Policy in Hong Kong: Implementation Issues for New Forms of Assessment." *The Hong Kong Institute of Education*. Retrieved on September 12th, 2008 from <http://www.iaea.info/papers.aspx?id=68>

²⁶ Dowling, M. (undated). Examining the Exams. Retrieved on Sept. 14, 2008 from http://www.hkeaa.edu.hk/files/pdf/markdowling_e.pdf.

²⁷ Chan, et al., 2008; Quality Assurance Division of the Education Bureau, 2008).

²⁸ Quality Assurance Division of the Education Bureau. (2008). "Performance Indicators for Hong Kong Schools, 2008 with Evidence of Performance." Retrieved on September 12th, 2008 from http://www.edb.gov.hk/FileManager/EN/Content_6456/pi2008%20eng%205_5.pdf