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21st Century Work Skills and Competencies

John Hawkins and Deane Neubauer

The Setting: The 21st century has borne witness to a steadily increasing pattern of global interdependence, a keystone of which has been the progressive and seemingly inescapable conjoining of economic activity throughout the world. This trajectory has been amplified by the role being paid by technology of all forms, but most especially (perhaps!) those that link computing, communication and automation. Whereas 20 years ago David Harvey's judgment that contemporary globalization had resulted in the annihilation of time and space seemed perhaps to border on overstatement, today it is a proposition that few would contest (Harvey, 1990). Situated in the center of this transformation is the nature of work in economies of all stripes as these forces of change rapidly impact what kinds of work are done where and by whom. Closely linked to these phenomena is the myriad of ties that link education at all levels with what we can more appropriately term the "worlds of work". It is also true, that there remains a digital divide that shuts out over 60% of the world which does not participate in those aspects of globalization that require this form of technology. This fact has significant implications for the link between learning and work (Internet World Stats, http://www.internetworldstats.com/stats.htm).

And for all that we accept, almost in a commonsensical manner, the root proposition that education and economic accomplishment are inseparably linked, it is nevertheless often the case that the internal dynamics and structures of education and economy operate such that as societal sectors they are out of alignment. This oft-marked *misalignment* crisis has had two distinct features that have occurred in various and different societies throughout the work. On the one hand even as economic growth has propelled society after society into the so-called massification stage of higher education, its institutions have tended to produce graduates ill-suited for the demands of the economies into which they are entered: in the worst of cases they are merely unemployable. On the other hand, even as higher education institutions (HEIs) in many societies struggle to adapt to patterns of changing economic development and job demands, the very nature of the societies in which they are situated is being significantly impacted by economic transformative forces. It is from this interactive structure that we conclude that within this alignment dilemma, higher education inevitably tends to play a "catch up" role—it is always, in

some important senses "behind the curve" in seeking to behave responsibly in preparing its graduates for the world they are about to confront on graduation. This is true both among the "connected" and the "disconnected" worlds. The critique has ranged from the classical Dore "Diploma Disease" whereby HEIs, especially in emerging economies, are simply providing credentials regardless of alignment to the work place, to the debate on the vocationalization of HE versus the quest for general education and liberal arts.

Several structural and behavioral consequences are flowing from this situation/circumstance. One is the pattern of educational re-entry, as workers within these transitional economies find it necessary to return to higher education to retrain them in an effort to accommodate a constantly changing job market. Another outcome has been the vast increase in graduate programs as workers in their return to higher education see graduate education as involving skill sets and perspectives that they may need to succeed. Within some environments, much of this graduate/workplace-focused education is coming from private sector entities that see this as a lucrative economic sub-sector in and of itself. And another is an acceptance that HE may have little to do with alignment and graduates of differentially ranked HEIs receive their alignment training at the work site following graduation. And, throughout the work we see a shifting sense that massification of higher education needs to become closer to universalization of higher education as the demands of employment seemly pay a greater premium on degree acquisition. (For a broader treatment of these issues see Neubauer and Tanaka, 2011).

To make the case in this way is to emphasize the continual pressure that higher education institutions are under to create opportunities to deal with such issues and to convince their relevant constituents (e.g. governments, accreditors, parents, students, employers) that their efforts are both relevant and appropriate. In doing so, however, it is possible that HEIs, given the power and enduring capacity of their own internal structures, may not sufficiently address a critical attendant dilemma that arises in this context, namely in such a rapidly changing world, what kinds of work skills and/or competencies should higher education students be provided to equip them for the world they encounter on graduation? It is this question that we seek to place in the center of our deliberations for this proposed senior seminar.

Addressing some exemplars:
We wish to put before us three examples of groups that have sought to "think seriously" about such questions. It is our hope that these will stimulate seminar participants to develop their own approach to addressing the issue presented above.

Example One: The Institute for the Future
The Institute for the Future is a San Francisco, CA based group that seeks to conduct various future-oriented exercises. (Website: http://www.iftf.org) In 2011 they turned their attention to the question of what might constitute appropriate 21st century workplace skills. In doing so, they first identified six "drivers of change" or "disruptive forces: things that might show up on most observers survey of things

which are indeed in one way or another changing the world in which we live. The six are:

- Extreme longevity—the fact of increasing global life spans that are having the effect of changing the nature of careers and related learning
- Rise of smart machines and systems—the process by which workplace robotics nudge workers out of rote, repetitive tasks (and which by the way, leave fewer jobs for human workers)
- Computational world—the massive increase in sensors and processing power that makes the world a programmable system and that seemingly obeys powerful but as yet poorly understood laws of computational complexity and capacity
- New Media Ecology—the constant invention of new communication tools that require new media literacies beyond texts
- Super-structured organizations—the continual emergence of social technologies that drive new forms of production and value creation
- A globally connected world—the fact that increased global interconnectivity puts diversity and adaptability at the center of all kinds of organizational operations

From these six drivers or disruptors, the IFE argues arise the need for at ten future work skills.

1. Sense-Making—the ability to determine the deeper meaning or significance of what is being expressed
2. Novel and adaptive thinking—developing a proficiency at thinking and coming up with solutions and responses beyond that which is rote or rule-based
3. Social Intelligence—gaining the ability to connect to others in a deep and direct way, to sense and stimulate reactions desired interactions
4. Transdisciplinarity—literacy in and an ability to understand concepts across multiple disciplines
5. New media literacy: an ability to critically assess and develop content that uses new media forms, and to leverage these media for persuasive communication
6. Design mindset—an ability to represent and develop tasks and work processes for desired outcomes
7. Cognitive load management—ability to discriminate and filter information for importance, and to understand how to maximize cognitive functioning using a variety of tools and techniques
8. Cross cultural competency—ability to operate in different cultural settings
9. Virtual collaboration—ability to work productively, drive engagement, and demonstrate presence as a member of a virtual team
10. Computational thinking—ability to translate vast amounts of data into abstract concepts and to understand data-based reasoning

These skills, it is argued, are relevant for situating the learner in the kinds of contingent and probabilistic environments being created by the overall thrusts of contemporary globalization. As is readily apparent, these skills and capabilities stand astride the ways in which most of our HEIs are organized: by colleges, disciplines and levels of credit acquisition.

Example Two: The Lumina Degree Profile

Seeking to address a somewhat different issue, the Lumina Foundation has focused on the issue of academic currency within the American polity, and specifically the issue of what the baccalaureate degree *means* in a context in which literally thousands of separate institutions are largely free to establish the content and by extension meaning of their own degrees. Lumina asked a small group of distinguished scholars to try and think through this issue and propose a set of parameters for degree levels, specially for the baccalaureate and masters degrees.

For the baccalaureate degree Lumina identified five areas for demonstrated graduation skills: Specialized knowledge, Broad integrative knowledge, Intellectual Skills, Applied Learning and Civic Learning. These were operationalized as follows.

In demonstrating specialized knowledge the student:
- Defines and explains the boundaries, divisions, styles and practices of the discipline.
- Defines and properly uses principal terms.
- Demonstrates fluency in use of tools, technologies and methods.
- Evaluates, clarifies and frames a complex question or challenge.
- Constructs a project related to a complex problem
- Constructs a summative project, paper or practice-based performance.

To show broad, integrative knowledge the student:

- Frames a complex, scientific, social, technological, economic or aesthetic challenge or problem from the perspectives and literature of at least two academic fields.
- Produces, independently or collaboratively, an investigative, creative or practical work that draws on theories, tools, and methods from at least two academic fields.
- Explains a problem in science, the arts, society, human services, economic life or technology from the perspective of at least two academic fields.

Intellectual skills may be demonstrated by:

- Differentiating and evaluating theories and approaches to complex standard and non-standard problems.

- Incorporating multiple information resources in different media or languages in projects, papers, or performances

- Constructing a cultural, political or technological alternative vision of either the natural or human world through a written report, laboratory report, exhibit, performance etc. Quantitative fluency. Example: find a widely read editorial and construct an empirical analysis of it using data.
- Communicating fluency, for example by exploring the expansion of cross border education in two or more Asian countries employing sensitivity to language difference (or use students on team with multiple language skills.)

- Means of demonstrating applied learning could include:

- Differentiating and evaluating theories and approaches to complex standard and non-standard problems.
- Incorporating multiple information resources in different media or languages in projects, papers, or performances
- Constructing a cultural, political or technological alternative vision of either the natural or human world through a written report, laboratory report, exhibit, performance etc. Quantitative fluency. Example: find a widely read editorial and construct an empirical analysis of it using data.
- Communicating fluency. An example might be exploring the expansion of cross border education in two or more Asian countries employing sensitivity to language difference (or use students on team with multiple language skills.)

And finally in demonstrating a capacity for civic learning the student may:

- Explain diverse perspectives on a contested issue and evaluate insights gained from different kinds of evidence reflecting scholarly and community perspectives
- Develop and justify a position on a public issue and relate this position to alternative views within the community or policy environment
- Collaborate in developing and implementing an approach to a civic issue, evaluates the process and, where applicable, weigh the result.[i]

Here they have basically suggested a reorientation of the "structure of knowledge", one that has been dominant for centuries.

Example Three: Singapore

Following a virtually identical rationale, the Ministry of Education in Singapore has developed a program to inculcate 21st century competencies in primary and secondary education. The following Figure clearly illustrates the effort to integrate

the various dimensions on which such competencies are meant to occur and as stipulated:

"Knowledge and skills must be underpinned by values. Values define a person's character. They shape the beliefs, attitudes and actions of a person, and therefore form the core of the framework of 21st century competencies.
The middle ring signifies the Social and Emotional Competencies—skills necessary for children to recognize and manage their emotions, develop care and concern for others, make responsible decisions, establish positive relationships, as well as to handle challenging situations effectively.

The outer ring of the framework represents the 21st century skills necessary for the globalised world we live in. These are:
- Civic literacy, global awareness and cross-cultural skills
- Critical and inventive thinking
- Information and communication skills"

At the student outcome level the desired objectives are:
- A confident person, who has a strong sense of right and wrong, is adaptable and resilient, knows himself, is discerning in judgment, thinks independently and critically, and communicates effectively.
- A self-directed learner, who questions, reflects, perseveres and takes responsibility for his own learning.
- An active contributor, who is able to work effectively in teams, is innovative, exercises initiative, takes calculated risks and strives for excellence.
- A concerned citizen, who is rooted to Singapore, has a strong sense of civic responsibility, is informed about Singapore and the world, and takes an active part in bettering the lives of others around him.

(http://www.moe.gov.sg/media/press/2010/03/moe-to-enhance-learning-of-21s.php)

The following visual display of the Singapore model suggests the inter-relationships between these elements.

Example 4: 21st Century Education in Singapore: Temasek Polytechnic and Cisco Transform Learning in the Digital Age

In the words of TP's CEO, Boo Kheng Hua:

Boo Kheng Hua, Principal and CEO at Temasek Polytechnic
 "Digital technologies are rapidly changing how we communicate and connect with people. They are transforming the way we engage students, offering them exciting opportunities to enhance their learning experience beyond borders. At Temasek Polytechnic, we are building a 21st Century digital campus which leverages advanced technologies to enable students to learn anywhere, anytime and on any device. The Green Data Centre and Virtualization Project will help us to realize this vision."

This venture, announced in 2011, seeks to utilize virtualization to serve the millennial generation and more closely link higher education technical training with the rapidly changing work-place. This venture has several key highlights:
- provide new ways for TP to deliver and manage information, learning content, rich-media, and academic and administrative services
- provide a virtual desktop for students available anywhere on campus and easily accessible through a web browser
- provide highly secure, mobile access to data, and deliver economies of scale
- provide a flexible curriculum, capacity to change fundamentally in response to industry needs, available at all times and places

http://newsroom.cisco.com/press-release-content?type=webcontent&articleId=556022

These four examples represent different approaches to what is perceived as essentially the same kind of issue, namely in an era of perhaps unprecedented change what do we want our students to know to equip them to deal with the world they will confront as they exit higher education? The issue is complicated by the sensible realization that whatever is to take place at the tertiary level is richly dependent on events and changes taking place at the primary and secondary levels. It is further complicated because it can cause us to question the very nature of "higher education" as a separate and discrete institutional form, with a long and distinguished history, which has nevertheless been resistant to change (for more on this see, Hershock, Mason, and Hawkins 2007).

A related issue of a far different order is how to achieve such results across educational systems that have very different histories and despite some common macro features, very different organizational structures, norms and behaviors.

Our task:

The goal of this senior seminar is to engage these important questions in meaningful ways that can inform discussions across the diversity of Asia Pacific societies and cultures. Many countries in the region for example have degree profiles as a part of their quality assurance endeavors, e.g. Malaysia. The burden of this senior seminar would be to raise questions about the kinds of drivers of change that we believe will be relevant in the area over the next decade or so and how these will produce a range of needs for workplace skills and competencies that HEIs within the region should/might address. A further step would be to suggest ways in which these changes/transformations might be initiated.

As is usual with our senior seminars we are asking participants to prepare a paper of between 2500-3500 words addressed to some aspect of the problematic represented above. We will have each paper presented and discussed during the seminar. Notes will be taken of all sessions. At the conclusion of the discussion of all papers we will convene as a seminar to discuss the subject as a whole, seeking to "fit in" the individual papers as they apply and/or assist the discussion. At the conclusion of the seminar, notes will be provided each of the presenters along with a list of suggestions, based on discussions, of how each paper might be revised for publication. Participants will be asked to return a revised manuscript of approximately 5000-5500 words for prompt publication by a major international publisher.

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[i] Of course numerous other approaches exist as well in the United States. For example note the publications of the Partnership for 21st Century Skills and work at the community college level, cf.
http://www.moe.gov.sg/media/press/2010/03/moe-to-enhance-learning-of-21s.php . One interesting example involves the cooperation of the Asia Society and the RAND Corporation, see: Saavedra and Opfer, "Teaching and Learning 21st Century Skills: Lessons from the Learning Sciences.