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Abstract

This is an audit of the IGCSE curriculum against criteria of sound preparation for life and work in the 21st Century. Although the curriculum has stood the test of time, aside from each students’ citizenship role, each must also be equipped to be an innovative lifelong learner. There are many views about what constitute 21st Century skills. In this white paper the curriculum will be examined in the light of Dr. Tony Wagner’s Seven Skills (Wagner, 2009). It is a ‘white paper’ because supporting academic literature is not provided for all of the opinions, observations and conclusions, so they may be biased.

This abstract reveals the audacity of our undertaking as educators: hoping to help students to front-load a lifetime’s learning in the first few years of life, when we ourselves cannot go a single year without updating our knowledge and skills.

The most pressing needs are for students to take charge of their own learning and acquire the knowledge, skills and attitudes for lifelong learning. The importance of these are recognised in International Baccalaureate programs and many others. We cannot be their teachers throughout their lifetime learning journey, although technology and goodwill may allow us to continue to contribute in some small way to their learning after they leave our schools. We must help our students to identify other people with special skills and knowledge who can help them. We must provide the experience and expectation that there will be ongoing peer learning. If we are teaching students beyond the early years, it is likely we have already experienced pockets of expertise greater than our own in our worldly and connected students. This is a blessing and everyone in the classroom can benefit from this knowledge.

These imperatives do not impose any extra burdens on our full curriculum. However, they impose on us the need to bring empowerment to the ways we reveal the curriculum to our students each day. The purpose of the audit is to set out the main 21st Century skills, then ‘re-vision’ key curriculum areas for their potential to help students acquire these skills. Suggestions will be made about especially useful types of activities and suitable perspectives to adopt as we continue to teach the existing curriculum.

The following section seeks to establish the connection between the Seven Skills, innovation and lifelong learning.

Context of Innovation and Lifelong Learning

It would be reassuring to announce here that the knowledge, skills and values required to ensure students can function as innovators are intrinsic to our various school curricula. However, they are not.
In addition to ensuring we help our students to prepare themselves for lifelong learning and collaborative participation in myriad pursuits around work, play and the duties of a full citizen we must make sure we produce innovators. The cultures of innovation and lifelong learning are traditionally entwined with 21st Century skills and are in the affective domain (values and attitudes), so they can appear difficult to pin down.

When we assess students on their preparedness, it is useful to consider Tomlinson, Wiggins & McTighe's (2006, 2005) work on 'backward design'. They found that learning objectives must be baked-in rather than sprinkled on the top afterwards. Furthermore that the learning objectives must be intrinsic to the assessment of the learning episode - perhaps the product created by the student in the course of their learning is the assessment item?

**Innovation**

We can treat innovation through considering Richard Franck's idiom: "Necessity is the mother of invention." It amplifies our experience that creative thought applied to finding a new way to achieve what we want is more likely when we can no longer use the old way - we need a problem to solve or an impasse. It is human nature to persist with the tools and ways we already know. Any such change must be driven by an environmental imperative or change will not occur. The 21st Century skills, especially [2] Influencing and Collaboration Skills, allow us to tap multi-disciplinary skills of many people to help overcome problems and dead-ends we face.

Although in teaching we can draw upon an intrinsic desire of students (especially younger students) to learn, actually changing the ways we all do things requires considerable effort. It is useful to consider innovation generally as problem-solving and to see a specific innovation objective as solving a specific problem. The Toyota method (Giles, 2011; Spear & Bowen, 1999) is a good example as it casts the entire production process as a big 'experiment' to discover the best way to make and deliver vehicles to customers. At Toyota every manufacturing operation is tentative, with its intrinsic 'problem' being the gap between that operation and the 'ideal' operation. Suggestions for improvements are expected at every level and they are exhaustively evaluated, with promising ones being tested and measured to see if they offer a marginal improvement. An innovative organisation provides a 'fertile' environment that favours the use of these and related skills, allows people to try new ways without penalty and reduces 'artificial' barriers to change as far as possible.

Finally, we should note that the 'skill-set' for an individual innovator must be considered separately from creating an innovative environment - the things you would 'build in' as the leader of an innovative organisation. These complementary facets of innovation are explored in more detail at the Innovation Commission website [http://innovationcommission.org/](http://innovationcommission.org/), which features video interviews with creative practitioners.

**Lifelong Learning**

Lifelong learning is an attitude and personal imperative that respects the fact that there will be continual change and we must learn and change throughout our lives. The 21st Century skill-set includes the means for engaging with learning resources which may exist online or with others who can help us, but who may be located far away. The skill-set also comes with the expectation that this engagement and continual learning is a way of life for our students.
Here are some questions this white paper will attempt to answer:

• What are these 21st Century knowledge, skills and values?
• Is there a checklist?
• How can we orientate our lessons and assessments to equip our students with the precursors for innovation?

21st Century Skills Audit
Dr. Tony Wagner's vision of 21st Century Skills is not the only one. Some alternatives are highlighted at the end of this paper. The list is derived from work with Change Managers in American schools:

1. Critical thinking and problem-solving
2. Collaboration across networks and leading by influence
3. Agility and adaptability
4. Initiative and entrepreneurship
5. Effective oral and written communication
6. Accessing and analysing information
7. Curiosity and imagination

Let us audit these skills across the curriculum, fitting each into our existing curricular framework and objectives:

1) Critical Thinking and Problem-solving
These are already part of many subjects including Mathematics and English. Try to emphasise lessons that develop higher-order thinking skills (HOTS). Meeting the extra objective of equipping students to hold long-term, rewarding jobs means we must feature human capabilities which cannot be outsourced to machines and which may also help us solve humanity's more difficult problems.

2) Collaboration across Networks and Leading by Influence
Once protocols for group work have been established with your students, you can help them to experiment with group leadership. Leading by influence is a skill required for 'leaderless' peer groups. In these scenarios a group member who may move the group through achievement of some of its interim goals may be quite 'junior' in the overall formal hierarchy. They qualify to lead through useful knowledge, skills, vision of goals and powers of persuasion rather than authority based on their position in the organisation. The classroom is ideal for learning this group skill because formal differences in status between students are less and the barriers to any student exercising influence are lower.

3) Agility and Adaptability
Our seasoned and well-travelled students already have these traits and we simply need to affirm students demonstrating them and provide encouragement.

4) Initiative and Entrepreneurship
Although entrepreneurial spirit is customarily judged on business-oriented outputs, the exercise of initiative includes recognising circumstances and ways of harnessing resources that will add value to the situation. You can encourage these insights in your students in many school contexts.
5) Effective Oral and Written Communication

This is 'old' curriculum and is well supported in teaching and assessment. Remember to review students’ achievements in the 21st Century skills taken together as a group - we are attempting to instill them all in each student rather than teach them one at a time. Our students, especially primary/elementary years may not be as aware of distinctions between the 'subjects' in their timetable in the way they might see specialist subjects such as Physical Education, Art and Music.

We need to ask whether it really makes sense to split the communication aspects of English from communication in Sciences, Humanities and ICTs, insofar as they appear as separate subjects? If you are a senior school English teacher, how would you feel if the Science department were sending their students to you for 'up-skilling' when it came time for them to write a laboratory report and these students could not express themselves clearly enough? Communication is cross-curricular and we all have a role to play in developing these skills in all of our students.

In relation to ‘disintegrating’ areas of study (subjects), there is also a lively debate about whether there is enough 'content' in ICTs to qualify it to be a separate subject rather than an amalgam of skills which are useful across a range of other subjects. Primary school is the 'golden age' for embedding 21st Century skills because subject boundaries are more fluid and components of the skills can be woven together to produce more authentic and integrated lessons and activities.

6) Accessing and Analyzing Information

I we were to envision a unit called Library Research 101 (LR101). It might include the Head Librarian's anti-plagiarism speech. It might then allow students to study the distinctions between their own ideas and those of other people, so they could start to consider how we might log or capture the origins of others' ideas?

The second unit LR201 would move on to consider which of the work of others is worthy of consideration and re-use: determining the hallmarks of authoritative works and websites (specialists, government etc.). Establishing authority is especially important when the resource is outside the normal academic orbit of printed books, peer-reviewed research and some government websites. Nowadays, a lot of worthy new knowledge may be propagated through online videos (e.g. Youku or YouTube) and Blogs. It may be difficult to judge if the presenter or writer is an 'authority' unless their claim is supported by other peer-reviewed and more mainstream media.

Once these hallmarks of authority and reliability are internalised by students, the next unit LR301 might contain the conventions and skills associated with adding to the stock human knowledge. In order to contribute, students must be skilled in research referencing as well as in the use of new publishing formats available online. Relevant online platforms include Wikis and Blogs as well as other specialist media publishing sites (Flickr, SoundCloud, Pinterest).

Note: The progression of sophistication in these hypothetical library research units mirrors Biggs’ SOLO taxonomy (Biggs & Tang, 2007) which adapted Bloom’s taxonomy (Bloom et al., 1956) to describe alignment of the curriculum to the ‘level’ of learning expected of the student and its subsequent assessment.
A key feature of these Web 2.0 media (which may not be well understood by 20th Century teachers) is that the knowledge created in them is tentative. These platforms allow two-way communication and students' works may be buffeted by peer review during the creative process itself, rather than being simply completed and submitted to the teacher for marking.

These newer formats are also intrinsically capable of supporting collaboration across many locations and time-zones. Furthermore, within the Wiki format it is possible to track and trace the editorial and creative inputs precisely. You can find more information about the significance of this tentative aspect of knowledge creation in my ePortfolio summary of the Toyota Method and in the works of Spear and Hanson.

7) Curiosity and imagination
Art can make a special contribution, preparing students very well in the areas of [3] Agility and Adaptability and [1] Critical Thinking and Problem-solving. Aside from students whose learning may be delayed due to a variety of special needs (including the need to learn a second language), learners can present with a variety of dominant learning preferences (cf Gardiner (1983), Giles 'Education 101'). Art can also reach students whose strengths are in spatial or aesthetic problem-solving and provide stimulation whilst promoting development of [6] Curiosity and Imagination. This may resonate more with students who are visual learners than an exercise during an English lesson designed to build the same skills. The rules for such creative expression in Art appear less restricted by the written medium and its traditions, which can favour visual thinkers and non-native English speakers.

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In the next part of this paper there is discussion of other relevant issues that do not directly affect classroom practice: teaching-to-the-test, alignment of teacher incentives and alternative selections of 21st Century skills.

Teach-to-the-Test
This highly goal-oriented approach to preparing students has a bad name because it can appear superficial in its preparation of students for life. It is useful to consider that it all depends on the test. It is part of human nature to want to compete and measure our achievements against those of others. It is easier to test objective knowledge with a high degree of reliability, which is attractive in high-stakes testing regimes. Assessment is part of, and preferably integral to, high quality learning (Gibbs & Simpson, 2005). Fitting the teaching of 21st Century skills into our curriculum depends mainly on the way we design and present our assessment items. If our design is good, we can get what we need for our grade-book while students are building their confidence in using 21st Century skills to complete our assessment items.

Assessment of student attributes such as creativity, problem-solving and moral values, which are 'applied' skills developed over time, is difficult to do reliably in a one-shot test. Establishing a 'profile' for each student over time and through a variety of assessments is most useful. During these periods each student can develop a 'Portfolio', which can be moderated. A good example of an enhanced 'one-shot' assessment is the College and Work Readiness Assessment (Hersh, 2006), a private American testing regime for creativity, problem-solving and writing skills.
Teacher Incentives
These 21st Century skills (especially those linked to the affective domain) and a student's commitment to lifelong learning are not all amenable to drill & grill (teaching-to-the-test). Although the education sector has valiantly tried to emulate the alignment to incentives used in the financial sector, rewarding teachers based on the high-stakes exam results of their students has its drawbacks. In the same way as a banker is rewarded each year with a percentage of the 'upside' achieved on their clients' portfolio, so the teacher could be compensated for the aggregate improvement of their students. However, students bring a package of aptitudes, motivation and family support (Bronfenbrener, 1979) which have little analogy to a stock portfolio, so calculating performance bonuses for teachers must remain an inexact science.

Such schemes, aside from focusing the rewards to teachers for the inculcation of vital habits of lifelong learning on short-term achievements, tend to incentivise the activities of the teacher rather than focusing on empowering each student and making them responsible for their own learning. The true value of the teachers' contributions can only be fully assessed in a longitudinal study of their students' performance in life over many decades.

Other Perspectives on the Skills
Other perspectives on 21st Century Skills, which have been termed the 'new basics' in the US can be found in the works of Berry et al.(2011) discussing aspirations for future schools; Singapore Ministry of Education (2010) which incorporates personal values; Vicki Davis (2010) which emphasises classroom setup and remote collaboration; Marc Prensky (2001, 2010) unraveling the new ‘digital DNA’ of students and many others.

Summary
The curriculum does not explicitly 'cover' the seven 21st Century skills. However, students can acquire most of the skills if the teacher can set lesson objectives consistent with overarching student imperatives of readiness for lifelong learning and innovation. There was discussion of how can we reframe or redefine the curriculum and learning processes already in place so they are optimally aligned with these objectives.
References

Berry, B. (2011) Teaching 2030 - What we must do for our students and our public schools...now and in the future. Teachers College Press, NY.


Giles, R. (unpub) Education 101 - What Have Teachers Learned?


21st century skills comprise skills, abilities, and learning dispositions that have been identified as being required for success in 21st century society and workplaces by educators, business leaders, academics, and governmental agencies. This is part of a growing international movement focusing on the skills required for students to master in preparation for success in a rapidly changing, digital society. Many of these skills are also associated with deeper learning, which is based on mastering 21CLD (21st Century Learning Design) is a professional development program developed by SRI. When teachers participate in the 21CLD program, they receive a practical framework and set of tools for building 21st century learning opportunities into their lessons. There is growing agreement in many countries that students need more than rote subject matter understanding to succeed in this rapidly-changing world: instead, they need to be skilled at collaborating, constructing deep subject-matter knowledge, solving real-world problems, using information and communication technologies (ICT) in power 21st Century skills are 12 abilities that today’s students need to succeed in their careers during the Information Age. 21st Century skills are: Critical thinking. Creativity. They’re essential in the age of the Internet. On this page, we’ll take a look at what’s included in 21st Century skills, how they help students, and why they’re so important. Video: What Are 21st Century Skills? Join Chris Zook, content marketing manager at Applied Educational Systems, as he delves into the details of 21st Century skills. Infographic List: 21st Century Skills. Want a quick graphic reference about 21st Century skills? Keep this infographic on-hand for any student of any age—even as young as middle school! Let’s start with an overview of the skill categories. The Three 21st Ce...