Meeting the Demands of the 21st Century Classroom

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The evolving demands of the global economy have compelled educational institutions worldwide to create different frameworks that merge core studies with interdisciplinary themes, promote creativity, and teach technological skills. These changes have also involved assessment methodologies, with more emphasis placed on formative assessment. While these have been relevant, it is our belief that if teachers want to assess both core academic skills and how well the 21st century skills have been assimilated, some additional components are needed. This paper shows how formative assessment can help evaluate both student understanding of content knowledge and the 21st century skills, when it is coupled with explicit assessment of collaborative learning and elements that encourage content to be taught in an integrated way. To put everything in perspective, we have provided a description of a how an IT-featured RSA Animate can be adapted to assess both the extent to which students understand a particular content knowledge and the acquisition of 21st century competencies.

Keywords: *21st Century Skills, Formative Assessment, Assessment, Collaborative Learning, Integrated Learning, ICT*

Modern Learning Needs and Objectives

With employees today revealing that they want graduates who have creative abilities, who are able to think on their feet, use technology, learn quickly and work in collaboration with others effectively, education systems around the world have come up with various reforms in the 21st century (Robinson, 2011). An additional framework was added to the teaching and learning of core academic subjects, so as to better prepare students for the challenges ahead of them. Blinkey et al. (2012, pp. 18-19) summed it up as *Ways of Thinking* (Creativity and innovation; Critical thinking, problem solving and decision making; Learning to learn, Metacognition), *Ways of Working* (Communication; Collaboration), *Tools for Working* (Information literacy; ICT literacy), and *Living in the World* (Local and global citizenship; Life and career; Personal and social responsibility – including cultural awareness and competence). (See also, Partnership for 21st Century Skills, 2009). The framework is "a blend of content knowledge, specific skills, expertise and literacies" and "the essential skills for success in today's world, such as critical thinking, problem solving, communication and collaboration." (Partnership for 21st Century Skills, 2009, p.1)

This has been incorporated into many educational systems around the world. In Singapore, for instance, the Ministry of Education has been a pioneer in revamping the outcomes and desired skills it wants its graduates to have (**Figure 1**).
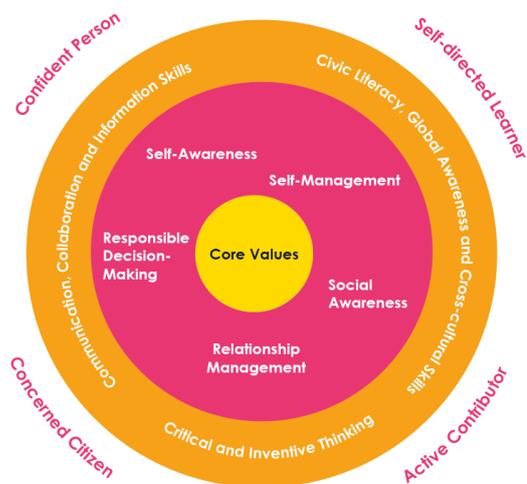
Figure 1: 21st Century Competencies and Desired Student Outcomes (Source: Opal, MOE, Singapore, 2014)

Arguably using this framework as a guide to the current climate of education, the Singaporean government has moved its educational goals to ensure that curriculum development, assessment, co-curricular activities, classroom practices, teacher development and policy measures effectively develop students into concerned citizens, active contributors, confident and self-directed learners.

Despite similar efforts worldwide, there remains a major challenge to the proper implementation of 21st century competencies: how can educators assess whether students are ready for the 21st century, especially when assessment is still seen as an important "support system" (Partnership for 21st Century Skills, 2009, pp. 7-8) for the framework? Our paper looks precisely at the necessary relationship between 21st century skills and meaningful assessment. It shows how formative assessment can be adapted through a lesson plan that focuses on the assessment of collaborative learning, contains classroom activities that integrate knowledge from different subjects, and makes use of the affordances of ICT. These may help assess whether students have learnt *and* simultaneously, if they have picked up desirable skills when they join the workforce.

Formative Assessment

Formative assessment has come a long way since its inception in 1967 (See Scrivener, 1967) and has been referred to through a multitude of terms, including, but not limited to formative evaluation and assessment for learning. Formative assessment, by definition, is essentially the process of evaluating students' learning while teaching, through assessment tasks and everyday classroom activities. This allows gaps in students' learning to be diagnosed as they occur, and teaching can be tailored to address these gaps in real-time (Wiliam, 2011, p. 37). In contrast, summative assessment only reveals significant knowledge gaps only after teaching and testing has been completed.

Essentially, formative assessment seeks to establish a direct, and *guaranteed*, relationship between teaching and learning, to ensure that teachers are neither completely directed by their own objectives in planning and executing teaching, nor are they doing the majority of the work while students are rendered passive. The works of Black and Wiliam (1998) and Wiliam (2011) has proven that formative assessment remains the best option for raising academic standards as the latter is more concerned with "[using] assessment to inform instruction, particularly at the classroom level." (Wiliam, 2011, p. 36) Furthermore, data collected has proven that formative assessment raises test score levels (See Black and Wiliam, 1998; Black, et

al., 2004).

Applying strategies of formative assessment in the classroom thus ensures high student achievement and meets a major criterion that most educational institutions of higher learning still value when they receive student application. Given this, even if teachers are aware of the importance of 21st century skills, the assessment of how the latter skills have been internalised sometimes takes the backseat. Using personal judgement to decide which 21st century skill may best fit parts of the syllabus, quick reflections or civics lessons to assess assimilation of the 21st century skills is inadequate. Hence, to keep increasing teaching standards and meaningfully impart 21st century skills to tomorrow's generation, perhaps we might need to create lessons that allow us to assess both what students have learnt formatively and what desirable 21st century traits they have assimilated through particular lessons.

Collaboration, Integration and ICT.

In many countries, the syllabi for the different core subjects have been aligned to fit the 21st century competencies. In Singapore for instance, it is possible to detect components in the national syllabi that focus on whether the content taught and learnt fulfil the competencies. Sometimes, this awareness of the 21st century skills extends to the suggestion of key activities that will accentuate certain desired skills in the students. **Figure 2** below is an example from the History Syllabus for the lower secondary level and it clearly shows the 21st century outcomes that certain lessons can produce.

21st Century Competency	Standards	Benchmark (End of S2)	Possible activities aligned to the lower secondary Histroy Syllabus
Civic Literacy, Global Awareness and Cross Cultural Skills (CGC) Learning outcome: Actively contributes to the community and nation, possesses an awareness of and the ability to analyse global issues and trends, and displays socio-cultural skills and sensitivity	CGC 1 Aware of community and national issues and plays a part to improve the community and nation	1.1c The student is able to describe issues that affect the culture, socio-economic development, governance, future and identity of Singapore, and provide the reasons for these issues	In the study of "Singapore's First Decade: How did like Change?" Students trace how Singapore cautiously chartered her future in the wake of the separation from Malaysia. Students will learn about the significant changes that took place domestically and the circumstances and decisions that drove such change. Students will also know the importance of shaping a Singaporean identity and the policies needed to ensure that Singapore survives as a small independent nation, with no resources except for its population
		1.2c The student is able, with support to plan and organise school and community activities' programmes to address social issues	Where applicable

Figure 2: Mapping of Lower Secondary History Syllabus to 21CC (Adapted from: MOE - http://www.moe.gov.sg/education/syllabuses/humanities/files/history-lower-secondary-2014.pdf)

In this syllabus, teachers are expected to link the topic of "the founding of Singapore" to civic literacy, global awareness and cross cultural skills and in the process, make students aware of certain competencies that are in line with the 21st century skills. While it might be straightforward for teachers to assess if the students have learnt the content of the chapter, evaluating whether any of the competencies have been learnt is not as clear cut. Even if teachers decide to adopt formative

assessment strategies by getting students to express their levels of understanding through exit passes for instance, the main focus may remain on the content rather than the 21st century skills.

One approach that would allow educators to assess 21st century skills is what Binkley et al. (2012, p. 27) calls a transformational strategy. In this case, on top of formative assessment strategies, educators attempt to create innovative assessments designed to affect curriculum and learning to stimulate collaboration in students' learning and to challenge higher-order thinking skills through a technology-rich assessment. Additionally, such an assessment should have the following criteria:

Table 1: Criteria for transformative assessment (Binkley et al., 2012, pp. 59-61)

Criteria	Explanation
1. Account for divergent responses	Apart from focusing on one final, correct answer, 21st century assessment should focus on allowing disparate responses to see how students think about certain issues.
2. Making students' thinking visible by revealing the kinds of conceptual strategies a student uses to solve a problem;	Proper assessment will have proper scaffolds that allow students to show their thought processes and the different ideas they have thought about.
3. Assessing collaboration;	Instead of focusing on individual assessment, 21st century assessment should be able to evaluate group work and what the groups' final products are
4. Including local and global citizenship;	It is important for 21st century assessment tools to be able to give perspectives from different sources (both local and international) and it is important that local and global citizenship are more apparent in these assessments.

Using these as a launchpad, three additions could be made to the use of formative assessment in class to ensure that both content knowledge and 21st century skills are evaluated. First, we believe that the concept of collaborative learning has to be reviewed; second, subjects must stop being taught in isolation and there should instead be an integrated approach to learning; finally, teachers could make use of the affordances of ICT as it can help create more meaningful learning opportunities and facilitate assessment. (McLoughlin and Lee, 2007) .

Collaborative learning, which occurs when students learn together (Dillenbourg, 1999), is heavily rooted in Vygotsky's beliefs that learning is a social process (Lee and Smagorinsky, 2000). As explained by Wiliam (2011, pp. 133-134), collaborative learning helps with motivation, social cohesion, personalisation, and cognitive elaboration. While this is valid, just considering collaboration as a prerequisite for formative assessment negates the power of social groups. As explained by Gee (2010, p. 17) collaborative learning "gives the learner an appreciative system" where learning starts with an identity. He defines identity as "the goals and norms/values that flow from a given social group and its conventions." (Gee, 2010, p. 17) As such, students must be made to think about the identities that are required to be successful in the 21st century. (Scardamalia et al., 2012, p. 263) On top of that, educators should also think of the domains in the 21st century skills that

are worth learning and the goals, norms, values and conventions of these domains. (Gee, 2010, p. 31) The domains refer to the *ways of thinking and learning*, the *tools for working* and *the way of life* that characterise the 21st century competencies. This ensures that the 21st century competencies become a significant part of the group's identity and the students are more aware of the skills that they should be focusing on. Ultimately, both group and individual outcomes should be assessed by getting them to formally express what competencies and values they have to demonstrate during their group work prior to beginning the task. Students could also be made to evaluate their group performance during and after the task and teachers could use the answers they get to direct the students in their learning.

Next, an integrated learning framework is necessary if we want to better assess whether students have assimilated the 21st century skills. In 1994, David Marsh and Anne Maljers came up with the concept of Content and Language Integrated Learning (CLIL) as an approach for learning content through an additional language (foreign or second), thus teaching both the subject and the language. The idea was to create an "umbrella term" which encompasses different forms of using language as a medium of instruction. (Mehisto, et al., 2008) The methodology is based on the idea that language should not be learnt in isolation from content as the latter can provide relevant information to inform instruction. Despite being rooted in language teaching, the same principle can be applied to other core subjects. As such, subjects like history can include scientific elements and even mathematical concepts. For instance, students might see how the theory of permutations has helped the allies decode the Nazi's Enigma machine. Also, instead of focusing on the practical components of chemistry, students can be asked to present a particular lab report and focus on the genre and linguistic features of such a task.

By integrating elements of different subjects, students are able to see how different skills and concepts contribute to particular tasks. This transfer of skills puts the students in authentic learning situations, as in real life, they need to be able to apply concepts and ideas from different fields to solve problems (Gee, 2010, p. 31). So, students must be owners of their learning, and also be able to make connections between different things that they have learnt over time and across disciplines. Learning tasks must hence get the students to think about the different connections they can make between topics as a group. This is part of what Scardamalia et al. (2012, p. 264) calls direct application theory of transfer, which entails "the ability to directly apply one's previous learning to a new setting or problem." (Scardamalia et al., p. 264) In this case, the assessment component could get the students to strategise their work and think about the different applicable skills, knowledge, themes and topics that would help them complete the task in question or understand the concepts at hand. This could be used as guided formative instruction as the teacher could provide feedback along the way to help students refine their thought processes and the concepts that they are using. This would hence provide meaningful assessment of the students' ability to use systems thinking (Partnership for 21st Century Skills, 2009, p. 4) to interpret their work, make conclusions, and reflect critically on their learning experiences and processes. Additionally, the fact that the students need to use skills from different topics makes it challenging, but also allows teachers across departments to cooperate and collect meaningful information that can further inform instruction to better help students.

Finally, at the risk of drawing criticisms from those who believe that technology is merely an enabler and should not be the main part of the lesson, we believe that some parts of 21st century assessment should contain an ICT component, simply because students are surrounded by ICT in their everyday lives and they should learn to behave responsibly and ethically when using it. ICT empowers students and allows them to find solutions to problems, to customise tools for particular purposes, to exceed the assessment criteria, to support discourse around all kinds of media, and to experiment of openness of knowledge (Scardamalia et al. 2012, p.278). When it comes to assessment, ICT offers three main advantages. First, it can facilitate traditional assessments, but it can also give new possibilities for assessing skills formerly difficult to measure (See Ridgway and McCusker, 2003) – ability to use different skills and knowledge, computer literacy, technical quality and the creation of multimodal texts. Second, it can also allow teachers to gauge the extent to which students have acquired them (Binkley et al., 2012, p. 26). Third, ICT can "impact favourably on a range of attributes considered desirable in an effective learner: problem-solving capability; critical thinking skill; information-handling ability" (McFarlane, 2001, p. 230) and allows those to be assessed with relative ease.

Thus, if these three components are added to parts of teaching practices, it can help assess student-led "social organisations of learning" that find self-directed, cross-disciplinary ways to "enhance learning and judgments about learning" (Gee, p. 36). With the aid of ICT, educators might further empower their students and could also target a key 21st century skill: using ICT effectively and responsibly.

RSA Animate: capturing core academic skills and 21st century competencies
Whiteboard animation (also called video scribing or animated doodling) is a process through which a creative story, a particular issue, a talk given by a famous speaker or a storyboard is drawn on a whiteboard or any white surfaces by artists who record themselves in the process of their artwork. Since 2010, the Royal Society of Arts (RSA) has converted selected speeches and books from its public events programme into whiteboard animations and it has revolutionised whiteboard animation. By 2011, the first few RSA Animate videos gained 46 million views and since then, it has gone viral (Halliday, 2011). The power of RSA Animates can be brought to the classroom and we believe that it has a lot of potential as it can be used for formative assessment whilst allowing teachers to evaluate the extent to which students have assimilated certain desirable 21st century outcomes.

Let us now consider a lesson plan where the three elements mentioned in the previous section – namely, assessment of collaborative learning, integrated learning and ICT – come into play. This lesson offers a lot of possible options for teachers and can even be applied in other subjects, but for simplicity's sake, let us go through its application in a General Paper classroom.

Figure 3: RSA Animate Lesson Plan

Subject: General Paper (English) **Length:** maximum of 3.5 hours (includes self-directed component outside of class time)	**Title:** RSA Animate Lesson Plan **Objectives:** 1. Get the students to make connections between what they've read, and GP skills 2. Induce critical thinking and analysis through a technology integrated project

	Description / Rationale
From the outset, it is important to get the students to think about the identity that the group should have and the type of group dynamics that would help them complete the task, and the expectations that they have of each other – these are related to the major **21st century skills**: *ways of thinking* and *ways of working*.	*1. Introduction* Teacher to state the purpose of the lesson: to learn to make connections between what students read by creating an RSA Video – teacher to get students to think of the type of skills that are required for such a task.
	2. Presentation of the task (i) Teacher to show a video of the work done for the RSA Animate; (ii) Teacher to outline the steps to follow and remind the students of the importance of group dynamics, initiative and ability to apply different knowledge; (iii) Students to work in groups of 4-5 **Note – Tasks involve the following:** a) Reading; b) Coming up with the number of steps that outline the reading/topic; c) Thinking of facts that are linked to each step; d) Make sure that every step is interconnected; e) Planning and doodling every fact / information – students to think of the illustrations that will make the information come alive; f) Dress rehearsal – to be completed outside of classroom time; g) Filming – Students to decide how best to do it; h) Writing of scripts of the narration; i) Recording of the narration; j) Editing and uploading k) voting
A group of high-performing students can be made to come up with the steps on their own and they might be made to think of the learning intentions and success criteria beforehand. If students are able to do that on their own, it would show that they are able to "analyse how parts of a whole interact with each other to produce overall outcomes in complex systems" (Partnership for 21st century skills, 2009) and this is an important **21st century outcome**.	
Formative assessment can be used at this level as students can be asked to have a *peer evaluation* of their friends' understanding of the reading and decide which one will be used for the main activity. This is what Wiliam (2011, p. 138) called activating students as instructional resources for one another.	*3. Reading* Prepare before the actual day and the groups should have discussed the main points in the reading
Step 4 is where core skill of the lesson lies. Usually, students tend to not read attentively and not make connections between the reading and their schemata. By breaking down, the students are forced to do so and the teacher can see straightaway which students are able to read properly as it will show on their overview. Additionally, The **21st century outcome** of critical thinking and problem solving can be indirectlyassessed here as the students have to *use systems thinking, make judgements and decisions,* and *make connections between information* to come up with these steps. (Partnership for 21st century skills. 2009)	*4. Brainstorming* (i) Students to come up with the number of steps that give a comprehensive overview of the reading and make the appropriate links between each step. (ii) Students to think of facts / information that help explain each step (iii) Teacher to check, guide the groups and give feedback and get student
	5. Doodling (i) Students to draw the best representation of each fact / information (ii) Teacher to give feedback
	6. Dress Rehearsal Students to work on their pictures during their free time and practice drawing it with their group mates
	7. Filming (i) Students to film their RSA Animation (ii) Teachers to assist with the filming and give feedback
This is an example **of integrating different core skills** into one particular lesson. In this case, the students have to use their writing and speaking skills to come up with a good narration. Another skill that comes in is the ability to use tone, figurative language, genre analysis to successfully complete the task.	*8. Writing the narration* (i) Students to work in groups to come up with the narration, which is to be completed outside of class time (ii) Scripts to be submitted to the teacher for a final check
	9. Recording the Narration and final editing (i) Narration to be recorded using smartphones or audio recorders (ii) Students to edit their work and speed up the video (iii) Students to match their narration to their video
Apart from the step 7 (filming), step 9 is where ICT allows students to discover new skills related to technology, research on how video editing, voice recording and voice editing. This is in line with the competency of *learning to work with tools* and it attunes the students to multimodal literacy.	*10. Uploading* (i) Work to be uploaded on LMS or any other online platform
	11. Voting & Reflection (i) JC1 students and teachers to vote for best video (ii) Prize to be awarded to best video (iii) Students to write reflections for what they have learnt

The final reflection provides an interesting feedback opportunity for the teachers when it comes to understanding the challenges and issues faced by the students. It is also possible to capture the latter's maturity of thought and their ability to understand particular values and skills that are important, on top of the core reading skills

Potential Issues

Not everyone agrees with the importance of the 21st century skills. For many, they are often seen as a distraction from teaching core content, they cannot be measured, they can reduce educational standards and confuse new teachers and they can be difficult to implement. (Silva, 2009, p. 630). Also, there is nothing innovative about these skills, and putting emphasis on them tends to weaken effective teaching. Furthermore, attempting to measure such soft skills is not easy as evaluating understanding of topics is often less complex than appraising 21st century competencies, as "these types of higher-order skills cannot be measured in reliable, cost-effective, or scalable ways" (Silva, 2009, p. 630). Another potential issue with focusing too much on 21st century skills is that educators tend to overthink about how we can make our students' life better in the future, instead of focusing on the present. So, it might actually reduce educational standards as most teachers could be more concerned about certain skills that do not match the current requirements of the syllabus. Moreover, this could be misleading for beginning or trainee teachers as the latter might not be as meticulous when it comes to teaching core subjects, believing that the 21st century competencies are the most important components of education.

The biggest problems come with the actual implementation of the three strategies. How can we consider assessing group work, when it is individual work that matters most? Also, how can students be expected to focus when they are asked to use concepts from different topics to come up with a particular solution? Some could likely be overwhelmed by the tasks and other students could be unable to make the necessary connections to complete the tasks. More seriously, some students might not be willing to take charge of their learning. Hence, placing more emphasis on group assessment would not be a relevant scale to evaluate student performance. Another problem with implementing such an assessment is that there is likely to be much resistance from the parents and teachers who have different pedagogical beliefs and more experience. The former often consider grades as most important and do not always share the same perspectives as teachers who want to focus on 21st century skills. The latter have been teaching long enough and even if some do embrace changes, others do not necessarily see the point in changing their pedagogy and test new techniques that they might feel are irrelevant.

Finally, with the use of ICT in lessons, some teachers might be sceptical, as we have often been subject to faulty appliances and unstable software. Moreover, including ICT to conduct any form of assessment requires a lot of monitoring and hence extra work. Furthermore, as explained by Blinkey et al. (2012, p. 28) "there are several concerns raised about assessment of traditional skills in an online setting, especially regarding security, cheating, validity, and reliability" and even online peer assessment can be affected by short attention span of students and excessive reliance on the computer, thus reducing the intended impact of formative assessment.

Conclusion

Borrowing from Piaget's theory of cognitive development (Piaget, 1964) it is important to note that current assessment modes are able to measure whether students have *assimilated* what they have been taught. This simply means that students are evaluated on their ability to produce things that fit an actual schema. When asking

probing questions in class, the teacher is still trying to see if the students have understood a particular topic using a particular schema that they were given. On the other hand, an all-inclusive assessment demonstrates if students have *accommodated to* knowledge around them. In this case teachers are able to see if the students have learnt by changing the way they think, which occurs when applying concepts from diverse subjects and comparing it with their group mates to come up with a new schema that will allow them to complete a particular task that will be assessed by the teacher. Formative assessment is adequate in assessing both assimilation and accommodation. However, if teachers want to get a better glimpse at how students have accommodated to 21st century competencies, they might need to add certain aspects to their classroom tasks. As suggested by this paper, these aspects include assessing group collaboration by getting students to think of the skills that are necessary for their groups to complete the project, creating tasks that integrate knowledge from different core subjects and making use of the affordances of ICT to create new opportunities for the students and get them to be effective and responsible users of the tools that they will be working with this century.

Acknowledgement

Bibliography:

Binkley, M., Erstad, O., Herman, J. , Raizen, S., Ripley, M. Miller-Ricci, M., and Rumble, M. (2012). Defining Twenty-First Century Skills. In P. Griffin, B. McGaw, E. Care (Eds.), *Assessment and Teaching of 21st Century Skills* (pp. 17-66). New York: Springer.

Black, P., and D. Wiliam. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, 80(2), 139–48.

Black, P., Harrison, C. Lee, C., Marshall, B., Wiliam, D. (2004). *Assessment for Learning: Putting It into Practice.* Maidenhead: Oxford University Press.

Dillenbourg, P. (1999). *Collaborative Learning: Cognitive and Computational Approaches*. Advances in Learning and Instruction Series. New York, NY: Elsevier Science, Inc.

Gee, J. P. (2010). Human Action and Social Groups as the Natural Home of Assessment: Thoughts on 21st Century Learning and Assessment. In V. J. Shute and B. J. Becker(Eds.) *Innovative Assessment for the 21st Century* (pp. 13-39). New York: Springer.

Gut, D. M. (2011). Integrating 21st Century Skills into the Curriculum. In G. Wan and D. M. Gut (Eds.) *Bringing Schools into the 21st Century: Explorations of Educational Purpose Volume 13* (pp. 137-157), New York: Springer.

Halliday, Josh (21 October 2011). Internet users get animated about RSA short film

series. *The Guardian*. Retrieved from
http://www.theguardian.com/artanddesign/2011/oct/21/internet-users-animated-rsa-films.

Lee, C.D. and Smagorinsky, P. (Eds.) (2000). *Vygotskian perspectives on literacy research: Constructing meaning through collaborative inquiry*. Cambridge, England: Cambridge University Press.

McFarlane, A. (2001). Perspectives on the relationships between ICT and assessment. *Journal of Computer Assisted Learning, 17*, 227–234.

McLoughlin, C. & Lee, M. (2007). Social software and participatory learning: Pedagogical choices with technology affordances in the Web 2.0 era. In *ICT: Providing choices for learners and learning. Proceedings ascilite Singapore 2007*. Retrieved from http://www.ascilite.org.au/conferences/singapore07/procs/mcloughlin.pdf.

Mehisto, P., Marsh, D. and Frigols, M. (2008). Uncovering CLIL: Content and Language Integrated Learning in Bilingual and Multilingual Education. Oxford: Macmillan.

Opal, Ministry of Education (2014). MOE 21CC Framework (2014 Onwards). Retrieved from http://21cc.opal.moe.edu.sg/cos/o.x?c=/21cc/pagetree&func=view&rid=1929.

Partnership for 21st Century Skills (2009), *P21 Framework Definitions*, Retrieved from http://www.p21.org/storage/documents/P21_Framework_Definitions.pdf.

Piaget, J. (1964). Development and learning. In R.E. Ripple a& V.N. Rockcastle (Eds.), *Piaget Rediscovered: A Report on the Conference of Cognitive Studies and Curriculum Development* (pp. 7–20). Ithaca, NY: Cornell University.

Ridgway, J., & McCusker, S. (2003). Using computers to assess new educational goals. Assessment in Education: Principles, Policy & Practice, 10 (3), 309–328.

Robinson, K. (2011). *Out of Our Minds: Learning to be Creative*. Chichester: Capstone Publishing Ltd.

Scardamalia, M., Bransford, J., Kozma, B. and Quellmalz, E. (2012) New Assessments and Environments for Knowledge Building. In P. Griffin, B. McGaw, E. Care (Eds.), *Assessment and Teaching of 21st Century Skills* (pp. 231-300). Springer: New York.

Scriven, M. (1967). The methodology of evaluation. In R.W. Tyler, R.M. Gagne, and M. Scriven (Eds.) *Perspectives of curriculum evaluation* (pp. 39–83). Chicago, IL: Rand McNally.

Silva, E. (2009) Measuring Skills for 21st-Century Learning. *The Phi Delta Kappan* 90(9), 630-634.

Wiliam, D. (2011). *Embedded Formative Assessment.* Bloomington: Solution Tree Press.