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Rationale for the Establishment of a progression path for a 21st Century learning environment in African Schools

Position Paper

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Introduction

The term "21st Century skills" has dominated the thinking of educationists and policy makers across the globe from the beginning of this Century. Although the phrase "21st Century Skills" may be seen to comprise a wide range of skills, work habits, character traits and attitudes that are believed to be critically important in the 21st Century, the said skills may not be entirely new. These skills encompass a wide body of knowledge that has not been coded and defined consistently leading to divergent interpretations from person to person, school to school, country to country, region to region. The end result has been a loose and shifting compromise.

The implementation of what has become the 21st Century skills also varies depending on the resources available and the skills under focus. Since not all of the skills are entirely new in the education systems and in society, what has ignited the re-emphasis of the skills deemed as the 21st Century skills? Why have they taken centre-stage in education reforms in the last decade? What has changed? What is or should be the focus while addressing these skills? These are questions for which answers should be sought internally so as to establish a common approach and understanding on what is being referred to when we talk about the 21st Century skills. Should the shift from 20th Century to the 21st Century education focus on the methodology of teaching, the content, the infrastructure, the teacher, the examiner, the industry, the community or a combination of all of them?

The argument is that these skills are essential for survival in this Century. While this may hold true, it has become increasingly clear that although different skills have been identified for different audiences in different countries, there are underpinning skills that are common to all and to the demands of this Century. Which ones to focus on, should be the prerogative of every education establishment? In Sub-Saharan Africa, these skills are still in the policy documents and research papers without a clear contextual definition and/or strategy on how they could affirmatively be integrated in the education systems.

GESCI, as an "ICT in education expert" has not as yet interrogated the notion of what 21st Century skills encompass in the African context, nor has it developed a clear position on its approach to the implementation of the 21st Century skills and how these should be actualized in the contexts it works in.

A systematic approach to the implementation of the 21st Century skills would provide **one** approach through which impact could be measured as opposed to using assessment methods that measure impact acquired through the methodologies of the last Century. This would also graduate the much-hyped 21st Century skills from the policy level to a testing ground for assessing the implications and progress in creating an environment for 21st Century learning. Often the terms, "collaboration, team work, critical thinking, communication skills (which are in the list of the said skills) are still terminologies that are left to different forms of interpretation and various versions of this exit. The extent to which their implementation

is achieved or can be achieved varies. The articulation of what these terminologies mean, systematic promotion, implementation and measurement of their progressive achievement needs re-examination.

This paper seeks to:

1. Generate support on the importance of 21st Century Skills and the need to systemically and systematically equip the learners with them
2. Examine the 21st Century Skills as defined by different audiences
3. Propose a list of 21st Century Skills, an approach for implementation and assessment through identifying initial indicators for students

Background information

The education projects related to teacher professional development that have been carried out by GESCI have endeavored to address the ICT competencies for Teachers according to the UNESCO ICT-CFT Competency framework of 2008. The articulation of these competencies has been improved upon over a period of time through research, benchmarking and evidence gathered during implementation from the field. Different audiences have been given the autonomy to identify, prioritize and contextualize these competencies based on a theme, objective or goals for different projects. These efforts have primarily been focused on Teachers, Instructors and Trainers of Trainers.

There is an increasing demand from funders to measure and show the impact of projects on the beneficiaries (learners). This is in spite of the fact that every proposal related to education underscores how at the end of the project period, the students will have been equipped with 21st Century Skills. Experience has shown that this is never deliberately planned for, monitored or evaluated in the projects although it constitutes a very academic discussion in everything that GESCI does. Going by the existing literature, there are a myriad of discussions, frameworks and approaches which have been derived in relation to the 21st Century Skills for different contexts. Through this position paper a proposal will be made on how this gap can be filled.

Statement of the Problem

Are the 21st Century Skills entirely new? If they are not what is the justification for advocating for these skills? What has changed so as to draw such a heightened focus? How is the world changing so as to impact on the demand for new skills?
There are trends that have taken the World by storm which are going to be examined in this section and their implications in the demand for new skills or a greater emphasis on some of the older skills in a new context.

Automation

Although it has become increasingly easy to automate routine tasks, Jerald (2009) argues that many tasks remain which can still not be executed by the computer. These, have been categorized as non-routine. The non-routine jobs cannot be broken down into simple steps for pattern recognition. Jerald notes that some of the non-routine tasks require expert thinking and complex communication. Expert thinking calls for finding solutions to unexpected problems for which there are no predictable solutions. Complex communication has been noted by Jerald to involve interacting with people to source for information, explaining, presenting and persuasion. Of importance is the observation that these skills do not supersede the traditional skills but on the contrary increase the demand for the reading, writing and arithmetic and a deeper content knowledge. According to Jerald, whereas those with skills in expert thinking and complex communication will get better jobs, students who leave schools with only the ability to follow directions will continue to compete for the low-wage routine service jobs.

Since computers are being substituted for the routine tasks that humans can do, Jerald argues that a curriculum that emphasizes following directions to find a single answer may well be preparing students for jobs that will be obsolete in future because they can be easily automated. On the contrary, as people are increasingly being called upon to perform tasks that computers cannot perform (involving complex interactions) education systems should increasingly provide avenues for problem solving, collaboration, thinking widely and critically and exploring multiple solutions to unpredictable problems. These processes will not be easily automated.

Globalization

Thomas Friedman, a New York Times writer sees the world removed from the international system built around division and walls to a system built around integration and webs. In the era of globalization, he argues, individuals reach towards the internet which is a symbol that we are all connected and nobody is in charge. Andrisescu (2008) notes that "globalization is defined as global integration of economic, political, religious and social systems. Globalization is also about the disappearance of the borders for knowledge dissemination". Andrisescu continues to argue that the Knowledge society (an outcome of globalization) is one that creates, shares and uses knowledge for people's prosperity and welfare. The main factor for knowledge society's development is innovation, market demand and lifelong learning, which require continuously improving working conditions, productivity and efficiency. The Knowledge Society uses problem solving instruments which include high speed computers, networks, information acquisition, processing, analysis and application.

The new wave of globalization in the 21st Century according to Andrisescu, is dominated by the software and the internet - tools which today allow individuals, ordinary people, to connect directly and share information and knowledge between themselves just by one mouse click. Modern technologies motivate the individual more than before to access very easy and fast information and knowledge. Communication with others is instant. But the individual has to know how to use the technology and most important to possess the

technology. Andrisescu notes that those without the technologies or the knowledge on how to use them will be left behind; the winners will be those who know how to use the technology around them which calls for adequate skills in digital literacy.

Digital literacy

Literacy, for the better part of the 19th Century, was noted to be a set of tangible cognitive skills of reading and writing. However over time as noted by UNESCO (2006) in its Education for All Global Monitoring Report, the concept has been argued to encompass a multiplicity of literacies which go beyond reading and writing. Among these is digital literacy which according to Lankshear and Knobel (2008) is the ability to match the medium we use to the kind of information we are presenting and the audience we are presenting it to.

Digital literacy as noted by Deakin University deviates from the Gilsters (1997) definition of digital literacy who saw it as "literacy for the digital age". Deakin University defines digital literacy as using technologies to find, use and disseminate information. They look at this skill not as a stationary concept but as one that evolves as technology changes to ensure students develop and apply skills based on new concepts for information discovery, transfer, analysis, review and communication. This is reiterated by the Open University of the UK which proposes 4 categories of digital literacy[1] in its checklist of digital literacy skill. These include:

- Understanding digital practices
- Finding information
- Using information
- Creating information
- Presenting information

Globalization & Automation require digital literacy skills.

Changing Workplace

Jerald while defining a 21st Century Education notes that changes in the workplace also necessitate a shift in the way education systems prepare learners. These changes are characterized by ***less hierarchy and supervision*** calling for a higher level of ***self-regulation***, ***more autonomy and individual responsibility,*** increased creativity, ***more horizontal collaboration*** through networks with cross-functional teams supported by audio conferencing, webcasts and net-meetings, ***less predictability and stability*** with the requirement of new demands coupled with the ability to continuously learn how to learn, acquire new skills to stay competitive. All these clearly spell out the skills required in today's workplace and heavily contribute to the debate of the 21st Century skills.

Literature Review

There are various definitions of the 21st Century Skills that have been put forward by various individuals and institutions. This section will present different listings of competencies and

[1] http://www.open.ac.uk/libraryservices/beingdigital/accessible/accessible-pdf-35-self-assessment-checklist.pdf

skills aligned to different 21st Century skills frameworks from around the World which will later be discussed in ensuing sections.

Kellner (n.d), argues that we need to develop new literacies in order to meet the challenge of new media and new technologies. This is echoed by Mishra & Keleluik 2011, who reiterate that calls for an education revolution were witnessed previously during the transition from oral to print and book-based teaching. This revolution required a restructuring of the education with new curricula, pedagogy, literacies, practices and goals.

Caroll 2008, in his analysis of 21st Century education, argues that the 21st Century has critical attributes; it is interdisciplinary, project-based, research driven, connected to the community, incorporates higher order thinking skills, multiple intelligences, technology and multimedia, multiple literacies, authentic assessments, self-directed learning, working both independently and interdependently. It is designed to challenge all students and provide for differentiation. He adds that new knowledge is connected to previous knowledge and personal experiences, interests, talents and passions. In addition, assessment is a demonstration of understanding through application of facts, through self-assessment and exposure to real world audiences.

Caroll further argues that some of the current efforts towards achieving a 21st Century education aim at creating change without actually changing. The general tendency is to take attributes of the 21st Century and force-fit them into the 19th and 20th Century ways of designing and delivering education.

Technological innovations as noted by Caroll (2008) ushered in by the 21st Century have increasingly diversified, globalized the world and saturated it with simple to complex media. The different media makes it possible to present information in different formats using different technologies thereby making information literacy (understanding how to access, use and present information) a major key component of 21st Century learning. Caroll further argues that 'the school', 'the teacher', 'the learner' and 'the curriculum' of the 21st Century need to be redefined.

In a study conducted by the Pacific Policy Research Center, 2010, it was noted that students cannot master 21st Century skills without the support from teachers who are *well trained and supported in this type of instruction.* The failure to implement 21st Century pedagogy, in their view, has often been attributed to educators being unprepared for the changes demanded by the alignment of the 21st Century learning requirements with the standards, curriculum, instruction and assessment methods. The center recommends that teachers should begin with a supplemental use of 21st Century skills to full integration. This calls for a systemic approach that is progressive in nature over time.

Tony Wagner advocates for seven survival skills for the 21st Century which include:

- Critical Thinking and Problem Solving
- Collaboration across Networks and Leading by Influence

- Agility and Adaptability
- Initiative and Entrepreneurialism
- Effective Oral and Written Communication
- Accessing and Analyzing Information
- Curiosity and Imagination

Partnership for 21st Century Skills

Learning for the 21st Century, as reported from a new public-private coalition known as the Partnership for 21st Century Skills, a vision on how schools can best prepare students to succeed in the first decades of the 21st Century, calls for schools to focus on six key elements of 21st Century learning. These 6 elements include:

- a focus beyond basic competency to an understanding of **core subjects and academic content at much higher levels**,
- The ability of the students to know how to use their knowledge and skills by thinking more **critically**, **applying** knowledge to new situations, **analyzing information**, **comprehending new ideas**, **communicating**, **collaborating**, **solving problems**, and **making decisions**
- Recognition that **21st Century tools** which are heavily driven by technology will continue to be, a driving force in workplaces, communities, and in personal lives in the 21st Century," this calls for the urgent need to incorporate information and communication technologies into education from the elementary grades.
- A connection with the world beyond the classroom, based on authentic projects. **21st Century context** brings experiences that are relevant to students' lives that are central and appropriate for learning in the information age.
- **Subject content** should be relevant to the preparation of students to live and work in a 21st Century world.
- Moving beyond standardized testing as the sole measure of student learning to measure the full range of students' skills. Technology-based assessments to deliver immediate feedback so as to inform immediate correction and improvement calls for new **Assessments that measure 21st Century Skills.**

The report recommends that developing a comprehensive framework for 21st Century learning requires more than identifying specific skills, content knowledge, expertise and literacies. An innovative **Support System** must be created to help students master the multi-dimensional abilities required of them in the 21st Century. The Partnership for 21st Century skills argues that the identification of 21st Century skills should be combined with the necessary support systems in the form of standards, assessments, curriculum and instruction, professional development and learning environments.

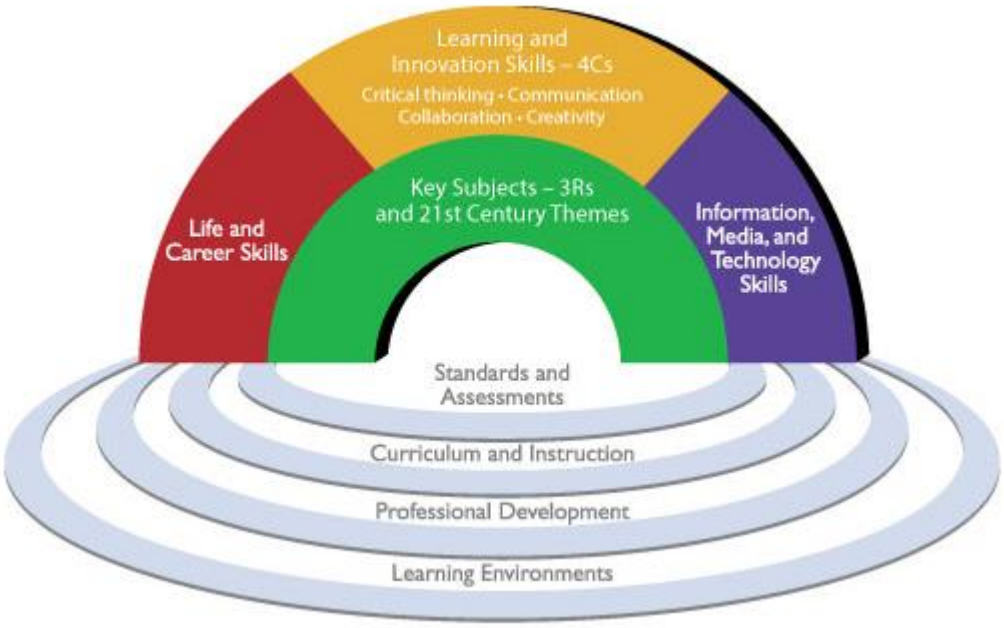

Figure 1: 21st Century Students Outcomes and Support Systems
Source: http://www.p21.org/our-work/p21-framework

International Society of Technology in Education (ISTE)

The International Society for Technology in Education (ISTE) is the premier nonprofit organization serving educators and education leaders committed to empowering connected learners in a connected world. ISTE serves more than 100,000 education stakeholders throughout the world.

ISTE features 6 fluencies that a student of the 21st Century Classroom should have.

1 - Creativity and innovation	"Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology"
2- Communication and collaboration	"Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others".
3- Research and Information fluency	"Students apply digital tools to gather, evaluate, and use information."
4- Critical thinking, problem solving, and decision making	"Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources"
5- Digital citizenship	"Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior."

6- Technology operations and concepts	"Students demonstrate a sound understanding of technology concepts, systems, and operations."

For each of the fluencies, ISTE provides indicators for students to measure progress as presented below.

Fluencies	Students indicators
• **Develop proficiency and fluency with the tools of technology**	• *Students in the 21st Century should have experience with and develop skills around technological tools used in the classroom and the world around them. Through this they will learn about technology and learn through technology. In addition, they must be able to select the most appropriate tools to address particular needs.*
• **Build intentional cross-cultural connections and relationships with others so to pose and solve problems collaboratively and strengthen independent thought.**	• *Students in the 21st Century need interpersonal skills in order to work collaboratively in both face-to-face and virtual environments to use and develop problem-solving skills. When learning experiences are grounded in well-informed teaching practices, the use of technology allows a wider range of voices to be heard, exposing students to opinions and norms outside of their own. Understanding the ways in which connections support learning and being intentional about creating connections and networks are important for 21st Century learners.*
• **Design and share information for global communities that have a variety of purposes**	• *Students in the 21st Century must be aware of the global nature of our world and be able to select, organize, and design information to be shared, understood, and distributed beyond their classrooms.*
• **Manage, analyze, and synthesize multiple streams of simultaneously presented information**	*Students in the 21st Century must be able to take information from multiple places and in a variety of different formats, determine its reliability, and create new knowledge from that information.*
• **Create, critique, analyze, and evaluate multimedia texts**	• *Students in the 21st Century must be critical consumers and creators of multimedia texts.*

• **Attend to the ethical responsibilities required by complex environments**	• *Students in the 21st Century must understand and adhere to legal and ethical practices as they use resources and create information*

Table 1: ISTE 21st Century Framework
Source: http://www.ncte.org/governance/21stCenturyframework

The ISTE framework goes further to analyze the implications of this framework on assessment both in the traditional sense and in view of the acquisition of the 21st Century skills.

21st Century Competencies for Singapore

In Singapore, the framework for 21st Century is embodied in the core values for every Singaporean. These include the beliefs, attitudes and actions of every person. These are thereafter tied closely with the social and emotional competencies and then the 21st Century competencies. The competencies further map out the expected outcomes from every Singaporean child which include a confident person, a self-directed learner, a concerned citizen, and an active contributor.

The framework for the 21st Century in Singapore is infused in the total curriculum which includes the academic curriculum, co-curricular activities, character and citizenship education and applied learning programmes. Teachers are equipped with the necessary skills and resources to empower them to develop 21st Century competencies in students through pre-service training and on-going in-service training and professional development programmes with a strong focus on developing their competencies to teach 21st Century Competencies.

The 21st Century Competencies are explicitly infused into the teaching and learning in all subject areas. Schools work closely with the industry, Institutes of Higher Learning and the community to create many hands-on, authentic learning environments for their students to ensure they develop skills aligned to industry demand and future needs.

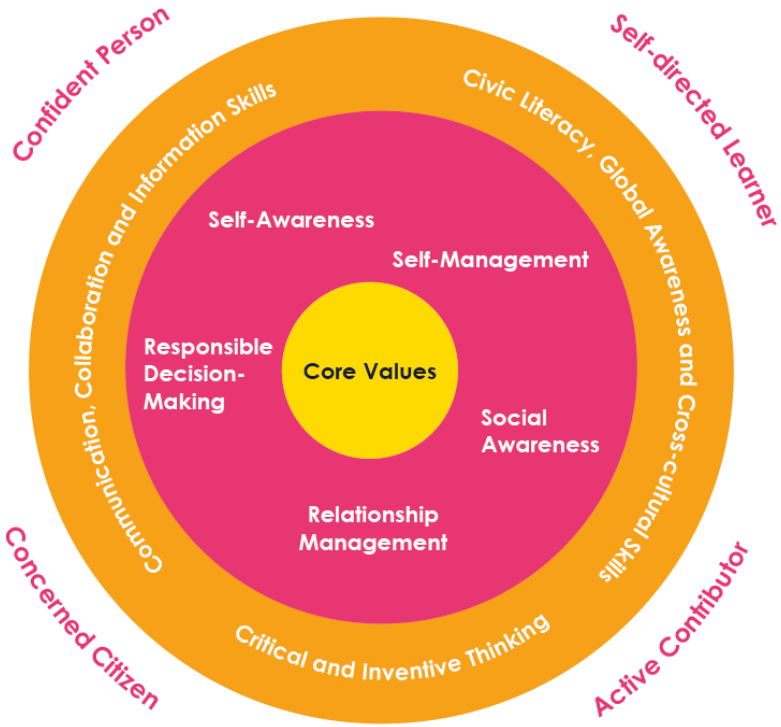

Figure 2: 21st Century Skills Framework - Singapore
Source: http://www.moe.gov.sg/media/press/2014/04/information-sheet-on-21st-Century.php

Australia - Assessment and Teaching of 21st Century Skills (AT21C) initiative

In Australia, the University of Melbourne in collaboration with Intel, CISCO and Microsoft in 2009 initiated the AT21C project to define 21ST Century Skills out of the realization that employers were increasingly challenged with entry level graduates who lacked the practical skills it takes to create, build and help sustain an information-rich business. The University of Melbourne notes that "Although reading, writing, mathematics and science are cornerstones of today's education, curricula must go further to include skills such as collaboration and digital literacy that will prepare students for 21st-Century employment". A critical component that will catalyze educational reform in their view would be establishing new forms of assessment.

The AT21C initiative defined 10 Skills and grouped them into four broad categories as presented in Table 2 below.

WAYS OF THINKING • Creativity and Innovation • Critical thinking, problem solving and decision making • Learning to learn/meta-recognition (knowledge about cognitive processes)	**TOOLS FOR WORKING** • Information Literacy • Information and Communication Technology (ICT)
WAYS OF WORKING • Communication • Collaboration (Networking)	**WAYS OF LIVING IN THE WORLD** • Citizenship – local and Global • Life and career • Personal and Social Responsibility (Cultural awareness and Competencies)

Table 2: 21st Centruy Skills for Australia
Source: http://www.atc21s.org/

Organization for Economic Co-operation and Development (OECD)

Findings from a survey conducted by Ananiadou and Claro (2009)) from the Directorate of Education in more than 50% of the OECD countries showed that most countries or regions cover 21st Century skills and competencies in their regulations, guidelines or recommendations for compulsory education. However, there are few specific definitions of these skills and competencies at national or regional level and virtually no clear formative or summative assessment policies for these skills. Evaluation regarding their teaching was noted to be in the hands of external inspectors as part of their whole school audits. In addition the research also brought to the fore the fact that few teacher training programmes were targeting the teaching or development of 21st Century skills, although there were several teacher training initiatives that focused on developing teachers' ICT pedagogical skills, most of which were optional.

In this study Ananiadou and Claro define the 21st Century skills and competencies as those skills and competencies young people will be required to have in order to be effective workers and citizens in the knowledge society of the 21st Century. In their view they present the competencies being focused on in the OECD countries in three dimensions: **information, communication and ethics** and **social impact**.

Skills in the **information dimension** are research and problem solving skills as they both involve at some point defining, searching for, evaluating, selecting, organizing, analyzing, and interpreting information. Under the information dimension, the information as a source (searching, selecting, evaluating and organizing information) and also as a product (the

restructuring and modelling of information and the development of own ideas (knowledge). Ananiadou and Claro argue that the process of developing one's own ideas is key, as it encourages students to develop their own thinking. Skills that belong mostly to this sub-dimension are *creativity and innovation, problem solving and decision making*.

Skills in the **communication dimension** according to the above report from OECD play an important role in the preparation of students to be not only lifelong learners, but also members of a larger community with a voice and a sense of responsibility to others. They propose that young people need to have the ability to communicate, exchange, criticize, and present information and ideas, including the use of ICT applications to participate in and make positive contributions to the digital culture. They see ICT applications strengthening and increasing the possibilities of communication and reinforcing the development of coordination and collaboration skills between peers. In this dimension there is on the one hand a focus on effective communication which calls for skills in processing, transforming, and formatting information, reflecting on the best way to present an idea to a particular audience. On the other hand, there is focus on *collaboration* and virtual interaction as supported by ICT tools by providing constructive feedback through critical reflection on others' work.

The **ethics and social impact dimension** focuses on *globalization* and *multiculturalism* which has greatly been propelled by ICTs. This brings with it a social impact and a social responsibility for actions taken through the use of ICT and which also touches on *environmental literacy*, awareness and responsibility.

21st Century Learning design

Beyers (2009) in his five dimension model of educating the "Net Generation" notes that the world in which our children live will be significantly different from that of yesterday. Beyers argues that an educated person in the last Century is one who knew something about everything which is an idea that seems to work when there aren't that many books in print. However, when there are so many books in print and in different formats and so many sources of knowledge, he observes that this idea is outdated. In today's world, there is so much to know that students will have to direct their learning out of practical necessity and will have to be in-charge of their own learning. He reiterates the fact that change in society is inevitable resulting in a demand for learners with new skills and a change in the curriculum.

Innovative Teaching & Learning (ITL) – Partnership in Learning (PIL)

The Innovative Teaching and Learning (ITL) design was a research across 7 countries; Finland, Senegal, Russia, Indonesia and Mexico, UK and South Africa under the partnership in learning. It was a Microsoft sponsored Project and describes six dimensions of students' 21st Century learning skills for students to develop. These skills are:

- collaboration
- knowledge construction
- self-regulation

- real world problem-solving and innovation
- use of ICT for learning
- skilled communication

Each of these skills have been elaborated on in terms of what the student should be doing to show activities that would support each of the skills and those that do not.

Discussion

The 21st Century Skills, although not entirely new have gained a new meaning which has been patterned by the technology surge of the 21st Century. These technologies have altered the thinking in society and presented a shift in the way human beings do virtually everything. All the skills are influenced by technology as it has become the medium of communication, collaboration, problem solving, self-management etc. All the skills that we may think about have technology as an underpinning element. This has often led to the misinterpretation that whenever there are computers in an education setting, then 21st Century skills are being imparted.

Findings presented above attest to the fact that the implementation of these skills calls for a deeper interrogation. Before asking education managers, school leaders and teachers to take on this new challenge of implementing the said skills, there is need to dig deeper than the flashy phrases and poorly defined buzzwords that tend to characterize the "21st Century skills" movement. As a first step, they should make a serious effort to understand what skills will be necessary for students to succeed in careers and personal lives. These should be communicated in clear and concrete ways that make sense to the classroom teachers who ultimately will be responsible for implementing them. Simply asking teachers to "address" a long list of inadequately defined skills will not be sufficient. It is important to note that the implementation of these skills is not just the responsibility of the teacher and cannot be done in isolation.

In Singapore, the emphasis is not the list of 21st Century Skills but the envisaged Singaporean – the expected output. This has led to a comprehensive framework which is not only a classroom activity but one that connects from Kindergarten to Higher education and has horizontal networks with the Industry and the community. These 21st Century expectations are weaved into the academic, co-curricular, character and citizenship education to "produce" the complete 21st Century Singaporean.

The Partnership for the 21st Century movement reinforces this notion. The support systems in standards, assessment, curriculum and instruction, professional development and the learning environment proposes a contextualized approach to the implementation. This is closely tied to the goals of education for every country and region.

There are other components of the education system that must also be affected and adjusted. The implementation of the 21st Century skills should be aligned with the pedagogy, curriculum, modes of assessment, teacher education and the goals of education. However,

worth noting is the fact that these skills do not require the erasure of the 3R's (**r**eading, w**r**iting and a**r**ithmetic) that dominated the philosophy of education in the last Century. On the contrary, the 21st Century skills should promote and require deep learning based on the 3Rs with the support of technology. The new philosophy brings a shift on learning with technology as the medium of learning. This brings in a new dimension to literacy, communication, collaboration, problem- solving and self-management among others. It challenges the authority of the teacher in content knowledge and removes the teacher's monopoly of knowledge. This shift and understanding is what every education establishment needs to redefine as guided by its goals, resources and aspirations.

Conclusion

The skills requirements for the 21st Century are not new. Advocating for these skills neither means that they should be taught in isolation nor that the traditional knowledge and skills in school subjects like math, language arts and science should be replaced or totally dropped by a new set of skills. On the contrary, these should be retained but students must be better equipped with the ability to apply what they learn in those subjects in the context of real world problems and challenges rather than reproducing facts for test scores.

The application of skills and competencies will best be taught in the context of the curriculum and not as a replacement. The 21st Century skills will be taught best to emhrace deep content knowledge. The main argument advanced by this approach to teaching is that, although such skills are very important, they cannot be taught independently, i.e. outside a particular knowledge domain such as those designated by traditional academic subjects, nor will students be able to apply such skills if they lack the appropriate factual knowledge on a particular domain.

The achievement of the 21st Century Skills implementation is a process and cannot be achieved at once. The depth of achievement of each skill will be guided by the level of content knowledge and the level of education they will be implemented at. A progression path with measurable indicators needs to be identified for different audiences with their full involvement. These audiences should have the liberty and flexibility to chart their own path in the attainment of the highest level of 21st Century learning based on the available resources and existing contexts. This pathway should be supported by guidelines for assessing the progress and ultimate achievement of 21st Century learning at different stages of education achievement. The resources available are also a guiding factor in defining the Skills. Although technology resources are a very powerful enabler, and should be most desired, it should also be noted that 21st Century can be promoted and implemented in a "technology resources constrained environment". Technology is not equal to 21st Century skills and the vice versa although its availability and use to support the said skills in a systematic approach will accelerate the achievement of results and greatly increase relevance.

Based on the findings and the discussion above, the successful implementation of the 21st Century skills has to be supported by participation of both economic and social institutions, ranging from private companies to higher education institutions, and this process risks being

irrelevant to schools unless the skills and competencies so identified become the very core of what teachers, schools and the wider society should care about. This can only be done by incorporating them into the national education standards that are enforced and assessed by governments.

Recommendations

A suitable framework for the implementation of 21st Century skills will require a total package. This package will comprise of skills and competencies to be acquired, indicators to measure progress and a clear definition of the required support systems.

This research paper has identified and proposes 10 21st Century skills that have been floated by various bodies of knowledge as presented in Appendix 2. The competencies identified and elaborated on in this framework are also loosely aligned to various components of the Sustainable Development Goals in Appendix 3.

It is worth noting that there has been scanty information on the status of 21st Century thinking, frameworks and implementation in Africa, other than the mention of these in policy documents. Efforts to discuss the issues have been championed by the private sector so far.

This position paper is meant to raise awareness on the lack of a clear and deliberate focus on this issue. It is hoped to serve as a call to action to address the 21st Century skills implementation and assessment more proactively in the upcoming GESCI projects.

Through this paper an initial framework which could be reviewed or contextualized for different audiences has been recommended.

Appendices

Appendix 1 - References

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Appendix 2 - Master Rubric for Evaluation of 21st Century Skills

Master Rubric for Evaluation of 21st Century Skills					
(1) Problem Solving *(Are students required to do more than remember information/procedure presented?*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Students can only solve problems according to how the teachers have shown them in the past	*Task requires little or no higher order thinking. One step problems with clear direction provided.*	*Task requires students to identify the problem and apply a given procedure to arrive at a solution.*	*Task requires student to use prior knowledge to identify the problem, select a previously learned procedure and arrive at a solution.*	*The learning activity's main requirements is problem solving. Use prior knowledge to identify a range of possible problems that may include aspects of real world, then select a previously learned procedure, arrive at a reasonable solution and evaluate.*	*Examine the nature of the problem, which includes aspects of a real world problem to create and implement a previously learned procedure, monitor its effectiveness, make adjustments to arrive at a reasonable solution and evaluate.*
Assessment questions on whether problem solving is taking place: • *Do students work in a group in ways that allow them to create new knowledge or to solve problems that can't be created or solved individually?* • *Do students, independently and collaboratively, solve problems as they arise in their work?* • *Are the students addressing a real world problem?*					

(2) Critical thinking *(Are students required to do more than remember, understand and reproduce content at a superficial level?)*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Students are gauged by their ability to state facts as provided in text-books and by the teacher	*The learning activity does not require students to construct knowledge. Students can complete the activity by reproducing information using familiar procedures.*	*Respond to information and ideas through prior knowledge, personal experience, or emotional reaction.*	*Interpreting information and ideas from limited sources, problem, or situation to develop a knowledge base. Not applying the knowledge to a new context.*	*Interpreting information and ideas from limited sources, problem, or situation to develop a knowledge base. Not applying the knowledge to a new context.*	*Interpret, analyse and evaluate information and ideas across a range of sources, to determine appropriate actions and express a point of view.*

Assessment questions on whether there is critical thinking?

- *Do students use inquiry to ask questions and solve problems?*
- *Do students critically analyze a variety of information from a variety of sources?*
- *Do students consciously make connections between their work and that of the greater community?*
- *Do students use tools to communicate original perspectives and to make new thinking visible?*
- *Do students articulate thoughts and ideas so that others can understand and act on them?*
- *Have the students interpreted, analyzed, synthesized, evaluated information or ideas from their research?*

(3) Creativity and Innovation *(Is the learning task more than just set by teacher and completed as outlined by teacher?)*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Creativity is seen as rebellion because it is not in the curriculum	*Limited creativity. Task is simple and produces a standard product/idea.*	*Generate and innovate upon ideas/products using creativity to create a refinement of a known idea/product.*	*Use knowledge and creativity to create inventive ideas/products*	*Does the learning task require students to be inventive?*	*Creates a unique or resourceful idea/product using a range of areas.*
Assessment questions on whether there is evidence of Creativity and Innovation • *Do students work in groups to create new sources that can't be created or solved by individuals?* • *Do students create new ideas using knowledge gained?* • *Was the idea innovative and di it build on existing knowledge?*					

(4) Self-Regulation *(Are students required to do more than remember and understand teacher driven task with no reflection on learning?)*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Students can only do what they are guided to do. They have no control over what they learn, how they learn, and how to know whether they have learnt	*All teacher-led activities, no independent direction. No higher order thinking required.*	*Students provided with some limited or restrictive choice around direction and adaption of activity or idea/product. No success criteria.*	*Students allowed limited choice of adaption/direction to investigate a teacher provided success criteria, selected idea or create specific product. Limited reflection of learning.*	*Students allowed choice around idea/product, limited restrictions set by teacher to achieve given success criteria. Some evidence of student self-reflection of learning.*	*Genuine opportunity for students to investigate negotiated success criteria. Evidence of student monitoring and self-reflection of learning.*
Assessment questions on whether there is self-Regulation: • *Did students show evidence that they were aware of learning goals?* • *Did students plan and monitor their own work?* • *Did students improve on their work based on feedback?*					

(5) Collaboration *(Do students work in groups and share information?)*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Students work individually on the learning activity.	*Group-work is encouraged in the school but learners are not guided on how to work collaboratively through research, contributions, communication , group regulation and attainment of results*	*Learners collaborate informally in pairs or groups. However they do not have shared responsibility for achieving a joint outcome or product.*	*Express own ideas and respond to diverse points of view. Students have the opportunity of sharing however independent product/idea is produced.*	*Learners work together in pairs or groups to have a shared responsibility and make substantive decisions about the purpose, content, process or product.*	*Learners work together in pairs or groups or network locally and remotely with diverse peers, experts and others to develop an interdependent product or idea.*

Assessment questions on whether Collaboration is taking place:

- *Do students work in groups of members with diverse perspectives and areas of expertise?*
- *Do students build on one another's thinking to gain new understanding?*
- *Do students gain new understandings by being part of a group or team?*
- *Are students open to and intentional about learning from and with others?*
- *Are students sharing responsibility?*
- *Are students making substantive decisions together?*
- *Is the product form their collaboration interdependent?*

(6) Communication (*Can/do students communicate effectively with each other and to others around the topic?)*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Teacher communicates, learners listen	*Students have limited or no communication to an audience*	*Use a given medium to express basic information to an audience.*	*Students use a medium to present relevant information to a particular audience.*	*Students select and use a range of communication tools to effectively engage a particular audience.*	*Students use multiple communication tools and avenues to substantively communicate to a variety of audiences.*

Assessment questions on the quality of Communication:

- *Do students take responsibility for communicating their ideas in a variety of ways?*
- *Do students choose tools to share information that match their need and audience?*
- *Do students share and publish their work in a variety of ways?*
- *Do students solve real problems and share results with real audiences?*
- *Do students publish in ways that meet the needs of a particular, authentic audience?*
- *Do students communicate information and ideas in a variety of forms and for various purposes?*
- *Is the communication multi-modal (uses difference modes)*
- *Does the communication contain enough supporting evidence?*

(7) Global Citizens (Multiculturalism) *(Does your teaching take into account community and global needs?)*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
School-based activities and community-based activities are two isolated activities	*No thoughts beyond own self and personal academic performance when in school*	*Some interest or basic understanding of significant community based issues.*	*Identify a need and take appropriate action based on basic understanding of community and world issues.*	*Develop/contribute to a collective course of action to spread awareness about community and world issues.*	*Forge a deep and lasting connection for a cause or social issue as demonstrated through ongoing commitment to communicate about the significance of the cause/issue as well as seek remedies and collective contributions.*
Assessment questions on whether problem solving is taking place • *Do students communicate information and ideas to different audiences?* • *Do students learn to share disagreements and new ways of thinking in ways that positively impact the work?*					

(8) **Information and Communication Technology – ICT** *Do you use ICT in your classroom?*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Learners are not allowed to use ICT for purposes other than basic literacy.	*Learners do not have the opportunity to use ICT although there are various types of ICTs available*	*ICT is required to construct knowledge in ways that add value to learning.*	*ICT used to change teaching and learning. ICT is used to construct knowledge in ways that add value to learning.*	*Does using ICT allow you to change your practice, the way you teach and what students produce.*	*Ethical use of ICT to generate new products/solutions previously unattainable*
Assessment questions on whether ICT is being used: • *Do students evaluate and use digital tools and resources that match the work they are doing?* • *Do students take risks and try new things with tools available to them?* • *Do students use a variety of tools correctly and efficiently?* • *Have the Students designed an ICT Product?*					

(9)* Digital Literacy (Information Literacy, Media Literacy)** ***Determining extent of information needed: *Students analyze and reconstruct a research topic identifying key concepts and ideas and planning their search and discovery approach.*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Accessing required information: Students access quality sources and demonstrate evidence of the use of these resources in their assessment tasks.	*Sources and evidence: Assessment tasks require students to demonstrate evidence of their ability to select the most appropriate and relevant sources of information important to their discipline or area of research.*	*Evaluating information critically: Students apply critical judgement when evaluating wide-ranging information sources for currency, reliability, authority, perspective discriminating between opinion and information*	*Using information effectively to accomplish a specific purpose: Students effectively communicate manage and synthesize information from a broad range of sources, establishing effective information management processes and skills to organize and communicate information using information curation tools.*	*Accessing and using information ethically and legally: Students correctly acknowledge the work of other authors, respect privacy and confidentiality and freedom of information.*	*Digital communication: Appropriate, efficient and effective use of technologies to communicate information clearly and coherently. Assessment may include participation in online discussions, contributing via social media, industry Tweet ups, professional, industry and open forums. Online collaboration and teamwork are key aspects of communication.*

Assessment questions on whether problem solving is taking place:

- *Do students find relevant and reliable sources that meet their needs?*
- *Do students use technology as a tool for communication, research, and creation of new works?*
- *Do students locate information from a variety of sources?*
- *Do students analyze the credibility of information and its appropriateness in meeting their needs?*
- *Do students synthesize information from a variety of sources?*
- *Do students manage new information to help them solve problems?*
- *Do students use information to make decisions as informed citizens?*
- *Do students strive to see limitations and overlaps between multiple streams of information?*

- *Do students analyze and evaluate the multimedia sources that they use?*
- *Do students evaluate multimedia sources for the effects of visuals, sounds, hyperlinks, and other features on the text's meaning or emotional impact?*
- *Do students evaluate their own multimedia works?*
- *Do students consider their own design choices as much as their choices about text?*
- *Do students share information in ways that consider all sources?*
- *Do students practice the safe and legal use of technology?*
- *Do students create products that are both informative and ethical?*
- *Do the students demonstrate knowledge creation supported by ICT?*
- *Could the knowledge creation have taken place without ICT?*

(10). Environmental Literacy *(Understanding how human decisions and actions affect environmental quality as well as using that understanding as the basis for responsible and effective citizenship)*					
Level 0	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Environmental literacy is not addressed in the curriculum	*Environmental literacy is not addressed on its own but is addressed within subjects*	*Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems*	*Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)*	*Investigate and analyze environmental issues, and make accurate conclusions about effective solutions*	*Take individual and collective action towards addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)*

Assessment questions on whether students are acquiring environmental literacy

- *Do the students demonstrate knowledge of the Earth systems as well as physical, life, social, and technical systems.*
- *Do students have some knowledge and understanding of environmental issues at local, regional, and global levels?*
- *So Students recognize issues at the interface of the environment and society, for example, population growth, use of natural resources, land use, loss of biodiversity, and ecosystem deterioration.*
- *Do students articulate the role and function of social, political, economic, and cultural influences on the causes, consequences, and improvement of environmental problems and issues?*
- *Do the students demonstrate ability to access information, compare, contrast, and evaluate information, and reason about the applications of knowledge and actions in environmental contexts*
- *Do students demonstrate the ability to apply knowledge and understanding on environmental issues?*

Appendix 3 – Sustainable Development Goals