

Exploring the Pedagogical Meaning and Implications of the 4Cs “Super Skills” for the 21st Century through Bruner’s 5E Lenses of Knowledge Construction to Improve Pedagogies of the New Learning Paradigm

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Abstract

As economies increasingly globalize and digital technologies assume ubiquitous presence and functional utility in peoples’ lives outside educational contexts, there is an increasing realization among pedagogues that education designed to equip graduates of the Digital Economy requires the teaching of new skills rather than the traditional core subjects. This realization has led to the emergence of what is called the New Learning Paradigm which postulates that students now need to be taught the skills most in demand in the 21st century. Those skills are epitomized in what The Partnership for 21st Century Skills calls the Framework for 21st Century Skills. Keys among those skills are what The Partnership characterizes as the 4Cs super skills.. What are those skills? Why are they essential for successful learning, teaching, assessment, working and living in today’s Digital Economy? How do they align with the full set of 21st century skills? What are the pedagogical implications of these 4Cs super skills? This paper answers these questions in four steps. Firstly, it articulates the 4Cs super skills. Secondly, it explains the “Rainbow” framework of the full set of essential 21st century skills as conceptualized by The Partnership for 21st Century Skills. Thirdly, it outlines Bruner’s 5E Instructional Model and explains how it provides an excellent lens through which to approach learning, teaching, assessment and curriculum development for the 4Cs super skills in Kivunja’s New Learning Paradigm.

Keywords

New Learning Paradigm, Partnership for 21st Century Skills, 4Cs Super Skills, Bruner’s 5E

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Instructional Model, Rainbow of 21st Century Skills

1. Which Are the 4Cs Super Skills and Why Are They Essential for Success in the Digital Economy?

In declaring its commitment to American students' success in *Preparing America's Students for College and Career*, the Consortium for Smarter Balanced Assessment (SBAC, 2015) in Washington DC reiterates very well the assertion of the Partnership for 21st Century Skills (P21, 2015a) as to what the 4Cs super skills are:

Today's students are moving beyond the basics and are embracing the 4 Cs—"super skills" for the 21st Century: Creativity, Communication, Critical Thinking, Collaboration. [These] 21st Century Skills [need to be] infused in the Common Core Standards which are the end goals of the Career and College Ready Standards. (SBAC, 2015: p. 5)

Saxena (2015) agrees when she says, "These...4Cs that are the super skills for the 21st century...help develop the qualities that students need to possess in the 21st century for success in college, careers and citizenship" (p. 1). These 4Cs super skills were identified by the Partnership for 21st Century Skills (P21, 2015b) as the skills that American students need to graduate with, in addition to the traditional skills, to effectively contribute to the progress and prosperity of America. The Partnership articulated this very well in their mission statement when they said:

Every child in the U.S. needs 21st century knowledge and skills to succeed as effective citizens, workers and leaders. This can be accomplished by fusing the 3Rs and 4Cs.... To successfully face rigorous higher education coursework, career challenges and a globally competitive workforce, U.S. schools must align classroom environments with real world environments by fusing the 3Rs and 4Cs. The 3Rs include: English, reading or language arts; mathematics; science; foreign languages; civics; government; economics; arts; history; and geography. The 4Cs include: critical thinking and problem solving; communication; collaboration; and creativity and innovation. As the 3Rs serve as an umbrella for other subjects and core content, the 4Cs are a shorthand for all the skills needed for success in college, career, and life. (P21, 2015a: pp. 1-2)

Following this strong assertion, the Partnership (P21, 2015c) elevated the status of these skills to "the 4Cs—"super skills" for the 21st century" (p. 1). These are very strong assertions and they need to be taken seriously because of their source—The Partnership for 21st Century Skills. The Partnership for 21st Century Skills is an organization that was formed in 2002 in the USA out of concern that American education was failing graduates because they were graduating without the skills needed to be productive citizens in the Digital Economy. In particular, there was the realization that whereas American society outside education had embraced technology, educational institutions were lagging behind. For example in a comprehensive study that involved some 7685 young people ranging in age from 13 to 20 years and from twelve countries, Tapscott (2009) concluded that "students won't be prepared for the world of today unless schools use technology to implement real change to their model of education" (p. 144). Other leaders in the field also argued that the reliance on the orthodox 3Rs of the Industrial Age without infusing technology was failing American children and was one of the major reasons why American teens were leaving college in record numbers. For example, Prensky (2001) argued that schooling organized on the traditional model was the reason for "a massive dropout problem in many high schools in the USA" (p. 122). This line of argument was sustained by other leaders in the field such as Kelly, McCain and Jukes (2009) who proposed that:

What's wrong is that the world has changed and schools have not. Capitalizing on the astounding power of new electronic tools, the world outside education has moved beyond the idea of mass production that was the hallmark of Taylor's assembly-line approach to life. The sudden shift to the online digital world has rendered that experience irrelevant to modern students. (p. 18)

Equally unequivocal was McNierney (2004) who proposed that it was necessary for teacher educators to "model instructional methods which help future teachers understand that technology-based instruction is no

longer an option. It is a requirement” (p. 65). Other giants in the field added to an understanding of this need to infuse technology into pedagogy with assertions such as:

America’s high schools are obsolete.... By obsolete I mean that our high schools, even when they’re working exactly as designed, cannot teach our kids what they need to know today. Training the workforce of tomorrow with the high school of today is like trying to teach kids about today’s computers on a 50-year-old mainframe. It’s the wrong tool for the times. (Gates, 2005)

These arguments, powerful as they were, were really not new since we know that in the mid 19th century John Dewey (1859-1952) said “If we teach today’s students as we taught yesterday’s, we rob them of tomorrow” (Randall, 1953: p. 9). But these were nevertheless valid and forceful propositions and so, a number of high powered individuals representing powerful public and private organizations such as Apple Computer Inc., Microsoft Corporation, USA Department of Education, Dell Computer Corporation, America Online Line Time Warner Inc., Consortium for School Networking, State Educational Technology Directors Association, the International Society for Technology in Education, and the National Education Association, (P21, 2014) joined hands in an effort to identify how the gap between the knowledge and skills taught at school and the knowledge and skills in demand in typical 21st century society could be bridged. That joint effort gave birth to The Partnership for 21st Century Skills. It was set up with the onerous mission to: “Serve as a catalyst to position 21st century readiness at the center of US K12 education by building collaborative partnerships among education, business, community and government leaders” (P21, 2008: p. 4). The Chair of The Partnership articulated its mission quite well when he said that their primary aim was to answer “a question of paramount importance to America’s educators, employers, parents and the public, how can we best prepare students to succeed in the 21st century?” (P21, 2015a: p. 2). The search for answers to this question led The Partnership to develop the set of skills that today’s graduates need to master so as to be able to engage with the demands of the Digital Economy. Kivunja (2014a) calls the move to these skills the shift to “the new learning paradigm” (p. 85) which he defines as:

The new philosophical approach to pedagogy which posits that for education to truly meet “the moral purpose of education and help produce citizens who can live and work productively in increasingly dynamically complex societies” (Fullan, 2000: p. 4), learning, teaching, assessment and curricula need to equip graduates with the skills that will enable them to contribute effectively to productive capacities of the 21st century economy. (Kivunja, 2015a: p. 5)

He argues that the new learning paradigm is “the vision for students’ success in the new global economy” (Kivunja, 2014b: p. 40).

Several bloggers have also endorsed the importance of the 4Cs. For example, Gerald (2015) refers to “the concept of 4Cs as the core of teaching and learning process in 21st century education...which take center stage in schools and transform learning opportunities for all kids and is important for enrollment into a good university, career and success in today’s world” (p. 1 & 8). Lin (2014) sets out “to embrace and emphasize the importance of 4Cs...in 21st century education” (p. 2). In her blog, Caroline Lippel (2013) introduces the discussion of the 4Cs of 21st century skills quite well when she says:

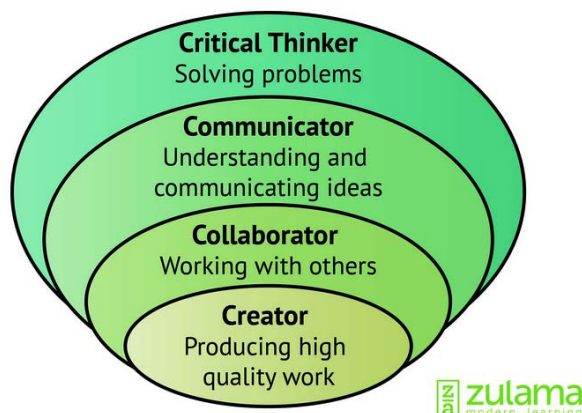
Education used to be about the three Rs, but Reading, wRiting, and aRithmetic aren’t the only skills today’s students need to be successful.... Students now need to be able to show that they can be Collaborators, Communicators, Creators, and Critical Thinkers. These skills make up the four Cs of 21st Century learning. (p. 1)

She then synthesizes the 4Cs as illustrated in **Figure 1**. Although the figure depicts each of the 4Cs as a distinct layer of knowledge construction for descriptive purposes, The Partnership for 21st Century Skills (P21, 2015a) views all the 4Cs as interdependent and interrelated in presenting them as “the 4Cs—‘super skills’ for the 21st century” (p. 1) and the “shorthand for all the skills needed for success in college, career and life” (P21, 2015a: p. 2). The discussion in the following subsections is presented along Lippel’s (2013) design represented in **Figure 1**, taking each of the 4Cs in turn.

1.1. Critical Thinking and Problem Solving

There is widespread consensus around the importance of critical thinking as an educational objective (See for example, Deakin, 2014; Facione, 2011; Kompf & Bond, 2001; Kuhn, 2005; MCEETYA, 2008; Miller, 1990;

The Four Cs of 21st Century Skills



Source: Lippl, C. (2013: p. 2).

Figure 1. The 4Cs super skills.

Van-Gelder, 2001). For example when the Council of all Australian Education Ministers met in Melbourne in December 2008, their meeting produced what is referred to as the Melbourne Declaration on Educational Goals for Young Australians (MCEETYA, 2008), in which the ministers expressed consensus on the common goal for the Australian curriculum to create opportunities for the development of critical thinking skills among students. However, in spite of such a high confluence of supporting views, there is little agreement over the meaning of critical thinking. In recognition of this conundrum Kivunja (2015d) asserts:

Critical thinking has been defined in many different ways, some as simple as “thinking which has a purpose” and “examining the thinking of others to improve our own” (University of Sydney, 2014: p. 1); equally simple as, “a commitment to using reason in the formulation of our beliefs” (Mulnix, 2010: p. 471). (p. 431)

Generally, critical thinking refers to an individual’s ability to use a number of his or her general cognitive processing skills which fall into Bloom’s (1956) high-order thinking levels of analyzing, evaluating and constructing new ideas or creating. This rather general definition aligns well with that of the Californian National Council for Excellence in Critical Thinking which defines critical thinking as “the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action” (NCECT, 2014: n.p.).

Critical thinking is a super skill in the 21st century “because it enables students to think deeply and to solve non-familiar problems in different ways” (Kivunja, 2015d: p. 433). This is very important because we know that the 21st century economy driven by digital technologies is typified by ever changing information which requires participants to have the capacity to manage and respond well to unfamiliar problems. It helps students to be open-minded, to question, not to take anything for granted and to think and reason through issues in a rational manner (Kompf & Bond, 2001). It is a super skill because, as highlighted by Kivunja (2014b), it equips graduates with “the skills that will enable them to be productive members in the Knowledge Economy, function effectively and responsibly and solve problems in ways that are sensitive and caring for others, society, the environment and the world as a whole” (p. 41). Facione (2011) puts it well when he asserts that critical thinking is essential for harmonious human society. Trilling and Fadel (2009) agree when they propose that training in critical thinking enables graduates to reason effectively, to engage in system thinking, develops their ability to make rational judgments and decisions, and enhances their ability to solve problems. These leaders in the field emphasize: “Critical thinking and problem solving are considered by many to be the new basics of 21st century learning” (Trilling & Fadel, 2009: p. 50). The Partnership (P21, 2011) says that critical thinking and problem solving are keys among the sets of skills that “separate students who are prepared for increasingly complex life and work environments in today’s world and those who are not” (p. 2). The Partnership further highlight the importance of critical thinking when they assert that critical thinking involves “looking at problems in a new way, linking learning across subjects & disciplines” (P21, 2015b: p. 1).

1.2. Communication

As illustrated in Lippel's (2013) **Figure 1** presented earlier, communication is about understanding and sharing ideas. Piascik (2015) agrees and adds it involves "sharing thoughts, questions, ideas and solutions" (p. 1). Effective communication has always been an essential skill for success in business, family relationships and all walks of life. However, the instantaneous mix of people of different cultures that has been enabled by 21st century information, media and digital technologies has made the need for effective communication more apparent and more vital than in previous generations. Whereas in the Industrial Age emphasis was on correct speech, fluency in reading, and accuracy in writing, the advent of information and digital technologies of the 21st century has brought with it new dimensions which call for a deeper and broader set of communication skills for graduates to be able to be effective participants in the Communication and Information Age, where there is much greater diversity of cultures. As The Partnership for 21st Century (P21, 2014) puts it, "Communication skills have always been valued in the workplace and in public life. But in the 21st century, these skills have been transformed and are even more important today" (p. 13).

Pedagogy abounds with research-based evidence indicating that interactional and transactional communication skills are essential for students' success, not only in the classroom but also in life outside school after graduation. (Coulson, 2006; Cruickshank & Kennedy, 1986; Muijs & Reynolds, 2011; Wragg, 1984). In *The World Beyond the Classroom*, Gerald (2015) asserts that communication is a super skill in the world because it is through communication that:

Thoughts, questions, ideas and solutions are shared. In today's competitive world, communication skills in careers especially in business oriented careers are the most sought after quality of an educated person. Thus, being able to communicate effectively is the most important of all life skills. (pp. 10-11)

Trilling and Fadel (2009) explain well what effective communication in the 21st century requires of graduates and why it is an essential skill. They say that graduates should be able to:

Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills, listen effectively to decipher meaning, including knowledge, values, attitudes and intentions, use communication to inform, instruct, motivate and persuade, utilize multiple media and technologies, communicate effectively in diverse environments. (Trilling & Fadel, 2009: p. 55)

A close look at these requirements quickly highlights why communication skills are among the 4Cs super skills because it is hard to imagine how anyone could effectively participate in the workplace or in any meaningful relationship without practising these skills in some form of verbal communication, non-verbal communication, written communication, audio communication, visual communication, or digital communication. As shown in the above quote, effective communication is about getting your desired message across effectively to your target audience; and this requires training so that graduates gain the communication skills they need to utilize in the workplace after school. It is therefore essential that graduates be taught how to plan their communication and to make sure that they communicate clearly, concisely, concretely, coherently, correctly, completely, and courteously (Baird & Stull, 1992: p. 16).

1.3. Collaboration

In the *Good Practice Guide* for the Bachelor of Laws at Flinders University (in Australia) "commissioned by the Law Associate Deans Network to support the implementation of the Threshold Learning Outcome 5: Communication and collaboration" (Handsley, 2011: p. 1) the *Guide*, following Kift, Israel and Field (2010), defines collaboration skills as "the skills of teamwork, working in groups, and working cooperatively with others" (Handsley, 2011: p. 1). Thus collaboration is important whenever teamwork, group work and cooperation are involved. It is noteworthy, as well articulated by Eggen and Kauchak (2012), that in pedagogical practice these three elements of collaboration are not identical. However, as explained by Brady (2006) they all involve the sharing of "social and cultural experiences" (p. 9) among participants. When applied effectively, collaboration can have significant positive effects on the people involved as was experienced, for instance, at William Clarke College in New South Wales (Australia), where teachers who taught collaboratively as a pair in one class in which they organized the students to work collaboratively achieved some very impressive results for both teachers and their students (Raphael, 2015). Impressive results about the power of collaboration to improve pedagogy

ical practices, student management and professional collaboration were also found by [Mary Brownell, Allyson Adams, Paul Sindelar and Nancy Waldron at the University of Florida](#) and [Stephanie Vanhover \(2006\)](#) at the University of Virginia in their joint study on learning from collaboration. Many other leaders in this field, including [Kagan \(1994\)](#), [Johnson and Johnson \(2009\)](#), [Killen \(2013\)](#) strongly endorse the power of collaboration to improve efficiency not only in teaching and learning but also in all walks of life after school. Thus, given the extent to which digital technologies have accentuated the confluence of social and cultural experiences among people, not only in one workplace but nationally and internationally, it is easy to appreciate why The Partnership for 21st Century Skills ([P21, 2015a](#)) included collaboration as one of the essential 4Cs super skills for successful learning and increased productivity in real work environments in the 21st century.

1.4. Creating and Innovating

The terms creativity and innovation are often used to refer to the conscious exploitation of “new ideas, or new uses of ideas, to add social or economic value” ([IBSA, 2009: p.1](#)). The Partnership for 21st Century ([P21, 2007](#)) says that “in today’s world of global competition and task automation, innovative capacity and a creative spirit are fast becoming requirements for personal and professional success” (p. 15). The Partnership ([P21, 2014](#)) emphasizes that in today’s economy fuelled by information and driven by digital technologies “creativity and innovation are key drivers in the Global Economy” (p. 24). As a matter of fact, the importance of creativity and innovation to be a foundation for the essence of survival of humans was well articulated by other leaders in the field such as [De Bono \(1995\)](#) who said “There is no doubt that creativity is the most important human resource of all. Without creativity, there would be no progress, and we would be forever repeating the same patterns” (p. 13). It is this emphasis on the vital role of creativity and innovation in the success of human endeavors that inspired The Partnership (P21) to characterize creativity and innovation as one of the 4Cs super skills essential for success in modern living. And it is important that this super skill be taught well because it is very complex involving, according to [Karlyn Adams \(2006\)](#) the confluence of three components:

- **Knowledge:** All the relevant understanding an individual brings to bear on a creative effort.
- **Creative Thinking:** Relates to how people approach problems and depends on personality and thinking/working style.
- **Motivation:** Motivation is generally accepted as key to creative production, and the most important motivators are intrinsic passion and interest in the work itself. ([Adams, 2006: p. 4](#))

The complexity of this super C skill is highlighted further by [Teresa Amabile](#) who explains that creativity involves some five complicated processes, namely, being able to disagree with others and yet feel comfortable about it, trying out solutions that are different from current ones, integrating knowledge gained from different fields, managing and solving difficult problems, and the ability to recognize a problematic situation, step away for a while looking for a solution, and return later with a potential solution ([Amabile, 1998](#)).

2. How Do the 4Cs Align with the Full Set of 21st Century Skills of the New Learning Paradigm?

The 4Cs super skills are not the only skills needed for successful study, work and living in the 21st century. As well explained by [Kivunja \(2014a\)](#) they are part of what he calls “the New Learning Paradigm” ([Kivunja, 2014a: pp. 84-86](#)) explained below.

2.1. The New Learning Paradigm

[Kivunja \(2014a\)](#) postulated that “Whereas pre-21st century learning paradigms catered reasonably well for the pursuit of the moral purpose of education in turning out school leavers with specialized skills that were applicable in highly compartmentalized and specialized Industrial Age economies, 21st century skills require a new paradigm” (p. 81)... Teaching our students so that they become well-equipped with the 21st century skills is the new learning paradigm” (p. 85). To extend an understanding of the meaning of the New Learning Paradigm [Kivunja \(2015a\)](#) explains that:

The New Learning Paradigm is the new philosophical approach to pedagogy which posits that for education to truly meet “the moral purpose of education and help produce citizens who can live and work productively in increasingly dynamically complex societies” ([Fullan, 2000: p. 4](#)), learning, teaching, assess-

ment and curricula need to equip graduates with the skills that will enable them to contribute effectively to productive capacities of the 21st century economy. These are the skills demanded by employers across all sectors of modern economies. (p. 55, in Press)

The full set of those skills is well articulated by The Partnership for 21st Century Skills (P21, 2008) in what they call the “*Rainbow*” or *Framework for 21st Century Skills* (P21, 2011) outlined below.

2.2. The Rainbow or Framework for 21st Century Skills

As explained earlier (see Section 1), The Partnership for 21st Century Skills is an organization that was formed in 2002 to find ways and make recommendations for how technology could be infused in all aspects of education throughout the USA at both primary and secondary levels (P21, 2008). The Partnership comprises leaders from education, (such as the National Education Association), business, (such as Apple Computer Inc., Dell Computer and Microsoft Corporations), and community and government institutions, (such as USA Department of Education), that play key roles in education and in the development and use of modern technologies, particularly digital technologies, in education (P21, 2014). When The Partnership met in Washington DC in 2002 they came up with a vision for moving USA education system to the digital world and epitomized it in what they called the *Rainbow* or *Framework for 21st Century Skills*. In their words:

The Framework presents a holistic view of 21st century teaching and learning that combines a discrete focus on 21st century student outcomes (a blending of specific skills, content knowledge, expertise and literacies) with innovative support systems to help students master the multi-dimensional abilities required of them in the 21st century and beyond. (P21, 2015b: p. 1)

Their vision articulated four sets of skills representing 21st student outcomes and four 21st century learning support systems which The Partnership agreed on as those that would equip graduates from American schools with the skills essential for their success as productive members of the workforce in the Information Age. They articulated the four sets of skills as the traditional Core Subjects skills, the Life and Career skills, the Learning and Innovations skills as well as the Information, Media and Technology skills, supported by four systems, (P21, 2011). The Partnership summarized the four sets of skills and the four support systems in a graphic that they called the “*Rainbow*” or *Framework for 21st Century Skills or Learning* (P21, 2015b: p. 1) which is illustrated in **Figure 2**.

The Partnership says, and as shown in the **Figure 2**, “The key elements of 21st century learning are represented in the graphic... The graphic represents both 21st century student outcomes (as represented by the arches of the rainbow) and 21st century learning support systems (as represented by the pools at the bottom). Thus, in addition to the four sets of 21st century student outcomes for the necessary skills delineated above, there are four sets of 21st century Support Systems shown in **Figure 2** (as the pools at the bottom) categorized by The Partnership as Standards and assessments, Curriculum and instruction, Professional development and Learning environments. Not detailed in the *Rainbow* (**Figure 2**) but important to point out are what The Partnership refers to as the five Interdisciplinary 21st Century Themes, which must be interwoven with the Core Subjects in preparing students for effective participation in the Knowledge Age economy. They delineated those five themes as, “Global awareness, Financial, economic, business and entrepreneurial literacy, Civic literacy, Health literacy, and Environmental literacy” (P21, 2015d: p. 1). A detailed discussion of what the Core Subjects are, the four Support Systems and the five Interdisciplinary Themes is given in Kivunja (2015a, in Press). The skills that comprise the Life and Career set were discussed in detail by Kivunja (2015b), those in the Learning and Innovations skills were unpacked in Kivunja (2014b) and those that comprise the Information, Media and Digital Technologies skills were elucidated in Kivunja (2015c). Thus, the 4Cs are part of the full cohort of 21st century skills as illustrated in **Figure 2**. As said earlier, “Teaching our students so that they become well-equipped with the 21st century skills is the New Learning Paradigm” (Kivunja, 2014a: p. 85).

3. What Are the Pedagogical Implications of the 4Cs Super Skills?

As illustrated in **Figure 2**, the 4Cs super skills sit right at the apex of the *Rainbow* or *Framework for 21st Century Skills*. And as discussed in Section 1 above, they are essential for success of our students on their graduation into the world of real work and life. In view of their significance to humans in all walks of life it is crucial, for the achievement of “the moral purpose of education” (Fullan, 2000: p. 4), that we pedagogues review how we

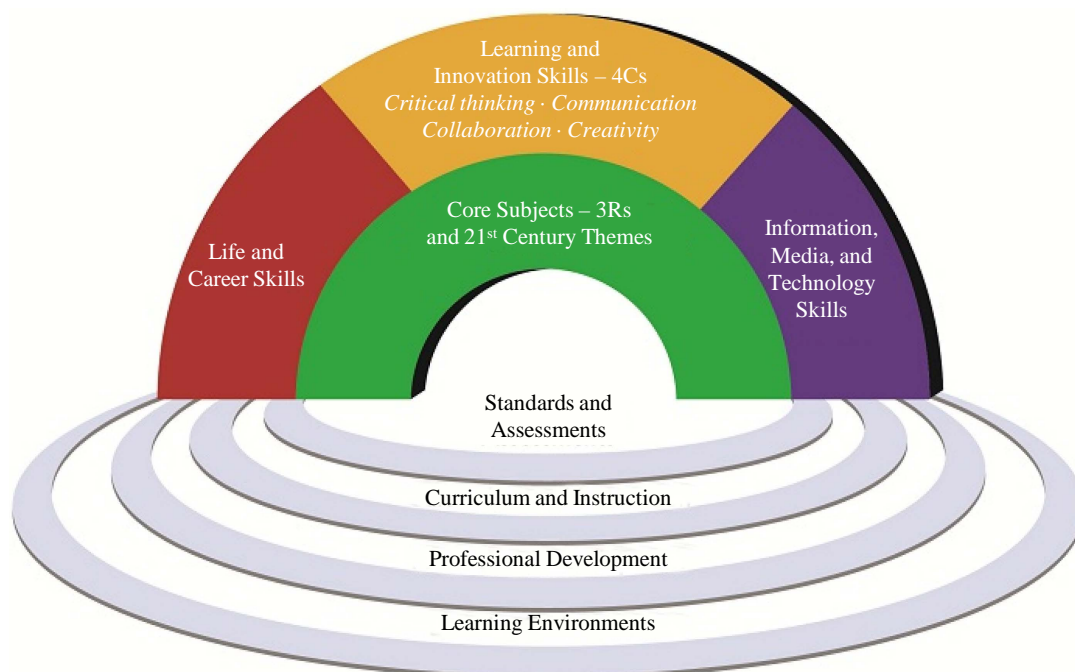


Figure 2. The rainbow or framework of 21st century skills (source: P21, 2015b).

can shift in our cultural and cognitive modes so as to transition our pedagogical structural, cultural and organizational dynamics (Kivunja & Power, 2006) to ensure that our graduates will be well equipped in these 4Cs super skills by the time they graduate to take up productive roles in the 21st century workplace. This section addresses the question: How can the 4Cs super skills be taught, learnt and assessed effectively, particularly using a well proven model such as Bruner's 5E Instructional Model? Of course there are many excellent instructional models (e.g. Bloom, 1956; de Bono, 1956; Gardner, 1983; Vygotsky, 1978), but Bruner's model is selected here for illustrative purposes because it appears to capture very well the important contributions of these other giants in the field, particularly when it comes to providing a scaffold that facilitates students' active construction of knowledge. But, admittedly, other models could also offer excellent material for further illustration with regard to the teaching of the 4Cs super skills. So, let's start by highlighting what is known in pedagogy as Bruner's 5E Instructional Model (Kivunja, 2015d) (Note the common use of 5E rather than 5Es for this model).

3.1. Bruner's 5E Instructional Model

What is popularly referred to as Bruner's 5E Instructional Model is a learning cycle with a very interesting history. The model has its origin in science rather than pedagogy. It is the brainchild of a leader in the biological sciences community Dr. Rodger W. Bybee (Bybee et al., 2006) who, while executive director at the Colorado Springs Biological Science Curriculum Study (BSCS) Educational Centre, developed it in collaboration with six of his colleagues. Bybee and his team argued that if we could get learners to engage, explore, explain, elaborate, and evaluate as they learn, these processes would enable them to maximize their participation in active learning and lead to deep (Entwistle, 2000; Flewelling & Higginson, 2002) rather than surface learning (Lublin, 2003). Because each of these five learning processes starts with the letter [e], the model was accordingly called the 5E Instructional Model.

The huge success of this model when applied in teaching science attracted scholars outside science of whom Jerome Seymour Bruner (1966) was the pedagogical vanguard. In *The Process of Education* Bruner (1960) argued that the purpose of education was not simply to transmit knowledge but mainly to facilitate the process of active cognition and the development of problem solving skills among learners, which the learners could then apply in similar or new situations to gain new knowledge, through active learning. Bruner (1961) further proposed the concept of *discovery learning*, which, like Vygotsky (1929) postulated that students learn through constructing knowledge by themselves and argued that this constructivist approach was maximized if students were scaffolded

and given opportunity to discover meaning by themselves through engagement, exploration, explanation, elaboration and evaluation. Bruner then made this, 5Es based constructivist learning even more popular in pedagogy by suggesting that with proper “scaffolding” (Wood, Bruner, & Ross, 1976) the learners could use the 5Es to “concentrate on the difficult skills...in the process of acquiring knowledge” (Bruner, 1978: p. 19). Thus, the 5E Instructional Model became very popular in pedagogy because Bruner showed how it could be used to facilitate learning as conceptualized by several leading scholars in the field (including himself), through active learning (Piaget, 1954), constructivist learning (Vygotsky, 1929), discovery learning (Bruner, 1961) and scaffolding (Wood, Bruner, & Ross, 1976). As a result, while acknowledging the origin of this model in the biological sciences, it is fair to say that Bruner was at the forefront of its understanding and application in pedagogy. As it is one of the well-known instructional models in education, and one that reflects the important contributions to pedagogy by the vast majority of experts in the field, including “aspects of the behaviourist and cognitivism models” (Jobrack, 2013: p. 5), it makes good sense to use it here to illustrate how we could teach the 4Cs super skills in today’s classrooms and lecture theatres. As said earlier, this does not mean that other models could not be used.

3.2. Utilizing Bruner’s 5E Lenses to Teach the 4Cs Super Skills

For brevity, the illustration of how each of Bruner’s 5Es could be used to teach each of the 4Cs is summarized in the following five tables, respectively. The examples are listed against the relevant Cs but with imagination, planning and differences in learning stages the examples could be used for multiple Cs.

3.2.1. Utilizing the Engagement Lens to Teach the 4Cs

The Engage lens of Bruner’s 5Es model focuses on maximizing student’s participation in active learning through actively engaging with the learning tasks, ideas or concepts (Bruner, 1966). **Table 1** summarizes examples that could be used to maximize learners’ engagement with each of the 4Cs super skills.

3.2.2. Utilizing the Exploration Lens to Teach the 4Cs

The Explore lens focuses on providing scaffolding to students and then letting them venture into new areas with you scaffolding and guiding their explorations. **Table 2** illustrates some examples of activities which can be given to students to offer them opportunities to explore what they are learning.

3.2.3. Utilizing the Explanation Lens to Teach the 4Cs

The Explanation lens focuses on information that is new or that students are unlikely to find by themselves. It focuses on elucidation of ideas and concepts and interpretation that extends students’ understanding to new knowledge frontiers. It zeroes in on “concerns that students might miss or experience cognitive overload or even develop misconceptions” (Jobrack, 2013: p. 7) if left on their own. **Table 3** illustrates students’ activities involving explanation.

3.2.4. Utilizing the Elaboration Lens to Teach the 4Cs

The Elaboration lens is also called the Extend lens (Jobrack, 2013: p. 8). It is used to give students the opportunity to extend their cognitive experiences into areas of increasing complexity. It allows students to connect current schema to new learning and to focus deeper so as to be able to elaborate on what they have already learnt or on new knowledge discovered. Reigeluth (1999) says that this lens can be used by the teacher to help students focus on new and more complicated concepts, and asking students to expand and elaborate on them. Students’ activities involving elaboration are illustrated in **Table 4**.

3.2.5. Utilizing the Evaluation Lens to Teach the 4Cs

The Evaluation lens can be used to give students the opportunity to focus on their current performance to determine how they are achieving the learning outcomes or not, and what they can do to improve their achievement. So, it can be a very good lens for students’ self-assessment and formative assessment. It can also be an excellent lens for summative assessment to inform the teacher on strategies and planning needed to improve teaching, learning and assessment, and to make changes as informed by the Evaluation lens (Anderson, 2003). Examples of students’ activities utilizing the evaluation lens are shown in **Table 5**.

Table 1. Teaching the 4C's super skills through Bruner's *E1: Engagement Lens*.

4C super skill	Examples of <i>Engagement</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> • Tell how and why previous learning is relevant to the present topic. • Connect your to new learning • Agree or disagree over an issue and give reasons for their position. • Conduct a debate to defend your position or stance about an environmental issue in the community • Use Internet resources to illustrate and communicate original ideas and stories
Communicating	<ul style="list-style-type: none"> • Discuss why previous knowledge is essential for current learning • Actively/attentively listen to each other's point of view • Ask questions on the topic • Illustrate and communicate you original ideas using digital technologies. • Communicate information which helps fellow students to troubleshoot a new software to increase its efficiency
Collaborating	<ul style="list-style-type: none"> • Work as a team to complete K-W-H-L chart <ul style="list-style-type: none"> ○ K: What each one knows ○ W: What each team member wants to know ○ H: How each member will find relevant data ○ L: What each team member will have learnt • Working in teams of 5 search the Web for data and discuss how it relates to the topic • Engage in learning activities with students in overseas countries
Creating and innovating	<ul style="list-style-type: none"> • Students engage in inquisitive activities • Respond to "what if" type of questions • Come up with an answer different to the one given • Design your own questions for the class to answer • Work individually or in a team and use digital tools to compose a digital story

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice over 30 years as synthesized in Kivunja (2015d).

Table 2. Teaching the 4C's super skills through Bruner's *E2: Exploration Lens*.

4C super skill	Examples of <i>Exploration</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> • Students venture into new areas of research • Given time and opportunity for metacognition • Attempt new experiments to discover new reactions and results • Conduct Internet searches and use the data to explore a particular life cycle • Conduct a study of a nature strip • Go on a virtual excursion • Go on a study field
Communicating	<ul style="list-style-type: none"> • Talk about relationships among ideas, concepts and themes • Discuss misperceptions and correct misconceptions • Probe for deeper understanding • Conduct a whole-class discussion on a controversial topic • Watch a video clip and discuss message it conveys • Discuss the safe use of the Internet
Collaborating	<ul style="list-style-type: none"> • Work in teams to study a new topic • Given opportunity to monitor and scaffold each other • Use the Internet to form peer learning networks with classmates. • Use the Internet to form virtual learning communities using Google Circles tools • Complete assessment tasks with learners in different countries, connected by the Internet • Work as a team to conduct a science experiment
Creating and innovating	<ul style="list-style-type: none"> • Take time to reflect and come up with a new idea. • Come up with a different opinion about what has been covered previously. • Use new Urls to find new learning resources and use them in class activities • Download useful resources from YouTube and use them to design something new • Create a curriculum-specific simulation that will encourage your peers to practise critical thinking

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice over 30 years as synthesized in Kivunja (2015d).

Table 3. Teaching the 4C's super skills through Bruner's *E3: Explanation Lens*.

4C super skill	Examples of <i>Explanation</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> • Demonstrate how something works • Set up an experiment and explain to the class how it works • Explain how past learning links to new knowledge • Look for and explain patterns in data • Use a Venn graphic organizer to explain the differences and commonalities in data • Apply previous knowledge to resolve a current software problem
Communicating	<ul style="list-style-type: none"> • Explain to the teacher personal understanding of an idea, concept, or issue • Reinforce, support or challenge what has been said • Conduct an interview and report the outcome to the class or topic • Describe the results of an experiment • Present a report to the class of a field trip. • Explain the meaning of a plot in the story they have just read • Describe and illustrate a concept using a model
Collaborating	<ul style="list-style-type: none"> • Conduct a Round-Robin of Four-Ways-Interviews and then discuss among your team the ideas generated by the interviews • Question each other and probe each other's contribution to develop a deeper and fuller explanation and understanding • Challenge each other's contribution to the team by asking them to explain further • Use the Think-Pair-Square cooperative learning structure to explain a topic to your team-members • Encourage equal participation in explaining something new
Creating and innovating	<ul style="list-style-type: none"> • Link past event to new learning occurrences • Develop a hypothesis to be tested • Come up with a new theory to replace an existing one • Create a glossary of terms from the topic learnt and explain them to the class • Compose a narrative and explain it • Use digital-imaging technology to create a graphic to be used in a digital presentation.

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice over 30 years as synthesized in Kivunja (2015d).

Table 4. Teaching the 4C's super skills through Bruner's *E4: Elaboration Lens*.

4C super skill	Examples of <i>Elaboration</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> • Look for deeper meaning of concepts they are introduced to • Search the Internet for further points connected to or are relevant to what is being learnt • Challenge current understanding • Questioning and correct misperceptions • Apply what is taught to solve new problems • Apply theory to real-life experiences
Communicating	<ul style="list-style-type: none"> • Talk more about a topic that has been discussed previously • Practise using formal language correctly • Discuss extension of a concept • Describe and demonstrate a process • Share your understanding of how a digital learning game helps learning • Create a media-rich presentation and share it with other students
Collaborating	<ul style="list-style-type: none"> • Challenge peers in a team to tell more • Work in a team to broaden what is being learnt • Share understandings of what has been learnt • Work together to solve a problem. • Publish to all members of your virtual community a problem you have encountered when learning and seek their assistance
Creating and innovating	<ul style="list-style-type: none"> • Raise new issues for discussion • Apply skills learnt to new contexts • Extend current learning to new areas • Apply knowledge learnt in one Key Learning Area (KLA) to several other KLAs • Design and complete a rich learning task • Telegraph new ideas • Develop and use new terminology • Try new skills • Practice injury prevention in the playground at your school by drawing up a few simple rules • Create a video documenting a community event in which your class or school participated

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice over 30 years as synthesized in Kivunja (2015d).

Table 5. Teaching the 4C's super skills through Bruner's *E5: Evaluation Lens*.

4C super skill	Examples of <i>Evaluation</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> • Reflect on what they have learnt and discuss its value in real life • Complete a Plus, Minus, Interesting (PMI) model of an topic they have learnt • Debate a current controversial issue at the school or in the community • Link or show connections between current class work and solving problems in the world beyond school • Complete a Cost-Benefit Analysis of an issue • Complete a self-assessment exercise following the completion of a major task or project • Review how you have achieved the learning outcomes • Recognize bias in resources available on the internet
Communicating	<ul style="list-style-type: none"> • Demonstrate masterly of certain learning in an oral presentation • Discuss the evaluation of a particular task • Evaluate digital resources for use in a named topic and discuss your findings with the class • Publish online your artwork with commentary that demonstrates your understanding • Select a set of digital tools and justify their value in completing a task
Collaborating	<ul style="list-style-type: none"> • Complete peer assessment for members in your team • Mentor each other in a team and provide feedback • Use the Kagan's (1994) Jig-Saw structure to evaluate a story • Work in teams to complete the Kivunja (2015) Star Graphic Organizer (What-Who-Where-When-Why-How) to evaluate a given topic • Use collaborative electronic tools to evaluate the topic or unit completed
Creating and innovating	<ul style="list-style-type: none"> • Complete a SWOT Analysis (Strengths, Weaknesses, Opportunities, Threats) of a new proposal for changes to a unit they are about to start • Use formative assessment to improve performance • Create a personal portfolio and assess each others' portfolio • Show links between unit completed and the next one • Complete open-ended assessment tasks. • Use digital tools to analyze data and to evaluate a theory learnt • Design a model of legal and ethical behaviors when using the Internet

Source: Application of [Bruner \(1960, 1961, 1966; NETS, 2007\)](#) to personal professional practice extending over 30 years as synthesized in [Kivunja \(2015d\)](#).

4. Conclusions

The Partnership for 21st Century Skills presented the 4Cs of critical thinking and problem solving, communication, collaboration, and creativity plus innovation, as the super skills in the 21st century because they are foundational essentials for success in college, university, career, and life outside educational institutions. On graduation, students will enter a highly competitive world of commerce, business and life that demands more skills than those evident in graduates of the Industrial Age. As rightly pointed out by [Grovo \(2015\)](#), 21st century industry requires “graduates with skills that will allow them to be immediately productive in the workforce” (p. 3). The 4Cs are super skills because they provide a core of skills which, when combined with the traditional Core Subjects skills, help students to develop and demonstrate a sound understanding and greater effectiveness and efficiencies in the Career and Life skills and the Information, Media and Technology skills all of which comprise the New Learning Paradigm.

But, the New Learning Paradigm is not just about the 4Cs, nor is it about just learning. It is about making a switch in learning, teaching, assessment and curriculum development to utilize all the elements of the *Rainbow* or *Framework for 21st Century Skills*. As discussed in this paper, this includes the four sets of skills representing students outcomes, the four supporting systems and the five interdisciplinary themes, all of which are needed to equip graduates with the skills that will enable them to contribute effectively to productive capacities in the 21st Digital Economy. Along this journey, the 4Cs are posited by the Partnership for 21st Century as the fuel that not only accelerates the achievement of the different elements of the *Rainbow*, but energizes participants in the pursuit of these elements. The 4Cs add value to human endeavor in the development of the different elements of the *Rainbow* and are therefore super skills, because as can be inferred from [Michael Woolcock \(1998, 2001\)](#), of what value is human enterprise if it does not add to social capital?

In their wisdom, The Partnership (P21) chose the metaphor of the *Rainbow* to represent the elements of the

Framework for 21st Century Skills. This appears to be a very prudent choice because it serves to emphasize the integrative and holistic nature of all the elements that together comprise the *Framework for 21st Century Skills*. Just like no *Rainbow* would be complete without some of the essential colors, the *Framework for 21st Century Skills* would not be complete unless the four sets of students' outcomes, the four supporting systems and the five interdisciplinary themes are all considered together. By way of reiteration as this paper concludes, the philosophical approach which posits that learning, teaching, assessment and curriculum development all need to include these 21st century skills of the *Rainbow* is what Kivunja (2014a) calls the New Learning Paradigm.

The *Rainbow* is a well-conceptualized model representing the Partnership's vision for success in 21st century studying, the professions, trades, industry and living. The location of the 4Cs at the summit of the *Rainbow* (please refer to **Figure 2**) is not accidental. It serves to highlight the position of the 4Cs super skills within the entire structure. These skills are super skills because they are essential to help students develop skills for increased productivity, creativity, critical thinking, problem solving, communication and collaboration, not only while still at college but even more importantly, later in their daily lives after graduation. These skills have always been essential for success but as Gardner (2000) says, now "technology brings them to our fingertips...the new technologies can really come into their own... With new software and the World Wide Web, it is possible to receive and to manipulate all kinds of (hopefully accurate) data, captured in a wide range of symbol systems, and evaluate respective claims and counterclaims" (p. 34) to enhance the power of the 4Cs super skills to influence the other elements of the *Rainbow*. The teaching of these 4Cs super skills within the New Learning Paradigm will help to educate graduates who will succeed in the real world of work. This is vital if education is to achieve its moral purpose—for, as can be inferred from Fullan (2000), of what value is education if it does not lead to the achievement of the moral purpose of education?

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