

-  **3** ENTREPRENEURSHIP
-  EMPLOYABILITY
-  EDUCATION

E³ LEARNING MODEL

PEDAGOGICAL PARADIGMS



basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA



INTRODUCTION

E³ is an initiative of the DBE that uses student-centred learning, including projects and games, in the existing CAPS curriculum to better prepare learners for the modern economy. The goal of E³ is to inspire 100% of learners to complete school and 100% of these learners to study further, get a job, or start their own enterprises.

Since the establishment of the E³ initiative within the DBE in January 2018, the E³ team has established various models and processes to guide its activities towards its goal namely to ensure that:

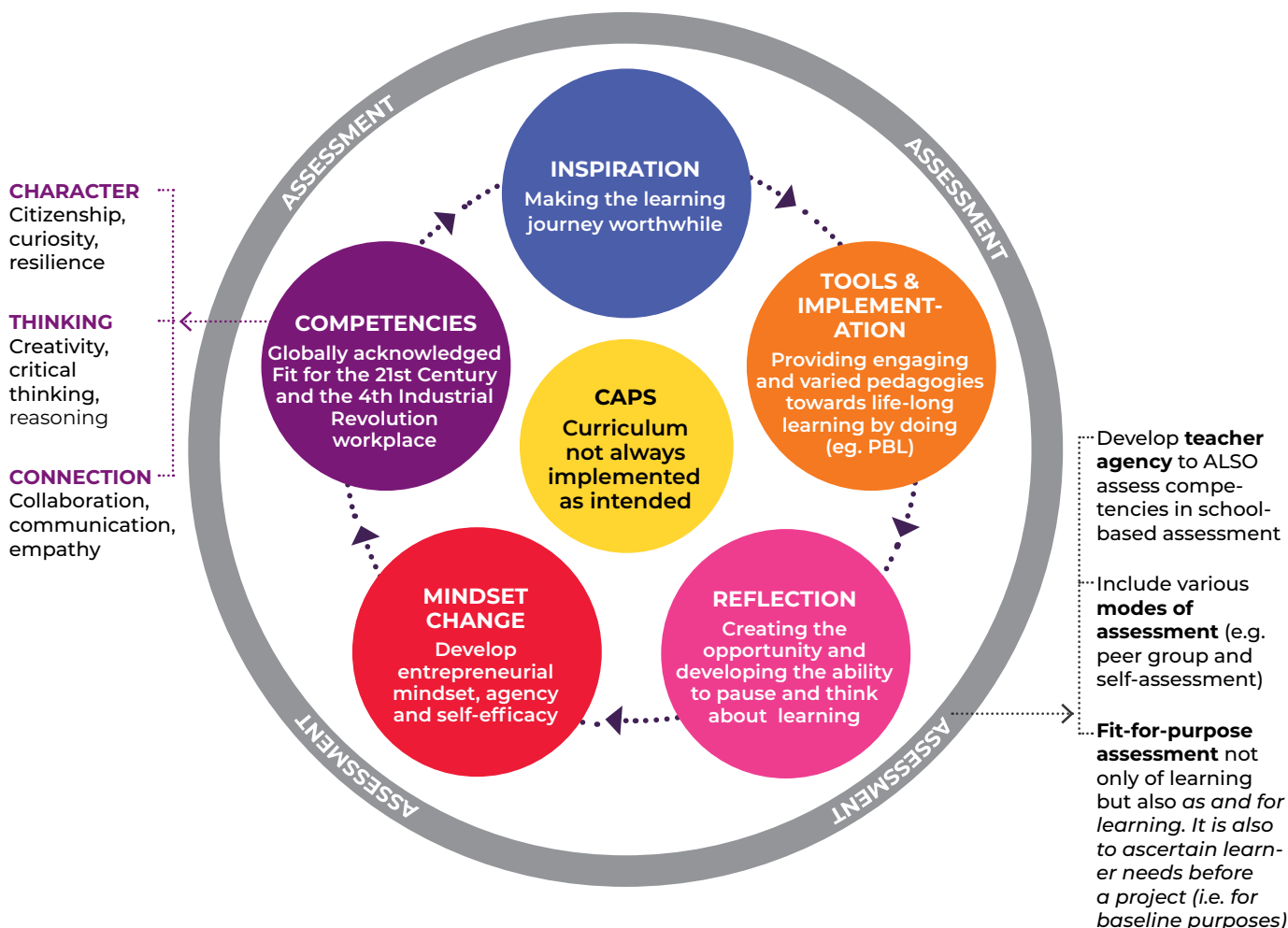
- 100% of school learners remain engaged, do not drop out, do not repeat grades, complete their schooling and that,
- 100% of these school leavers ('Matriculants') are equipped with the skills to:
 - a) become entrepreneurs in the future,
 - b) get a job, or
 - c) successfully study further (or combinations of these)

A *Theory of Change* guides strategy towards the desired outcomes which are measured by indicators and tracked in an *M&E process*. The *Strategy* is designed around this framework and comprises three *workstreams* namely Institutionalization, School Implementation and Partner and Opportunity Creation. Within the School Implementation workstream is the objective to develop, train and implement progressive learning methodologies in schools by training teachers and the support functions around them.

To guide this objective, the E³ team devised a *learning model* based on input from visits to a number of schools in various countries, literature reviews and discussions with experts. It established the following Learning Model:

E³ LEARNING MODEL

The E³ model follows a learning cycle that will foster a solution-seeking (entrepreneurial) mindset every day in every classroom.



1 INSPIRATION

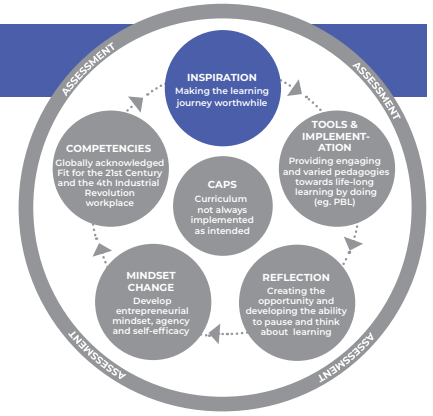
Making the learning journey worthwhile

COMPELLING GOAL



“ Let’s stop asking kids what they want to be when they grow up. Ask them what problems they want to solve and what they need to learn in order to solve those problems.

- Jaime Casap, Google Education



This statement sums up E³'s vision of a system that prepares learners to be solution-seekers and problem solvers. It places the “what they need to learn” as a useful, relevant, meaningful, compelling function rather than as a compliant, uninspiring, seemingly meaningless assessment-driven slog that demotivates young people. As soon as learning is contributing to a compelling goal, learners are engaged and proactively seeking knowledge. This is the goal of E³.

So, key to E³'s model, is the importance of the relevance of education, learning and schooling. Currently with more than 50% of learners not completing their schooling, there is a dire need to ensure that learners are engaged and interested in knowledge and the process of learning.

In order to make learning relevant and inspiring the E³ team solicited input from the provinces around compelling problems and burning issues that they felt that were important in their communities.

The following issues were identified:

Grade /subject	Burning issue	Project description
Life Skills Grade 4	Lack of confidence/linked to cultural identity	Learners produce a culturally rich item (recipe book, indigenous stories as communicated orally by family members). Public event: intercultural evening
Life Skills Grade 5	Need to be self-sufficient/poor nutrition	Learners build a tower garden. Event: tower garden expo
Life Skills Grade 6	Bullying and violence in society	Learners start an <i>I Care/Environmental</i> club with animal shelter as an activity. Event: launch meeting managed by learners
EMS Grade 7	Need to raise money/leave a legacy for school	Entrepreneurship Day
EMS Grade 8	Need for positive role-models from community	Interview and create posters of local heroes. Event: local heroes address school
EMS Grade 9	Self-sufficiency – starting own business.	Groups start enterprises and face “Dragon’s Den”
LO Grade 10	Ignorance around new world of work and 4IR/Gr 9 subject choice	Learners research and organize Future-focused Expo for Grade 9 learners and parents

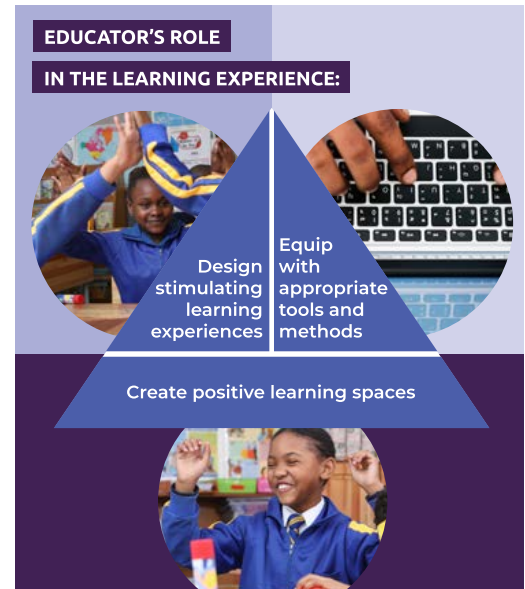
These burning issues were workshopped by teachers and curriculum experts into projects to be facilitated by teachers using project-based and learner-centered learning methods.

Equally critical to creating inspiration is the role of the teacher in the learning experience. It is crucial that teachers' mindsets change to seeing themselves as facilitators rather than content experts.

With information as ubiquitous it now is, the teacher's role is to ensure that he/she creates positive learning spaces that are conducive to an environment that can unlock the critical competencies and create space for experimentation, mistakes, creativity, curiosity and reflection.

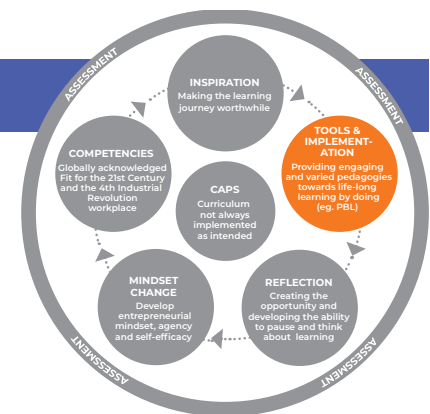
The environment should be equipped with appropriate tools and methods that can be utilized when appropriate at the opportune moment for learning and development.

Teachers need to design stimulating learning experiences such as the projects listed above that can include inter-subject integration, critical thinking opportunities and collaboration between learners.



2 TOOLS AND IMPLEMENTATION

Providing engaging and varied pedagogies towards life-long learning-by-doing



THE PROJECT-BASED LEARNING (PBL) PROCESS

Project-Based Learning is a progressive pedagogy which promotes small-group learner involvement in solving real-life problems by developing rigorous research strategies. It is learning-by-doing and focuses on developing specific curriculum knowledge and skills while inspiring students to question actively, think critically, and draw connections between their studies and the real world.

In South African schools, school projects have been viewed as a tool for reinforcing real-life knowledge and experience. PBL views projects as a series of learner-driven activities and investigations, over a good period of time, so that learners, on their own, are discovering new knowledge and skills and developing strong values without the direct traditional lecture approach.

HOW DOES IT WORK?

Students work on a project over an extended period of time – from a week up to a semester – that engages them in solving a real-world problem or answering a complex question – such as the ones identified and listed above. They demonstrate their knowledge and skills by developing a public product or presentation for a real audience. As a result, students develop deep content knowledge as well as critical thinking, creativity, and communication skills in the context of doing an authentic, meaningful project. Project-Based Learning unleashes a contagious, creative energy among students and teachers. (<https://www.bie.org/blog/pbl-can-start-in-your-classroom>)

The time frame is extended to simulate reality as far as possible. With more time, learners can clearly see the importance of planning and also keep track of the project's progress using Gantt charts and tools.

ADVANTAGES OF PROJECT-BASED LEARNING

PBL equips learners for 21st century skills

There is no longer a place for 'chalk and talk' teaching as the only methodology applied in the classroom. Although there is a space for traditional teaching for certain types of information sharing, "the old-school model of passively learning facts and reciting them out of context is no longer sufficient

to prepare students to survive in today's world. Solving highly complex problems requires that students have both fundamental skills (reading, writing, and math) and 21st century skills (teamwork, problem-solving, research-gathering, time-management, information synthesizing, utilizing high tech tools)." (https://www.bie.org/blog/pbl_can_start_in_your_classroom)

A student who has been engaged in excellent PBL during high school has a much greater chance of being employed and of moving up the ladder into management and leadership positions.



Learning becomes more relevant and meaningful

Bringing the real world into the classroom provides a very powerful learning experience. A teacher, committed to the principles and passionate about PBL pedagogy, will encourage learners to be critical and independent thinkers and workers, and, since the project will visibly simulate the real world, learners will see value and be more committed. They will gain in confidence and, with time, become problem-solvers.

Assessment is more meaningful as it is authentic

The assessment in PBL is more diverse and includes almost all forms of assessment, from the traditional test to observation of research practices. Authentic assessment also involves assessing learners' contributions in pairs, groups or individually while they are doing the work. This is less stressful for the learner and allows for repetition if the learner was not on point on a specific day. Because there is so much opportunity for quieter one-on-one sessions with a learner, the teacher gets to know the learner better which can enhance both the learner's and the teacher's performance.

PBL accommodates diversity in the classroom

Globally classrooms are becoming less and less homogeneous and teachers have a challenge in ensuring that learners from different cultural and language groups as well as those with differing abilities, are all treated equally. Learners engaged in PBL have an excellent chance of developing their skills as they are, by the very nature of projects and the accompanying activities, forced to use various modalities in doing research, solving problems, discussing, and asking and answering questions.

PBL gives learners struggling with English communication more options for speaking

We know that in South Africa English, communication is a key obstacle to academic success. If the teacher groups learners purposefully, she can ensure that each group has a strong and empathetic speaker of English to model conversation. Because most types of communication are informal and functional, learners not comfortable in speaking English are offered numerous opportunities to communicate within a low-risk environment.

Research supports PBL

A growing body of research supports the use of PBL. Schools where PBL is practiced find a decline in absenteeism, an increase in cooperative learning skills, and improvement in student achievement. When technology is used to promote critical thinking and communication, these benefits are further enhanced. These benefits, combined with a compelling goal, create the opportunity for learners to develop their own path towards a solution-seeking mindset. Inquiry and observation are used to identify a problem while experimentation and adaptation are activated to solve the problem. Communication and collaboration become critical in order to obtain more knowledge to progress the experimentation process. Finally, creative and critical thinking is unlocked to adapt the problem-solution.

TOOLS

In addition to the methodology of teaching (PBL), E³ is also integrating the process of set of thinking tools that learners learn to use that are applicable to any problem-solving opportunity. The work done by Roger Martin¹ in Toronto at the Rotman School of Management has been instrumental in guiding this process.

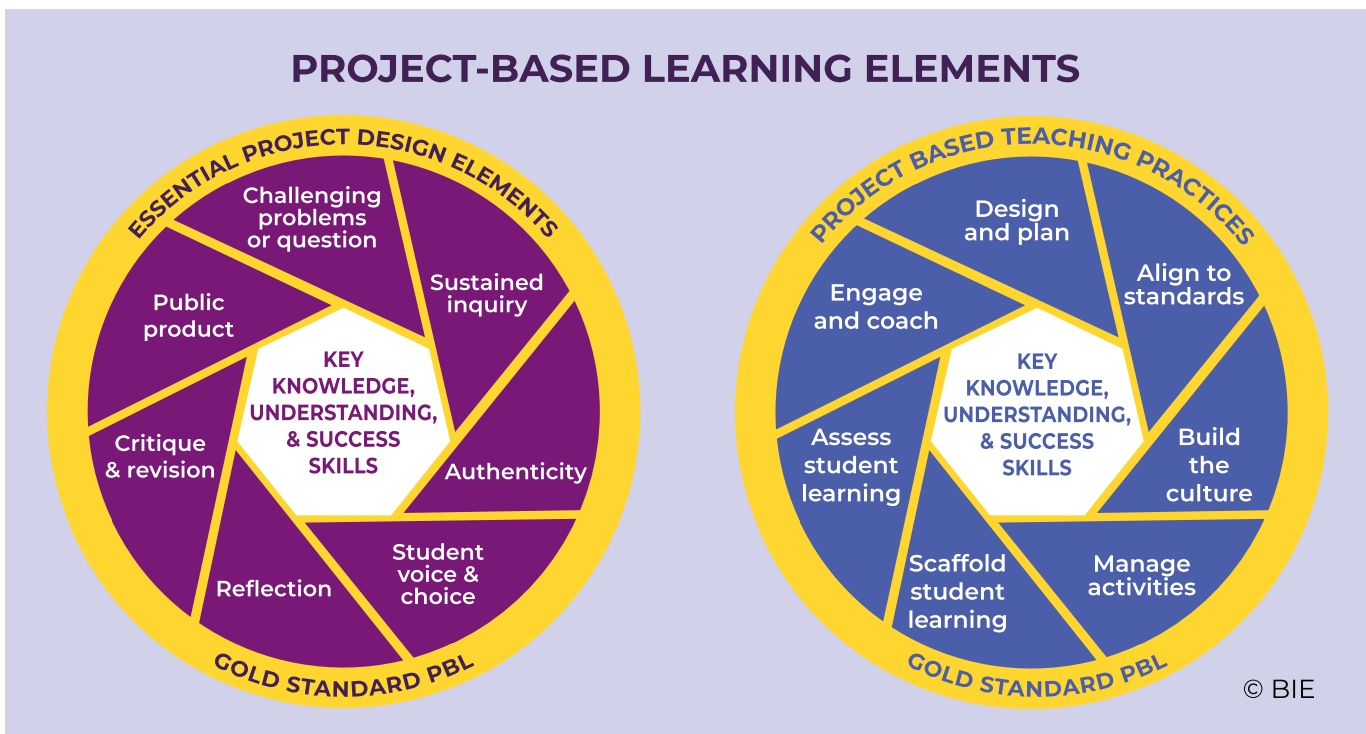
¹ Roger Martin: <https://rogerlmartin.com/meet-roger/i-think-initiative>

The tools¹ that have emerged out of the integrative thinking process are:

- **Pro-Pro:** This problem-solving process does a deep dive into the benefits of opposing models, through the point-of-view of different stakeholders. The Pro-Pro moves one out of debate and into a constructive mode of understanding the logic of different perspectives to create a solution.
- **Ladder of Inference:** A thinking framework that slows down thinking to support metacognition. The Ladder of Inference breaks down how one builds models into data, interpretation and conclusion. Doing this as a team gives space to see what data might be missing, different ways of **interpreting that data and coming to multiple conclusions.**
- **Causal Model:** A framework to understand one's theories and build new ones by diving into the complexity of the situation. Causal Models help one understand what is causing a problem, or what will cause one to achieve a desired solution. From there one can decide on areas for action. The Causal Model stops a group from simplifying, thus leveraging the experiences and knowledge of **everyone around the table, towards deciding on next steps.**
- **Assertive Inquiry:** A conversation framework based on the idea "I have a view worth hearing but I might be missing something." How does one respond to ideas that are different to one's own in real time? While one thinks one is being open and asking questions, one often entrenches oneself in one's perspective and does all one can to defend one's ideas. Assertive Inquiry brings awareness to one's thinking and behaviours that contribute to bad conversations and offers away to engage productively with others.

ESSENTIAL PROJECT DESIGN ELEMENTS

How do we create successful projects? The Buck Institute lists a number of criteria which all contribute to achieving a sound project design:



Challenging problem or question

This is a concrete (or abstract) problem which is real to the learners and is usually problem-based. In other words, the PBL is centred on a research type cycle in which a problem is identified, research is undertaken, investigations are done and some or other solution is the result. "An engaging problem or question makes learning more meaningful for students. They are not just gaining knowledge to remember it; they are learning because they have a real need to know something, so they can use this knowledge to solve a problem or answer a question that matters to them. The problem or question should challenge students without being intimidating." (Buck Institute)

¹ <http://www.rotmanithink.ca/teachers>

Sustained inquiry

PBL is different from the projects currently being set in schools which have not yet embraced rigorous enquiry as a criterion for success. Merely looking up information is not enough: it is too shallow and does not demand active follow up and “testing” which leads to more depth. Sustained enquiry takes time and is taken seriously and it is iterative: “when confronted with a challenging problem or question, students ask questions, find resources to help answer them, then ask deeper questions – and the process repeats until a satisfactory solution or answer is developed.” And, of course, sources of primary and secondary information are broad: from traditional “looking up” research to real-life interviews and field work.

Authenticity

This is critical if we are to keep learners involved: the project must be real, not a simulation of reality. A project can be authentic in various ways, often in combination, e.g. the problem is a genuine problem that the school or community need to solve, e.g. raising money for the Grade 7 Legacy Project. Also: in combination it can be the production of a series of YouTube videos of local heroes to teach learners about entrepreneurship. “Finally, a project can have personal authenticity when it speaks to students’ own concerns, interests, cultures, identities, and issues in their lives.”

Student voice & choice

If students have a say in the selection of the project problem, they work harder because they feel they own it, it speaks to them personally. If there is no personal commitment, the project becomes an exercise with no real value for them.

3 REFLECTION

Creating the opportunity and developing the ability to pause and think about learning

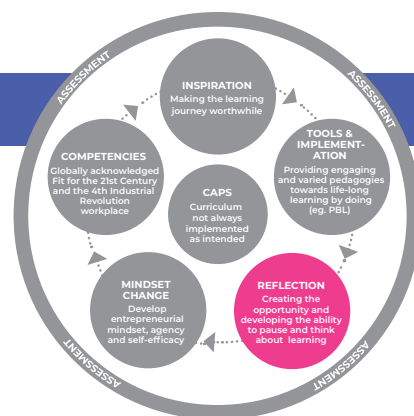
John Dewey’s¹ ideas underpin a great deal of thinking related to PBL, especially the importance of reflection: “We do not learn from experience. We learn from reflecting on experience.” Learners and teachers should be reflecting on various questions during the process: what is being learned, why this learning is important and how the learning is presented. Are they learning about their own learning style?

Reflection should not be a random exercise. Value should be attached to it, not only because it consolidates and internalises key learnings, but also because learners, through reflection, are discovering that their ideas are important as they make meaning of the world around them within a constructivist paradigm.

Reflection also helps learners and teachers develop better PBL skills and attitudes. Dewey writes that reflection “gives an individual an increased power of control” (Dewey, 1933, p. 21). It “emancipates us

from merely impulsive and merely routine activity... It converts action that is merely appetitive, blind and impulsive into intelligent action” (1933, p. 17). It is not enough just to have an experience. Reflection directs that experience to learning and deeper insights.

Reflection requires agency, a growth mindset and a willingness to change. These are all fundamental concepts in the E³ Learning Model. Systemically the schooling process also needs to enable the obvious opportunities for iteration, repetition and learning from mistakes that reflection will reveal. This is still a challenge in the current schooling system.



¹ <https://facultyportfolioresource.weebly.com/uploads/2/1/5/3/2153229/journalkeepingchapter.pdf>

Develop entrepreneurial mindset, agency and self-efficacy

AGENCY

Rather than speaking of The Entrepreneur, E³ chooses to refer to individuals with an entrepreneurial mindset as “Entrepreneurials”. They are people of the search and discovery generation who subscribe to ‘if it’s going to be it’s up to me’. They have a search and discovery opportunity-seeking mindset that drives their purpose in the search for an intersection between their interests and abilities that also serve the needs of their fellow human beings. Entrepreneurials are those who take it upon themselves to solve problems for others. Unlike generational definitions, such as Millennials, Entrepreneurials are not beholden to a particular age group – rather they are beholden to a particular mindset: a common logic that underpins their abilities and actions. They exist within established organisations and/or they create new ones. So personal agency is developed through unlocking a mindset that produces value and usefulness to others.

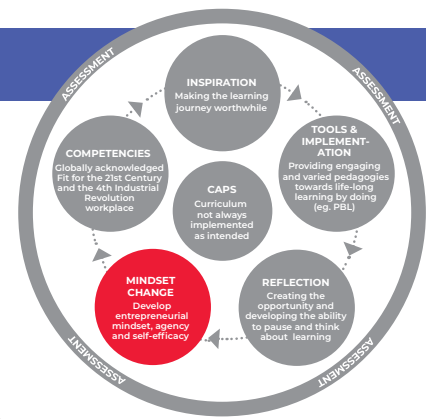
All mindsets have at their base a set of beliefs and assumptions that manifest themselves in espoused values and certain behaviours. If learners have at the base of their assumptions that they are helpless, that life is happening to them, that they should wait for instruction and guidance, they will develop a set of values that will translate into the behaviour of learned-helplessness. This can develop an entitled, passive mindset that does not lead to engagement and purpose-driven behaviour. The entrepreneurial mindset is weighted on the side of mastery orientation rather than a helpless orientation. It is the work of the E³ pedagogy to ensure that learners believe that they are able and that they have **personal agency**. It is these assumptions that will create their values and determine their behaviours as they make their choices during and after school. Like all skills this mindset can be achieved through practice and repetition and it is for this reason that the pedagogical constructs underpinning E³ should be implemented from as young an age as possible. Individual-agency and more particularly the learner’s sense of their agency is at the crux of what constitutes an entrepreneurial mindset. It is made up of a number of key ingredients:

Growth mindset

The first ingredient is to create the open-mindedness towards a growth mindset. It is a key element that learners should be able to overcome a fixed mindset and the belief that their intelligence, talent and abilities are immutable. Dr. Carol Dweck demonstrates the positive impact on individual motivation and achievement when learners believe that they can grow and develop through action and effort by focusing on their learning instead of externally dictated performance goals. This is obviously key in an educational context and particularly apposite in our South African context where the belief in our abilities is at an all-time low. Entrepreneurials embrace the growth mindset in the pursuit of knowledge and invest effort in order to learn and shape their ideas. This is the mindset that E³ seeks to embed in all learners.

Intrinsic motivation

Much work has been done on the concept of intrinsic motivation and it is another key element contributing to a sense of personal agency. Particularly the work of Deci and Ryan in their self-determination theory provides strong methodology for a deeper understanding of how entrepreneurial thought and action ties to intrinsic motivation. People with an entrepreneurial mindset tend to learn implicitly, taking in information without an awareness of gaining tacit knowledge which can be difficult to transfer to others. When asked what they know, so-called ‘entrepreneurials’ often cannot explain how they achieved their success. By researching the implicit nature of this method of learning, we come to understand how an entrepreneurial mindset is developed over time and without conscious effort. It is this intrinsic motivation to find new, useful, and more knowledge that leads to life-long learning and the pursuit of solutions and purpose that is at the heart of the ‘entrepreneurial’ who may or may not be an actual entrepreneur..



Internal locus of control

A further element of personal agency is that of internal locus of control. It is the social theory expounded by Dr Julian Rotter and others, which describes the psychology behind how individuals perceive their agency as they interact with their environment. Locus of control is a core concept behind the entrepreneurial mindset as those with an internal locus of control believe that they have the ability to influence their outcomes, rather than let their circumstances determine the course of their lives.

With the history that has shaped South Africa and the consequences of decades of colonisation and apartheid control, it is not surprising that generally South Africans do not have strong loci of control. It is a country that has been dominated by power figures whether that be the leaders, the ministers, the teachers, the parents.

Learners are at the bottom end of that continuum with 13 years of conditioning to listen to authority unquestioningly and receive knowledge and instruction indiscriminately. An internal locus of control gives the individual the permission to grasp their own agency and, combined with a growth mindset and intrinsic motivation, they can begin to question this authority and to determine their own purpose and path.

Regulation of emotions



Resilience has long been accepted as a critical component of the entrepreneurial mindset. It can also be framed as the ability to regulate emotions in order to cope with ambiguity and to deal with challenges and set-backs. These adverse events could be failing a school test or having a failed business or even relationship. It is about how the growth mindset is able to cope with this that creates the entrepreneurial quality. Again this mindset is underpinned by the assumptions and beliefs that are at the base of the reaction to an event. Should an adverse event occur, the belief that one holds about that event plays itself out in emotional consequences. It is at this stage that resilience enables the individual to confront, reflect, and dispute these probably irrational beliefs and to create new ones. Martin Seligman, regarded as the father of positive psychology, takes this further by showing the effects of an optimistic explanatory style – by being able to see challenges as temporary and fixable and then to frame them (i.e. challenges) in language that is positive. This falls directly in line with how the entrepreneurial mindset can positively impact an individual's motivation, performance, and resiliency to enhance human potential.

SELF-EFFICACY

Dr Albert Bandura's social cognitive theory of human functioning forms much of the research-based psychological underpinning of the entrepreneurial mindset. His work demonstrates that human functioning is deeply related to individual and collective agency, and that self-efficacy empowers individuals to create their own future through their actions, despite their circumstances. This concept of self-efficacy is critical to understand in order to be able to create effective pedagogy to ensure individual agency. The crucial idea here, however, is that it is not the actual abilities of learners that matters, but rather what their beliefs in their abilities are. The sense of personal agency matters more than actual agency.

Success

The mechanisms to achieve agency provide a powerful framework for how teaching can be instrumental in this process too. These are coupled with the notion mentioned earlier that performance and motivation are partly determined by how effective people believe they can be. Mahatma Gandhi put it so succinctly: "If I have the belief that I can do it, I shall surely acquire the capacity to do it even if I may not have it at the beginning".

So the most important mechanism to achieve agency is the experience of the performance outcome. If learners experience failure, they will experience a diminishing of self-efficacy. If they perform well, they are more likely to feel confident to perform well in the future.

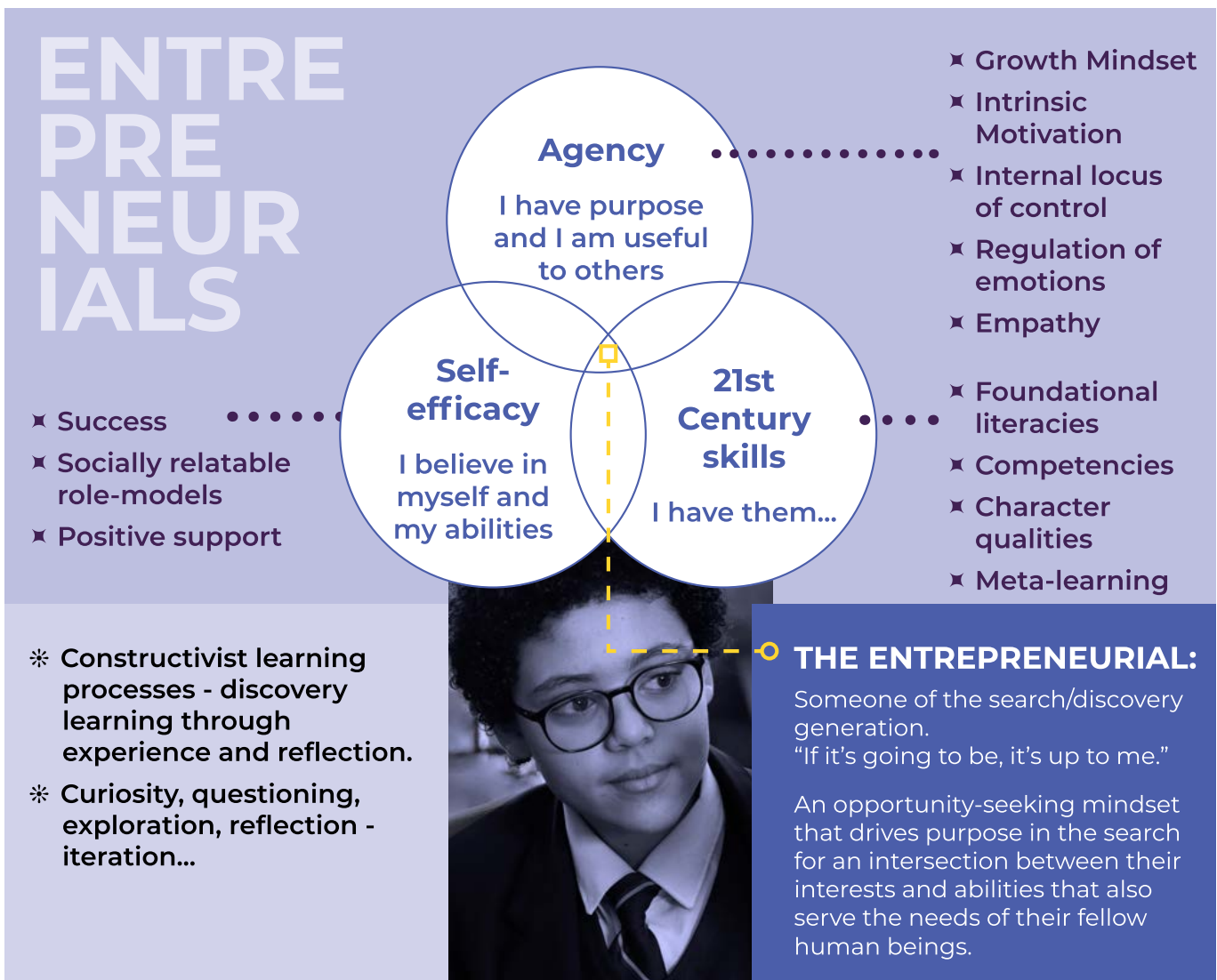
Combined with a growth mindset it is possible to increase self-motivated persistence when the situation is viewed as an achievable challenge. "Success builds a robust belief in one's personal efficacy. Failures undermine it, especially if failures occur before a sense of efficacy is firmly established." Albert Bandura (1997). The link to schools, assessments and exams are obvious here when one considers the effects of failure on the development of belief in self-efficacy and agency at a young age when these factors are yet to be established.

Socially relatable models

Vicarious experience or the observation of socially relatable models are crucial to the development of self-efficacy. Watching a person in a similar position perform and then comparing one's own competence with the other's skills can influence self-efficacy. If a person sees someone similar to them succeed it can increase their own self-efficacy. The reverse is also true. Mentoring or being exposed to successful people with the same profile and skills set can be a powerful contributor to self-efficacy and agency.

Positive support

Verbal persuasion and positive support are also influencing factors. In addition, the level of credibility directly influences the effectiveness of the verbal persuasion. If the person has an established, respected position the influence will be stronger. If one considers the critical role of the teacher in the lives of learners as established, respected authority figures, one can see the impact that positive verbal persuasion and mentoring can have on the child. Self-efficacy is possible through the taste of success, the support of a "cheerleader", the exposure to socially relatable role-models and the ability to regulate emotions in the face of challenges and set-back. All this is in the context of the changing world, the 4IR and the intelligences and characteristics and competencies that are required for life-long learning and the ability to interact with the uncertainty of this changing world.



5

COMPETENCIES

Globally acknowledged;
fit for the 21st century and
the 4IR workplace

Globally we are on the edge of a mammoth revolution in technology and it is critical as educators that we prepare for it. The scale of the changes will change the way we buy and sell, are transported, learn ... in fact the way we live will change drastically. The scale and complexity of the revolution will be “unlike anything humankind has experienced before.”

Teachers and schools must prepare a way of responding in an integrated and all-embracing manner or else our learners will be left behind. E³ Learning Model is part of the response required.

This is not the first industrial revolution to hit us. There have been three before this one:



The **First Industrial Revolution** is aligned with the invention of the use of water and steam power to mechanize production.



The **Second Industrial Revolution** is characterised by the use of electrical power to mass produce.



The **Third Industrial Revolution** is known as the digital age as technology and information are used to facilitate production.



The **Fourth Industrial Revolution** started in the middle of the last century but is only beginning to realise today. It is often referred to as the internet of things and artificial intelligence and it is characterised by a mass of technologies that is “blurring the lines of the physical, digital, and biological spheres.” And, the speed of change is exponential. By the time our current learners leave school, the world as they knew it will no longer exist.

Unless learners have had some insights on these changes and how to respond, they shall be out of their depth.

Already artificial intelligence is upon us. Think of self-driving cars, drones, robots doing the work of people in some industries (i.e. virtual assistants). 3-D printing is already well-established while many schools still believe that their photocopier is their greatest asset!

CHALLENGES AND OPPORTUNITIES

For many, especially those who have been able to access technology freely, these concepts do not seem alien as they already bank, buy and sell and book flights using the internet. They have seen drones in action (albeit in movies) and have probably also been exposed to robotics and 3-D printing.

But for most South African children the world outside the safe confines of their schools and homes will be a huge challenge. Schools have to prepare them for responses to an unknown world. If they are able to embrace this world with confidence, the opportunities are enormous: costs, especially in transport and communication will reduce, markets will be opened globally, and the cost of buying and selling will drop. Especially for entrepreneurs, the forecast is good and thus, by implication, an ability to tap into these opportunities will encourage small enterprise development. In turn, the unemployment rate is likely to drop – if our learners are ready for the challenge.

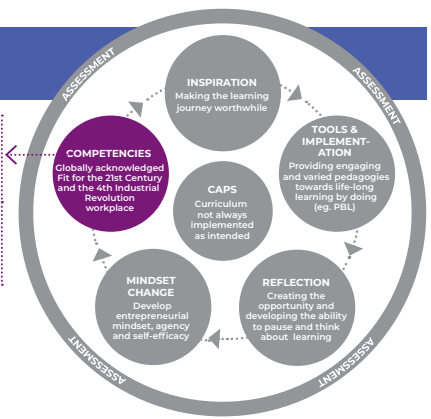
The goal of the DBE’s competence-base curriculum is that learners should leave school with the developmental capacity to:

- interactively mobilize and ethically use information, data, knowledge, skills, values, attitudes and technology, to
- engage effectively and across diverse 21st century contexts, to
- attain individual, collective and global good.

CHARACTER
Citizenship,
curiosity,
resilience

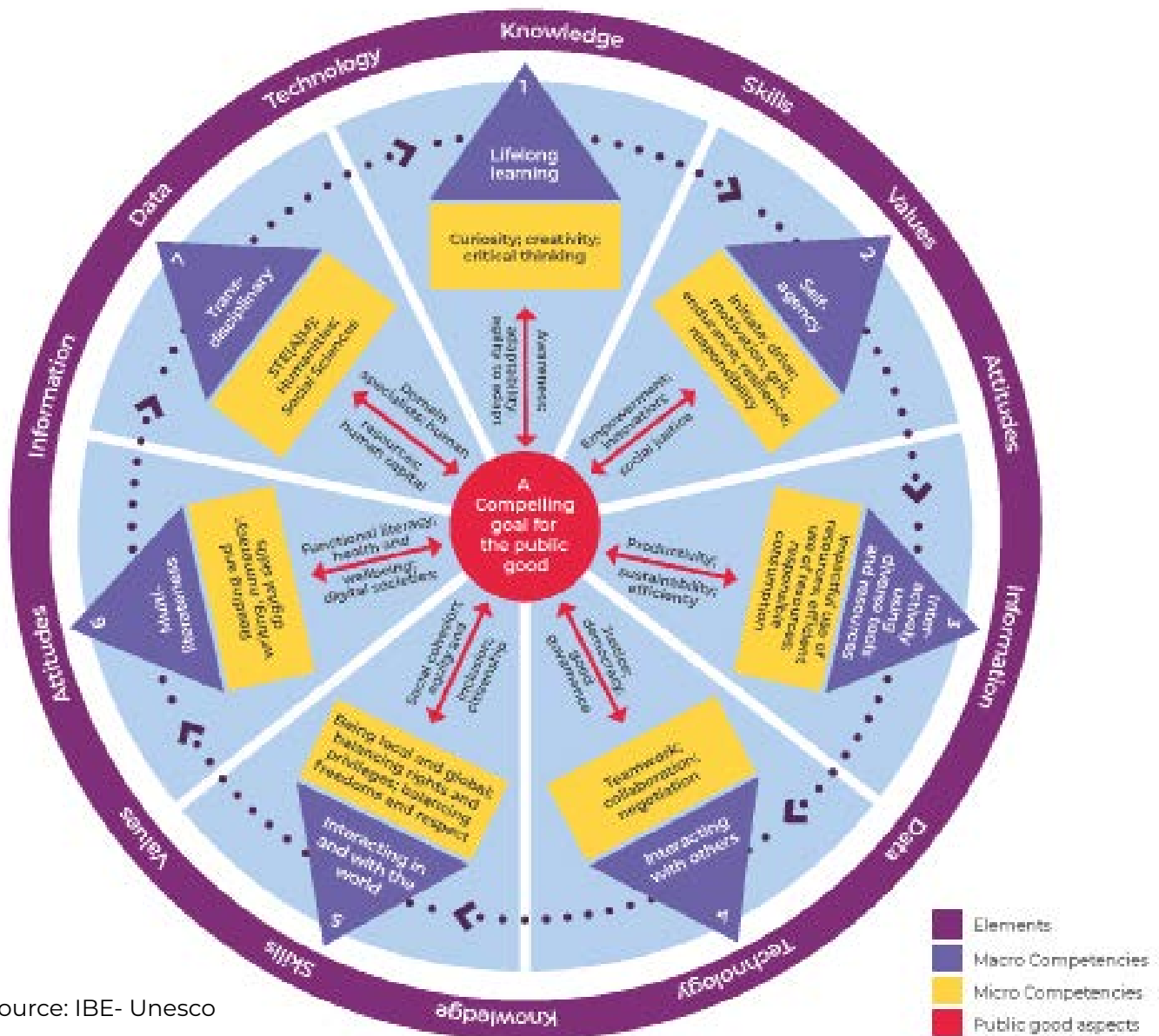
THINKING
Creativity,
critical thinking,
reasoning

CONNECTION
Collaboration,
communication,
empathy



The DBE has adopted the following UNESCO framework of the International Bureau of Education to guide the development of this in every subject and in every class and grade.

Competence-based framework



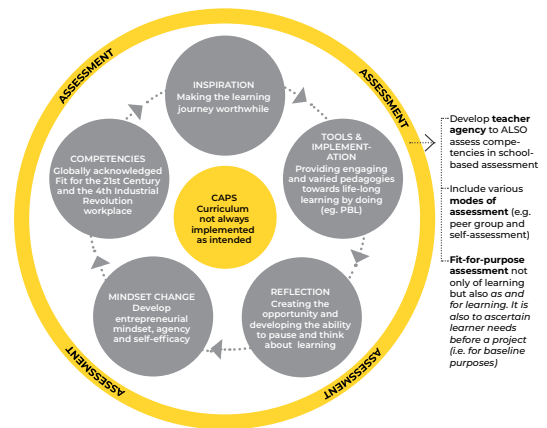
Based on the UNESCO model and a number of others, E³ has adopted its own simplified version of what competencies are critical for the teachers to activate in learners. This framework has been graphically adapted by E³ and has been further simplified based on the need for educators to be able to easily assess and implement the development of these competencies in the classroom. (See Appendix 1 for a detailed Literature Review of the competencies and the attention they are receiving globally).

E³ has simplified core elements of the above and other models to facilitate understanding by teachers. The basic elements are the need to develop **character** (through citizenship, curiosity and resilience); **thinking** (through creativity, critical thinking and reasoning) and **connection** (through collaboration, communication and empathy).

Assessment in project-based learning

PBL is most effective when four types of assessment are carried out:

- Baseline assessment (before project starts) to ascertain where/which learners may need assistance to ensure that they are successful
- Continuous assessment (during the project), after a step of the project has been completed to ensure that the problem-solving strategy is working
- Summative assessment (after the whole project has ended) to ensure that learners' learning has deepened as they now have a helicopter view of the process
- Process assessment in which the teacher assesses the PBL process and her own competence in implementing the project, every step of the way. This forms part of training teachers in participative action research.



Assessment in Project-based Learning is generally continuous - as a segment of work is completed, learners and teachers stand back and reflect on the efficacy of that part of the work in solving the problem and embedding small chunks of learning (i.o.w. assessment for learning, during learning). However, assessment, especially in the higher grades, has to test depth and skills, but covering a larger chunk of work (i.o.w. assessment of learning, after learning, i.e. summative assessment).

Baseline assessment is critical as the empathetic teacher knows that no learner may be left behind. Learners who are struggling are offered assistance on-the-spot so that they do not embark on the project with a deficit. Baseline assessment also offers the teacher information which may assist her in grouping learners for maximum productivity and empowerment.



The E³ programme has selected Term 3 as the term in which projects are being implemented because the formal assessment task as required by the CAPS is a project. This means that the project in the PBL programme is not an add on, but part of the CAPS, i.o.w. teachers are covering the same content, but the content is unpacked in the steps of the project, i.o.w. an exciting change in pedagogy but achieving the same outcomes and satisfying the same assessment requirements.

E3 are continually in consultation with the DBE and whenever there is a request for comment the E3 team contribute to change in terms of policy and approach. The E3 team have already commented on the need for assessment to include a tracking mindset change. This remains an international challenge!



APPENDIX 1 - LITERATURE REVIEW

1. DEFINITION OF 21ST CENTURY SKILLS AND COMPETENCES: WHAT SHOULD WE LEARN?

Around the world, growing calls for new frameworks and approaches to teaching and learning are largely based on the assertion that education has failed to prepare learners for the demands of the 21st century (Kereluik et al. 2013, 128). According to Saavedra and Opfer (2012) "container-title": "Phi Delta Kappan", "page": "8-13", "volume": "94", "issue": "2", "source": "DOI.org (Crossref, the "outdated transmission model of education, through which teachers transmit factual knowledge to students via lectures and textbooks, remains the dominant approach to compulsory education in much of the world". Through this model, students can learn information, but typically don't have much practice applying the knowledge to new contexts, communicating it in complex ways, using it to solve problems, or using it as a platform to develop creativity (Saavedra and Opfer 2012, 9)" container-title": "Phi Delta Kappan", "page": "8-13", "volume": "94", "issue": "2", "source": "DOI.org (Crossref. The traditional model of education emphasizes routine, rule-based knowledge and is based on the assumption that memorizing information and regurgitating it represents knowledge acquisition, which can then be deposited, stored and used at a later date (Hooks 1994, 5; OECD 2012, 34).

Education literature has long recognized that this traditional model of education is ill-suited for our current context. Furthermore, as indicated in Chapter 2, 21st century learning and entrepreneurship education have become the leading imperatives in the discourse about education reform, and their implementation is intended to move us away from traditional approaches. However, despite this, national education systems have proven stubborn and slow to adapt to change. In the South African context, although a series of curriculum reforms have been implemented in an attempt to shift the education status quo and respond to the demands of the 21st century; there remains a huge gap between what is intended by education policy makers, scholars and practitioners; what is actually learned in South African classrooms and learner outcomes.

It is worth noting at this stage that this gap between what curriculum reformers intend and what actually happens in learning environments is not unique to South Africa. In fact, in order to better understand some of the challenges that different countries face with integrating 21CC into national curricula, many scholars and policy-makers make the distinction between the intended, implemented and attained curriculum (Voogt and Roblin 2012, 301). The argument made is that, although countries may recognize the need for 21st century education approaches and make the necessary shifts in policy and law, these may not necessarily translate into school and classroom contexts and lead to tangible outcomes. Voogt and Roblin (2012) say the following in relation to the gaps between the intended, implemented and attained curriculum:

The 21st century competencies needed in the knowledge society can be regarded as the overall rationale and goals for learning—i.e. the intended curriculum. However, there may be a gap between the needs of the knowledge society expressed by the advocates of 21st century competences and the ways in which these competences are addressed in national and school curricula— i.e. the implemented curriculum. Finally, appropriate assessment practices need to be in place to be able to determine whether expected learning outcomes are achieved—i.e. the attained curriculum.

The implication then is that it is important to clearly distinguish between these three aspects of education delivery, so that the education problem in the 21st century context, and the solution space, are more clearly defined. Put differently, the distinction between the intended, implemented and attained curriculum highlights the fact that when states think about integrating 21CC into their curricula, they ought to be thinking at three levels, namely: at the level of curriculum policy and statements; at the level of pedagogy and at the level of assessment. Bearing in mind the distinction between these three, this chapter discusses what 21CC are; what the dominant frameworks and approaches are (i.e. the overall rationale and goals for learning) and how this applies to the South African context. Curriculum implementation/pedagogy and assessment are discussed in Chapters 4 and 5.

1.1 The Learning Agenda for the 21st Century

It is clear in the literature that the 21st century learner requires more than rote learning and memorization of routine knowledge in order to be able to grapple with the ambiguities and contradictions of a world that is constantly and rapidly changing. The OECD summarizes the predominant views about the characteristics of learning in the 21st century by saying that, it is about "curiosity and self-direction, managing non-linear information structures, building one's own mental representation of and synthesis of information, (finding) one's own way through hypertext on the internet...and developing healthy skepticism, an inquiring mindset and interpreting and resolving conflicting pieces of information" (OECD 2012, 34). In today's world, individuals create value by synthesizing disparate bits of information and making connections between ideas that previously seemed unrelated. The world is also no longer divided into specialists and generalists, but requires being familiar with and receptive to knowledge in different fields (OECD 2012, 34). The knowledge worker is therefore versatile and able to apply depth of skill to a progressively widening scope of situations and experiences, whilst gaining new competencies, building new relationships and assuming new roles (OECD 2012, 34).

The nature of what is required of the 21st century learner and knowledge worker today, combined with a lack of

confidence that current education systems are not preparing learners to meet present and future realities, has led to countries now being more explicit about “new learning domains” and including them as specific goals of the education experience (Care et al. 2018, 8). These new learning domains have been referred to as “21st century competencies/skills/values/attitudes/ethics”; “soft skills”; “life skills”; “social-emotional skills”; “intra-personal and inter-personal skills”; “global competences” etc. depending on the context and jurisdiction. In addition, several international organizations and individual scholars have developed various frameworks, which provide different descriptions and accompanying specifications of what these new learning domains entail (Voogt and Roblin 2012, 301).

The term “21st century skills” is the most popular and has typically been open to some interpretation, again in different contexts and jurisdictions. However, it is generally considered to denote a combination of skills that are important in a modern society and workforce (Care et al. 2018, 8). The terms “transferable” or “transversal” competencies has also been used and encompass some of the same skills that can be applied across multiple situations, in contrast to technical vocational skills, which are specific to particular occupations (Care et al. 2018, 8). In some regions and frameworks, the term also refers to a combination of interpersonal and intrapersonal skills, which may include emotional characteristics, attitudes, and values. In this paper, we are concerned with the “learnable and teachable competencies” that have been identified by countries; international organizations and education scholars and practitioners around the world, as central to the aspirations of building relevant and responsive schooling systems.

Although there is a diverse range of competencies that have been identified in the literature, 21st century competencies generally include skills such as critical thinking, collaboration, communication, problem solving, and digital literacy. For convenience, throughout this paper, we refer to these transferable or generalizable skills as 21CC. There are many reports and research papers that discuss the difficulties in terminology, labeling, and frameworks and structures of 21CC. Although this paper will touch on some of these difficulties, its aim is not to make a choice about what specific knowledge, skills, attitudes, values, and character should be sought. It similarly does not engage in the evaluation of the adequacy of particular frameworks and structures.¹ This paper is focused on identifying the competencies that are most frequently cited in the literature as important to modern society and labour, and then uses these to determine the implications for curriculum, pedagogy and assessment in the South African context.

1.2 Dominant 21CC. Frameworks and Approaches

This subsection synthesizes the literature on 21st century and entrepreneurship education, in an effort to map the different frameworks and approaches to 21CC, tracing the commonalities between dominant approaches in order to understand the claims that are made about what competences are integral to 21st century learning. Since a lot of work has already been done to summarize and understand different frameworks and approaches, our discussion relies mainly on secondary sources.

1.2.1 Country Approaches

A large-scale study, which maps countries' expressions of aspirations to equip students with 21CC was conducted by the Optimizing Assessment for All (OAA) initiative between the years 2016 and 2018. The study found that there has been a significant shift in countries' explicit identification of 21CC as part of their national education agendas and priorities (Care, Griffin, and Wilson 2018).
collection-title: "Educational Assessment in an Information Age", publisher: "Springer International Publishing", source: "www.springer.com", abstract: "This book provides a detailed description of research and application outcomes from the Assessment and Teaching of 21st Century Skills project, which explored a framework for understanding the nature of these skills. The major element of this new volume is the presentation of research information from the global assessment of two 21st century skills that are amenable to teaching and learning: collaborative problem solving, and learning in digital networks. The outcomes presented include evidence to support the validity of assessment of 21st century skills and descriptions of consequent pedagogical approaches which can be used both to teach the skills and to use them to enhance key learning goals in secondary education systems. The sections of the volume are connected through a focus on the degree to which innovative assessment tasks measure the constructs of interest. This focus is informed by conceptual and methodological issues associated with affordances of 21st century computer-based assessment. How understanding of the nature of the skills, as derived from these assessments, can guide approaches to the integration of 21st century skills in the classroom, is informed by initiatives adopted by participating countries. The guiding questions in this volume are: "Do the assessment tasks measure the constructs?" and "What are the implications for assessment and teaching in the classroom?" It is the third volume of papers from this project published by Springer.", URL: "https://www.springer.com/gp/book/9783319653662", ISBN: "978-3-319-65366-2", title-short: "Assessment and Teaching of 21st Century Skills", language: "en", editor: [{"family": "Care", "given": "Esther"}, {"family": "Griffin", "given": "Patrick"}, {"family": "Wilson", "given": "Mark"}], issued: [{"date-parts": [{"2018}]}], accessed: [{"date-parts": [{"2019", "9", "12"}]}], schema: "https://github.com/citation-style-language/schema/raw/master/csl-citation.json".

¹ For review of frameworks, see Dede (2010) and current work being undertaken at Harvard [<https://easel.gse.harvard.edu/taxonomy-project>].

However, the degree to which these expressions have translated into implementation varies across countries. In the study, the extent to which countries have moved toward implementation of 21CC curricula was explored through several indicators, namely:

- Whether a country identified specific 21CC in their education mission, vision statements, or associated policy documents, such as national education plans (which indicates a country’s social and economic goals or values);
- Whether a country identified specific 21CC within the curriculum (which indicates what competences governments value); and
- Whether a country described how 21CC develop and progress over time from basic to more complex forms and through the different education levels (which suggests an intention to develop and teach these skills) (Care et al. 2018, 8).

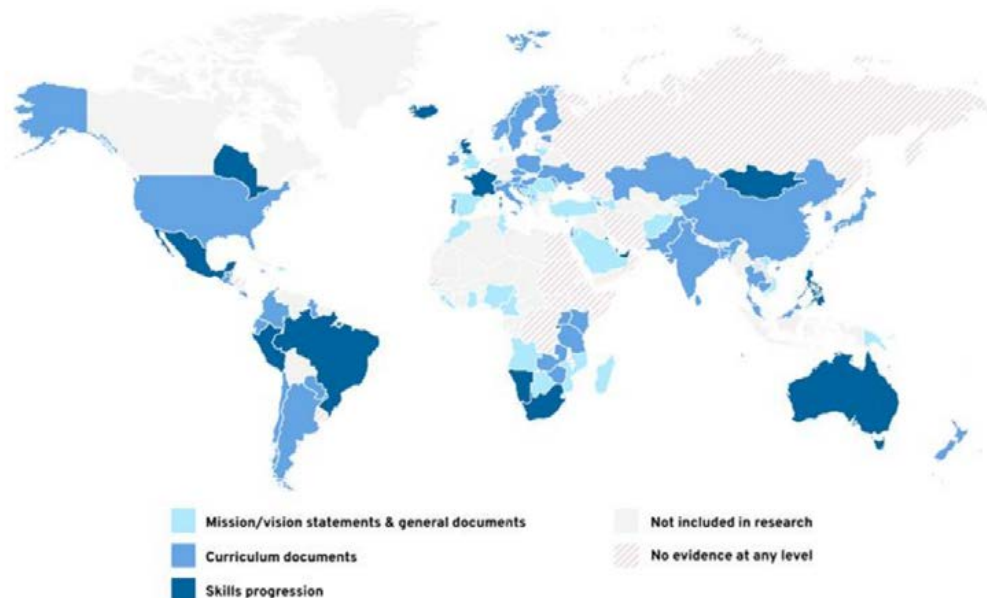
Figure 1 shows that of the 152 countries for which data was collected:

53 (35 percent) countries—including Spain, Morocco, Madagascar, and Dominican Republic—identified specific skills in their mission or vision statements and/or general policy documents but not in their curricula (although in some countries, curricula were unavailable online). Fifty-eight (38 percent) countries—including Chile, Norway, India, New Zealand, and Zambia—have specific skills embedded within their curricular documents, but do not show evidence of progressions of skills. Only 17 (11 percent) countries—including Australia, Mexico, Singapore, Iceland, and United Arab Emirates—provide descriptions of how skills develop and progress over time, and across different educational levels. In 25 (16 percent) countries—including Iran, Russia, Democratic Republic of Congo, and Egypt—there was no evidence of the presence of any of the three indicators described above (Care et al. 2018, 8).

The four most frequently identified competencies within national policy documents across the 152 countries were **communication, creativity, critical thinking, and problem solving**. Other skills identified include **information technology, social, and entrepreneurship skills** (Care et al. 2018, 9). The data indicates that countries are explicitly identifying a wide range of 21CC as integral to their curricula, moving beyond the primacy of academic knowledge (Care et al. 2018, 9).

It is worth noting that the above study only focused on publicly available information, which is a limitation because countries may have national policy documents that identify 21CC, but do not make these available online to the public (e.g., national curriculum may not be online), and/or the information available online may not be up to date (Care et al. 2018, 9). Nevertheless, what the study shows is that countries around the world are moving toward an explicit focus on equipping learners with a broad range of competences for the 21st century.

Figure 1: Explicit identification of skills in national documents across 152 countries

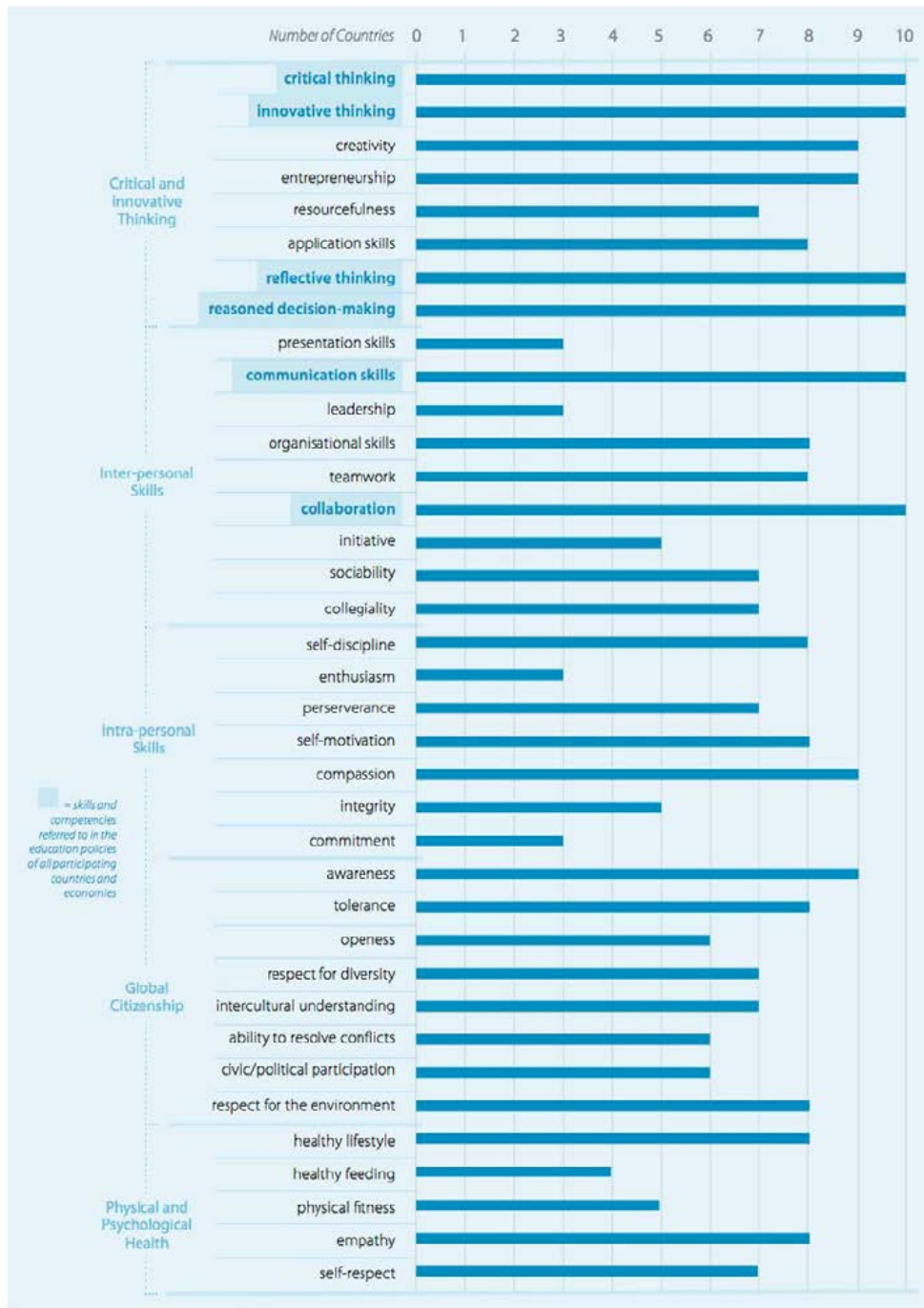


Source: (Care et al. 2018, 9)

To further portray this shift in country policy and awareness around 21CC, Care et al. (2018) discuss another set of studies conducted by the Asia-Pacific Education Research Network (ERI-Net) and UNESCO, which focused on shifts towards competency-based approaches at a regional level. In the three studies, the ERI-Net set out to explore the uptake of “transversal competencies” by national education systems in the Asia-Pacific region (Care et al. 2018, 10). The ERI-Net drew on a group of 10 – 11 country cases, varying the group of countries slightly across the three studies. Participating countries included Australia, China (Shanghai; Beijing), Hong Kong SAR, India, Japan, Republic of Korea, Malaysia, Mongolia, Thailand, Viet Nam, and the Philippines. The three ERI-NET studies were then followed by two additional UNESCO studies implemented through the Network on Education Quality Monitoring in the Asia-Pacific (NEQMAP) (Care et al. 2018, 10). These explored the assessment of transversal competencies and drew on the three previously ERI-Net studies, as well as Cambodia, Nepal, and Pakistan.

Figure 2 below captures the transversal competencies (or 21CC) that participating countries indicated they value. Notably, none of the countries in these studies mentioned acquisition of knowledge and “cognitive skills” as the primary goals of education. The most cited 21CC were **critical, innovative, and reflective thinking; reasoned decision-making; communication;** and **collaboration** (Figure 2). However, there were additional competencies that were unique to specific countries and which tended to be more strongly associated with attitudes, values, and ethics (Care et al. 2018, 10).

Figure 2: Number of countries and economies by skills and competencies



Source: (Care et al. 2018, 11).

Based on the most commonly cited competences, the ERI-Net then developed a framework to group and define the competencies that were most valued by countries participating in the study (Table 1).

Table 1: ERI-Network Definition of Transversal Competencies (21CC)

Learning Domains	Examples of key skills, competences, values and attitudes
Critical and innovative thinking	Creativity, entrepreneurship, resourcefulness, application skills, reflective thinking, reasoned decision-making
Interpersonal skills	Communication skills, organizational skills, teamwork, collaboration, sociability, collegiality, empathy, compassion
Intrapersonal skills	Self-discipline, ability to learn independently, flexibility and adaptability, self-awareness, perseverance, self-motivation, compassion, integrity, self-respect
Global citizenship	Awareness, tolerance, openness, responsibility, respect for diversity, ethical understanding, intercultural understanding, democratic participation, conflict resolution, respect for the environment, national identity, sense of belonging
Media and information literacy	Ability to obtain and analyse information through ICTs, ability to critically evaluate information and media content, ethical use of ICTs
Others (e.g., physical health, religions)	Appreciation of healthy lifestyle, respect for religious values

Source: (Care et al. 2018, 12)

The above global and regional studies show that, although different countries may value and emphasize different 21CC, and may classify and categorize them in different ways, there are competences that are commonly recognized as integral to a 21st century curriculum across different countries.

1.2.2 International Organizations and Scholar Approaches

As countries have shifted towards a common understanding that national education systems need to become “21st century ready”, so have different international organizations, multilateral agencies, global education communities and individual scholars—who have joined the clarion call for the integration of competency-based approaches in national education curricula. Similar to country and regional approaches, there has also been some diversity in expression and emphasis among them about what constitutes 21CC and what a 21st century education looks like in practice. However, there now appears to be some convergence between these different actors about what these competences are, as well as the enabling pedagogical approaches that are likely to foster them (Voogt and Roblin 2012, 301; Tan et al. 2017, 425).

Table 2 below captures some of the dominant international frameworks that have been developed by education and economic organizations, and the manner in which they have grouped and prioritized different 21CC. These organizations include the Partnership for 21st Century Skills (P21); the National Academy of Sciences’ Education for Life and Work; the Assessment and Teaching of 21st Century Skills (ACT21S); the OECD and the World Economic Forum (WEF).

Similar to the national and regional frameworks discussed above, **critical thinking, problem solving, creativity, collaboration** and **communication** feature prominently in the international frameworks depicted in the table. Socio-emotional and lifelong learning aptitudes, such as **positive self-concept, adaptivity** and **resilience** are also expressed in different ways by the different organizations.

The fact that there are commonalities between national, regional and international frameworks with respect to what competencies should be developed through education shows that there is a convergence towards integrating 21CC. However, the manner in which these frameworks emphasize, prioritize, categorize and classify competences differently means that there is not yet a common language to define them. Important concepts, such as knowledge, competencies, skills and abilities are also contested. What denotes knowledge? How is this different from a competence, a skill or an ability? These are questions that do not have clear-cut answers in the literature, which has an impact on how 21CC are understood, supported and sustained within national education systems.

Table 2: Overview of International 21CC Education Frameworks

Sources: (Tan et al. 2017; Soffel 2016)

Partnership for 21st Century Skills	National Academy of Sciences' Education for Life and Work: Developing Transferable 21st Century Knowledge and Skills	Assessment and Teaching of 21st Century Skills (ACT21S)	OECD Definition and Selection of Competencies (DESeCo)	World Economic Forum
Learning and Innovation Skills Creativity and Innovation Critical thinking and Problem Solving	Cognitive Competences Cognitive Processes and Strategies Knowledge Creativity	Ways of Thinking Creativity and Innovation Critical Thinking, Problem-Solving and Decision-Making Learning to Learn, Meta-Cognition	Using Tools Interactively Use language, symbols and texts interactively Use knowledge and information interactively	Foundational Literacies Literacy Numeracy Scientific literacy ICT literacy Financial literacy Cultural and civic literacy
Information, Media and Technology Skills Information Literacy Media Literacy ICT Literacy	Inter-personal competencies Teamwork Leadership	Tools for Working Information Literacy ICT Literacy	Interacting in Heterogeneous Groups Relate well with others Cooperate, work in teams Manage and resolve conflicts	Competencies Critical thinking/problem solving Creativity Communication Collaboration
Learning and Innovation Skills Communication Collaboration	Intra-personal competencies Intellectual Openness Work Ethic, Conscientiousness Positive Core Self-Evaluation	Ways of Working Communication Collaboration, Teamwork	Acting Autonomously Act within big picture Form and conduct life plans and personal projects Defend and assert rights interests, limits and needs	Character Qualities Curiosity Initiative Persistence/grit Adaptability Leadership Social and cultural awareness
Life and Career Skills Flexibility, Adaptability Initiative, Self-Direction Social, Cross-Cultural Skills Productivity, Accountability Leadership, Responsibility		Living in the World Citizenship (local and global) Life and Career Skills Personal and Social Responsibility (including social awareness and competence)		

In an effort to grapple with this challenge, different scholars have engaged in studies to examine prominent 21CC frameworks and approaches and, based on these, developed their own frameworks to address some of the problems with definition, categorization and classification of these competencies. There are many studies that do this work, but we focus on the work of Voogt and Roblin (Voogt and Roblin 2012) and Kereluik et al. (Kereluik et al. 2013) as points of entry.

Voogt and Roblin's study examines the frameworks of 8 organizations in an effort to gain better insight into the similarities and differences between international 21CC frameworks ("horizontal consistency") and the coherence between intentions, implementation and assessment of outcomes ("vertical consistency"). The 8 frameworks include those developed by the P21, ATCS and OECD (which are captured in Table 2 above) and 5 others. Similar to the studies discussed previously, the authors found that there were strong agreements on the need for com-

petencies in the areas of **communication, collaboration, ICT-related competencies** and/or **cultural awareness** (Table 3). **Creativity, critical thinking, problem-solving** and the **capacity to develop relevant and high-quality products** were also found to be highly regarded 21CC by most of the frameworks. The main differences found in the frameworks were in relation to competencies that are related to core subjects and especially whether or not to consider them, or the core curriculum, when defining 21CC.

Table 3: Summary of 21cc Found in Global Frameworks

Mentioned in <i>all</i> frameworks	Mentioned in <i>most</i> frameworks	Mentioned in a <i>few</i> frameworks	Mentioned in <i>only one</i> framework
Collaboration	Creativity	Learning to learn	Risk-taking,
Communication	Critical thinking	Self-direction	Manage and solve conflicts
ICT literacy	Problem-solving	Planning	Sense of initiative and entrepreneurship
Social and/or cultural skills, citizenship	Develop quality products/productivity	Flexibility and adaptability	Interdisciplinary themes
		Mathematics, communication in mother tongue, science	Core subjects: economics, geography, government and civics
		History	

Source: (Voogt and Roblin 2012, 309)

Voogt and Roblin (2012) also dedicate considerable discussion to ICT, which lies at the core of all 21CC frameworks. They point out that:

the development of ICT is not only regarded as an argument for the need of new competences by all frameworks, but it is also associated to a whole new set of competences about how to effectively use, manage, evaluate, and produce information across different types of media. While some frameworks emphasize ICT-related competences as separate learning domains, others call attention to more integrative approaches where the development of ICT skills is embedded within other 21st century competences, such as critical thinking, problem-solving, communication, and collaboration ((Voogt and Roblin 2012, 309).

The authors then provide useful definitions for what is meant by ICT-related competencies, according to the different frameworks. They highlight that, when defining ICT-related competences, most frameworks refer to three types of literacies: information literacy, technological literacy and ICT literacy. These are summarized in Table 4 below.

Table 4: Definitions of ICT-Related Competencies

ICT-Related Competence	Description
Information literacy	The capacity to access information efficiently and effectively; to evaluate information critically and competently and to use information accurately and creatively (<i>American Association of School Librarians and Association for Educational Communications and Technology 1998</i>).
Technological Literacy	The capacity to use, understand, and evaluate technology, as well as to understand the technological principles and strategies needed to develop solutions and achieve goals (<i>U.S. Department of Education 2010</i>).
ICT Literacy	ICT literacy in its traditional form refers to the technical skills related to the use of technology (<i>Anderson 2001</i>). However, this term can also be conceptualized in a much broader way as the use of digital technology, communication tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society (<i>Committee on Technological Literacy 2002</i>).

Source: (Voogt and Roblin 2012, 309)

The main difference between ICT literacy and technological literacy lies in the different emphasis they place on the competences needed to function in a knowledge society (Voogt and Roblin 2012, 308). Technological literacy emphasizes the inter-play between technology and society and the importance of understanding the technological principles needed to solve complex problems and face the challenges of a knowledge society. Conversely, ICT literacy focuses mainly on how to make effective and efficient use of digital technologies.

Kereluik et al. (2013) go a step further in their analysis of global 21CC frameworks by not merely describing what is common and uncommon amongst them and attempting to provide some definitions, but they also use what has emerged from the literature to develop a new 21CC model, which seeks to codify what is meant by these competences in an integrated and comprehensive way. Kereluik et al. follow a rigorous methodology, which involves coding the different elements of 15 different global prominent frameworks and analyzing relevant documents to recognize patterns and themes in the data. Their model is intended to synthesize and capture the essence of all the frameworks they considered in a manner that is able to guide the implementation of 21CC curricula.

The authors identify three broad categories of competences, with three subcategories within each of them (Table 5). The three broad categories are **Foundational Knowledge**, which speaks to what learners need to know; **Meta Knowledge**, which is the knowledge that learners should rely on to act, and **Humanistic Knowledge**, which encapsulates the values learners should bring to their actions. The three categories within each of these are summarized and defined in the Table 5 below.

It is noteworthy that Kereluik et al. (2013) include core content knowledge as part of their model, particularly as the national and regional frameworks, as well as Voogt's and Roblin's (2012) analysis (see Table 3 above), seem to imply that core subjects are often neglected in 21CC frameworks, as these frameworks focus on new ways of knowing and learning and pay little attention to traditional learning domains. Kereluik et al. however contend that traditional academic domains are the building blocks upon which 21CC competencies are developed (Kereluik et al. 2013, 130). According to the authors, excellence in these domains requires disciplined ways of thinking characterized by highly complex and deeply ingrained mental processes e.g. applying mathematical principles to solve everyday problems or applying scientific ways of thinking to understand the natural world.

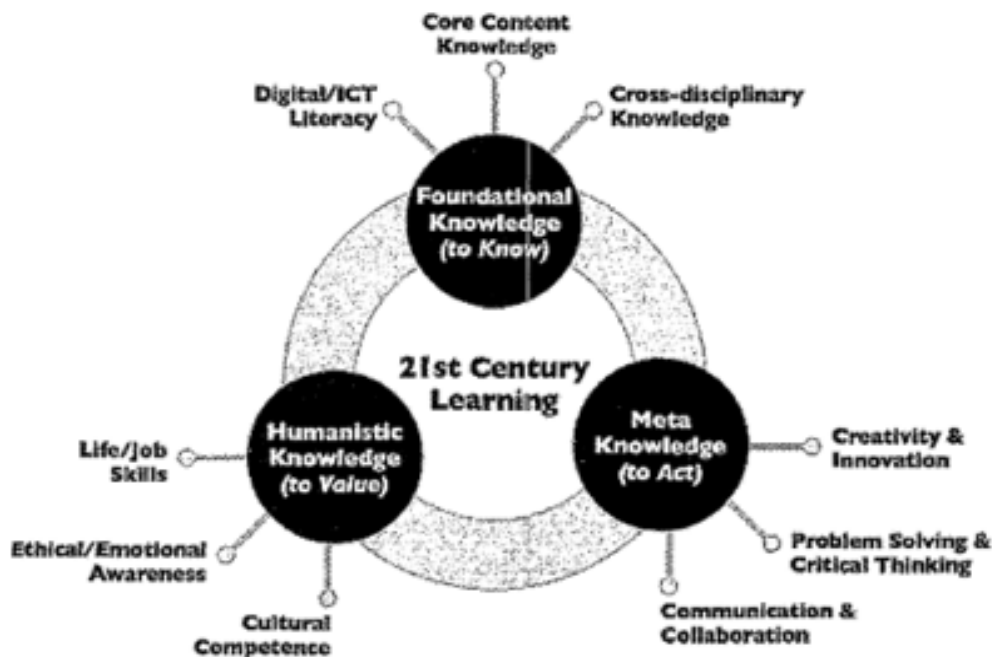
Table 5: Summary of Kereluik et al. Model of 21CC

Foundational Knowledge (to Know)	Meta Knowledge (to Act)	Humanistic Knowledge (to Value)
<i>This category responds to the question: what do learners need to know?</i>	<i>This category is about the knowledge process of working with foundational knowledge</i>	<i>This form of knowledge offers a vision of the learner's self and its location in a broader social and global context.</i>
1. Core Content Knowledge	1. Problem Solving and Critical Thinking	1. Life Skills, Job Skills and Leadership
Refers to traditional academic domains e.g. English and Mathematics. Excellence in these is the foundation upon which 21CC are developed.	Critical thinking involves the ability to interpret information and make informed decisions based on such information. Problem solving is the use of critical thinking skills toward the effective resolution of a specific problem or toward a specific end goal.	Life skills, job skills, and leadership (including aspects of personal and professional leadership) serve to create lifelong learners who are capable of success beyond the confines of the classroom.
2. Digital Information Literacy	2. Communication and Collaboration	3. Cultural Competence
Can be defined as the ability to effectively and thoughtfully evaluate, navigate, and construct information using a range of digital technologies to function fluently in a digital world. An important part of this is the ability to effectively seek out, organize, and process information from a variety of media.	Communication involves the ability to clearly articulate oneself through all communication media (oral, written, nonverbal and digital), as well as the skills necessary to be an active and respectful listener to diverse audiences. Collaboration includes similar dimensions as communication, but also includes important individual contributions, such as flexibility, willingness to participate and recognition of group and individual efforts and success.	Cultural competence also includes aspects of personal, interpersonal, and intercultural competence evidenced through effective communication, collaboration, and appreciation of ideas and emotions of all types of individuals.
3. Cross-Disciplinary Knowledge	3. Creativity and Innovation	3. Ethical Awareness
Knowledge that integrates and synthesizes information from across fields or domains, such as the application of knowledge to new contexts in the pursuit of specific end goals.	Creativity and innovation involve applying a wide range of knowledge and skills to the generation of novel and worthwhile products (tangible or intangible), as well as the ability to evaluate, elaborate, and refine ideas and products.	Ethical awareness includes the knowledge and skills necessary for success in a culturally diverse society, such as the ability to imagine oneself in someone else's position and feel with that individual (empathy), as well as the ability to engage in ethical decision making.

According to the authors, traditional learning domains, therefore, remain important to 21st century learning; however, modes of enquiry ought to shift to accommodate new ways of thinking and acting (Kereluik et al. 2013, 133).

It is also worth expanding on the authors' conception of life skills, job skills and leadership as a component of Humanistic Knowledge. Here, the authors refer to the ability to regulate one's efforts to meet particular ends. In our globalized, digital and interconnected world, self-regulation necessitates the organization of the demands of different aspects of our lives, including the personal and professional, in ways that lead to individual success and also promote the common good. Self-regulation is identified as critical for learners, as the 21st century requires them to be able to organize relevant and particular information and then respond appropriately to solve problems. Job and life skills interact with cultural competence and ethical awareness as requirements for social and economic success in the 21st century. Our interconnected world requires us to communicate with diverse groups of people across the world and it has become increasingly important to be driven by a value system which respects difference and maintains a core of empathy and understanding.

Figure 3: A Visual Depiction of the Three-Category 21CC Model



Source: (Kereluik et al. 2013, 130)

The visual depiction of the three-category model developed by Kereluik et al. in Figure 3 above shows that the dimensions of the model do not function as discrete categories—there are overlaps and demarcations are not clear-cut, as different dimensions are always supporting and informing each other. The model's contribution to the discussion is that it provides a “big picture view” of what we mean by 21CC and the authors' analysis provides a clearer vision of a field that has been dominated by multiple, and at times seemingly conflicting, perspectives.

1.3 Entrepreneurship and 21CC

Alongside the growing body of literature about 21st century teaching and learning, another body of literature, which investigates the role of entrepreneurship in the 21st century economy has also been pre-occupied with what competencies are required for successful entrepreneurial activity. As already indicated in Chapter 2, entrepreneurship is recognized as a key driver for economic development, in both developed and developing contexts. According to Seth (2019), entrepreneurship is important as it has the ability to improve standards of living and create wealth, not only for the entrepreneurs, but also for related businesses. Entrepreneurs also help drive change with innovation, where new and improved products enable new markets to be developed (Seth 2019). Entrepreneurial activity can also help boost national income and tax revenue as a result of higher earnings. Entrepreneurs have also been thought of as national assets to be cultivated and motivated as creators of social change, through their investment in the development of communities. In the South African context, job creation is one of the major areas that entrepreneurship has been intended to have the most impact, given the country's very high rates of unemployment (Allan Gray Orbis Foundation 2019) the stakeholders who are trying to create fertile ground for individuals who choose this route, destined to have a similar struggle? The answer to this question is critical, because it reveals much about the state of entrepreneurship in South Africa. And, at present, it's an answer that gives cause for concern. Never in South Africa has there been such a crying need for entrepreneurs who not only succeed, but who have the ability to positively impact and transform their community. However, at the same time, it's clear that these people are not receiving the support that would allow this to become a reality. This was highlighted during the State of the Nation Address given by President Cyril Ramaphosa during February. Although Mr Ramaphosa admittedly had a number of challenges that required urgent attention, the omission of entrepreneurship as a national priority,"URL": "https://www.allangrayorbis.org/entrepreneurship-blog/the-state-of-entrepreneurship-in-south-africa/", "language": "en-US", "author": [{"family": "Allan Gray Orbis Foundation", "given": ""}], "issued": {"date-parts": [{"2019", 3, 8}]}, "accessed": {"date-parts": [{"2019", 9, 13}]}, "schema": "https://github.com/citation-style-language/schema/raw/master/csl-citation.json" .

It is for these above reasons that researchers have been pre-occupied with the question of how to use education to develop entrepreneurial competencies, in order to drive positive social and economic outcomes, which has resulted in a rich and diverse body of literature on entrepreneurship education. While much of the 21CC literature is focused on basic education, a considerable body of literature on entrepreneurship education is higher-education focused.

Research investigating entrepreneurial competencies has shown that there is a meaningful overlap between 21CC and entrepreneurial competencies (Boyles 2012, 42). Similar to the research on 21CC, scholars in the field of entrepreneurship education have produced a number of theoretically and empirically supported concepts, including: human capital (Gimeno, Folta, Cooper, & Woo 1997; Shane 2000), social capital and social skills (Aldrich

& Zimmer 1986; Baron & Markman 2000; Burt 1992), self-efficacy (Boyd & Vozikis 1994; Chen et al. 1998; Markman et al. 2002; Scherer et al. 1989), and creativity (Gilad, 1984; Timmons 1978; Ward 2004; Whiting, 1988), which have been proven to have a demonstrated relationship to entrepreneurial activity. Generally speaking, stronger competencies in these areas increase the likelihood of engaging in entrepreneurial activity and/or entrepreneurial success (Boyles 2012, 44).

Based on her study of the relevant literature, Boyles (2012) groups entrepreneurial competencies into three major categories, namely: **cognitive; social** and **action-oriented**. Through an in-depth analysis of these three categories, she reveals a pattern, which demonstrates significant and relevant connections to 21CC. A summary of these three categories, along with their connections to 21CC categories, are contained in Table 6 below.

The main take-away from Boyles' analysis is that, similar to 21CC, the cognitive, social and action-oriented competencies associated with entrepreneurship are teachable and learnable. Boyles' critique of the use of the number of graduates that start or intend to start businesses as a metric for success for entrepreneurship education programmes is also important. According to the author, research on venture establishment in the US consistently shows that businesses are started by individuals over the age of 35, while younger entrepreneurs (aged 18 – 24) make up about 3% of all entrepreneurs in the US (Boyles 2012, 49). Boyles therefore argues that the importance of prior industry experience to the success of entrepreneurial activity offers a viable explanation for this empirical reality, which means that entrepreneurship education programmes are better served by pursuing metrics that aim to develop successful knowledge workers at the first instance (Boyles 2012, 49). And, as the research suggests, the best way to develop workers who will thrive in the new knowledge economy is through the development of 21CC. In Boyles' conception, by arming learners with 21CC, we give them a much better chance to secure employment; garner specific and important industry knowledge and, ultimately, as a result of the congruencies between 21CC and entrepreneurial competencies, to become successful entrepreneurs. Although one may not entirely agree with Boyles reasoning here, her analysis highlights the linkages, and the need for alignment, between the goals and outcomes of 21st century and entrepreneurship education.

Table 6: Entrepreneurial Competencies and their Links to 21CC Categories Source: Adapted from (Boyles 2012)

	Cognition	Social	Action-Oriented
Description	Relates to an entrepreneur's distinct ways of thinking, which increase their likelihood of identifying opportunities and developing new ventures to exploit those opportunities.	Relates to an entrepreneur's ability to generate important connections and networks, which impact the likelihood of success in entrepreneurial activity. These relationships form the basis of an entrepreneur's <i>social capital</i> .	Relates to the ability to take action in order to manifest and exploit a recognized opportunity. Recognizes entrepreneurship as a conscious process of establishing goals, planning, monitoring execution and adjusting for success.
Key Characteristics	Ability to process information integrative ways and reason logically and creatively to solve problems Active search and entrepreneurial alertness: i.e. actively searching for new opportunities and being able to identify and appreciate them when they appear Opportunity recognition and development	Social skills, including the ability to accurately assess others, adapt to changing and different social situations, initially and consistently portray a good impression of self to others, and to successfully persuade others,	Ability to regulate efforts to meet particular ends, including taking Initiative; self-management; self-efficacy and taking personal responsibility
Connections to 21CC categories	Information, media and technology literacy; critical thinking, problem-solving, and creativity (inventive thinking).	Communication and collaboration	Productivity and results;

1.4 Critiques of Competency Approaches

The convergence of countries, international organizations and global scholar or education communities on 21CC as integral to modern society and labour should not mask some of the critiques/controversies of 21CC frameworks and approaches. Several authors have made it a point to highlight that these competences on their own are not new (Voogt and Roblin 2012; Kereluik et al. 2013; van de Oudeweetering and Voogt 2017). For instance, competences such as problem-solving and critical thinking have been associated with academic achievement and as characteristic of a desirable education as early as the 1900s (Voogt and Roblin 2012, 316). However, it is the significance of learning them in an integrated way, their importance for all age levels and the implications of technological advancements to enable them, which makes their implementation in educational practice a complex curriculum innovation (Voogt and Roblin 2012, 316; van de Oudeweetering and Voogt 2017, 118).

There are other voices who have challenged the universality of 21CC. Some claim that, although the concept of competency is extremely valuable for guiding how teaching and learning should unfold in the classroom; it usually represents the voices of businesses and firms. According to this view, in many ways, the rhetoric of 21st CC is seen as yet another facet of an economist or instrumental approach to education, according to which the main goal is to prepare workers for knowledge-intensive economies or even in some cases for particular firms, as opposed to emphasizing the harmonious development of all human abilities. Voogt and Roblin (Voogt and Roblin 2012) are quite critical of the fact that the dominant global frameworks for 21CC do not contain meaningful contributions from the education sector, let alone schools and teachers.

Furthermore, some people argue that, as they are commonly defined, 21CC are not within reach of all young people, firstly because not all today's students are going to become knowledge-intensive workers, even in developed countries. Secondly, the rhetoric forgets the needs of the vast majority of the world's population in developing countries. They argue therefore that the discourse on 21CC is hardly relevant in all contexts and there is a risk of enlarging socio-economic disparities when promoting such competencies among the world's elite.

A different perspective asserts that 21CC frameworks overemphasize skills at the expense of "core knowledge" or traditional subjects. Proponents of this particular argument say that although learning skills is very important, they cannot be learnt independently or outside of particular knowledge domains e.g. traditional academic subjects (Kereluik et al. 2013). They also claim that students will not be able to apply these skills if they lack the appropriate factual knowledge on a particular domain (Ananiadou and Claro 2009, 6).

1.5 Implications for Measurement

The South African context echoes the global state of play in that different actors continue to lament the fact that the education system is failing to prepare learners for the 21st century. Similar to the discourse on the current nature of education globally, 21st century teaching and learning and entrepreneurship education continue to be evoked as solutions to some of the challenges facing the education system in South Africa, as discussed in Chapter 2. Current efforts to align CAPS with 21st century education have highlighted the distinction between South Africa's intended, implemented and attained curriculum. It is commonly understood that the basic education curriculum *intends* to develop 21CC, or at least contains language that aligns with 21CC. An excerpt of the National Curriculum Statement (NCS) Grade R-12 is contained in Figure 4 below. The reader will note that one of the principles on which the NCS is based is that of **active and critical learning**, which means encouraging an active and critical approach to learning, rather than rote and uncritical learning of given truths. The learners that the NCS intends to develop also possess the hallmarks of 21CC competencies, including: **problem-solving using critical and creative thinking; working effectively and collaboratively in teams; self-organization and self-management**; the ability to collect, analyze, organize and critically evaluate information (**information literacy**); **effective communication**; an ability to **care for the environment and for others**, using science and technology, and the ability to **appreciate the world as a set of related or inter-connected systems**.

However, as indicated in the literature, an expression of the intent to develop 21CC does not necessarily translate into actual implementation. In his study investigating the teaching strategies for the implementation of South Africa's science curriculum, Msimanga (2013) observes that teaching and learning in South African classrooms "is largely teacher-centred, characterized by learner passivity and rote learning; teachers' questioning aims at data recall...with cursory reference to applications of science knowledge in societal and development issues".

Figure 4: Excerpt from the Curriculum and Assessment Policy Statement

- (c) The National Curriculum Statement Grades R-12 is based on the following principles:
- **Social transformation:** ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of the population;
 - **Active and critical learning:** encouraging an active and critical approach to learning, rather than rote and uncritical learning of given truths;
 - **High knowledge and high skills:** the minimum standards of knowledge and skills to be achieved at each grade are specified and set high, achievable standards in all subjects;
 - **Progression:** content and context of each grade shows progression from simple to complex;

- (d) The National Curriculum Statement Grades R-12 aims to produce learners that are able to:
- identify and solve problems and make decisions using critical and creative thinking;
 - work effectively as individuals and with others as members of a team;
 - organise and manage themselves and their activities responsibly and effectively;
 - collect, analyse, organise and critically evaluate information;
 - communicate effectively using visual, symbolic and/or language skills in various modes;
 - use science and technology effectively and critically showing responsibility towards the environment and the health of others; and
 - demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation.

Source: (Department of Basic Education 2011)

In a 2016 DBE Roundtable on Assessment, our Minister of Basic Education, Angie Motshekga, also cautioned against the inappropriate assessment practices that are rife in South Africa's basic education system. She advised that the education system should not be driven by assessments and examinations and that a more holistic assessment approach should be adopted. She further indicated that she viewed CAPS to be a foundational base for schools that should not simply be implemented slavishly without educator mediation.

The role of the teacher in delivering a 21st century education in the classroom then becomes significantly important and one of the central questions for measurement is around the mechanisms that teachers use and deploy in the classroom to deliver the *intended* curriculum in order to ensure that 21CC are developed, as well as the factors that hinder effective implementation of a 21CC-based curriculum.

The discussion in this chapter also shows that, as the future remains volatile and unpredictable, attempts to articulate the kinds of skills, competencies, and dispositions learners will need in the future are inevitably speculative (and context dependent). 21CC discourse remains at a nascent stage in most countries, despite attempts to concretize frameworks and describe various innovative practices and policies. For purposes of measurement, there is a choice to be made about what 21CC are considered important for the South African context and which competences the E³ programme will privilege to achieve its aims. In other words, for purposes of the baseline study, there is a choice to be made regarding the prioritization and definition of specific 21CC for measurement and room to be created for this prioritization and definition to be refined based on the context of South African classrooms.

Critiques of the 21CC discourse also show us that, as our understanding continues to develop, there is also a need to trouble the dominant discourses of 21CC. As previously indicated, frameworks, particularly those propagated worldwide by organizations such as the OECD, WEF, P21 etc. may perpetuate the language of competition and economic rationality, pushing for the alignment of curriculum around skills considered necessary for employment in the global marketplace (Tan et al. 2017, 433). Consequently, policymakers and educators may inadvertently be pressured to privilege the question of how to implement 21CC most effectively over more philosophical questions about why 21CC are valuable for a thriving life and citizenry. In this sense, the next stage of development of 21CC may need to lend greater attention to exploring the ethics and values informing 21CC schooling as well as articulate a clearer philosophy of education grounded on the vision of South Africa's constitutional democracy—a vision which identifies education as a key lever for achieving socio-economic justice.

More specifically, the challenge is how South Africa can develop its own brand of 21CC values and philosophy, not merely adapting frameworks and discourses propagated by scholars and organizations from the Global North, but one that is derived from the voices of its own scholars and educators and that takes into account its situatedness in a multicultural, African context. Tools for measurement therefore need to make an attempt to center educator voices, and other voices within the education system, to ensure continued development of approaches that fit our context.