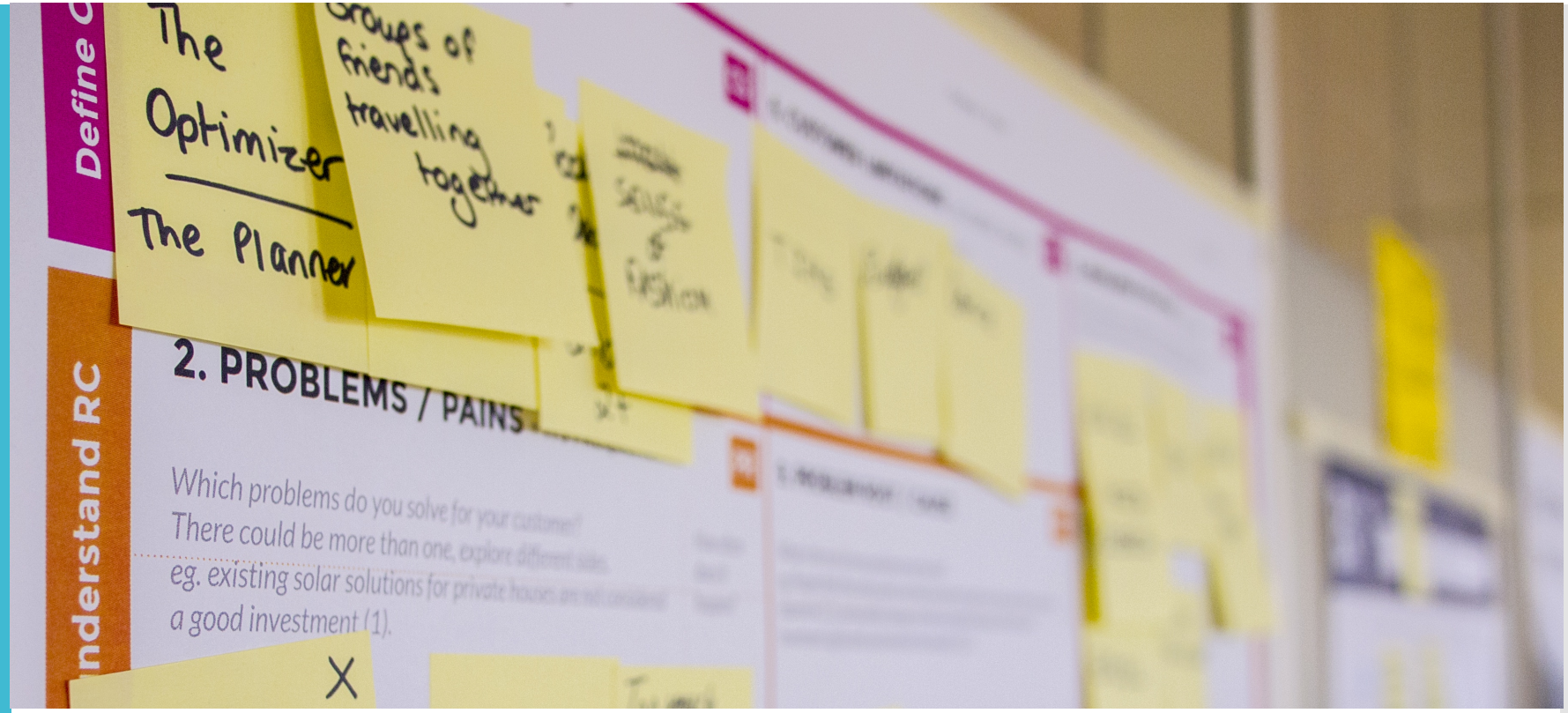
Framing assessment for learning in project-based learning: the development of process thinking.

Presented by Dr Vikki Eriksson

THE IDEA COLLECTIVE

Innovative Design Education Africa



Cape Peninsula University of Technology

THE IDEA COLLECTIVE

Innovative Design Education Africa

ESTABLISHING THE CONTEXT

"The principal goal of education in the schools should be creating men and women who are capable of doing new things, not simply repeating what other generations have done; men and women who are creative, inventive and discoverers, who can be critical and verify, and not accept, everything they are offered."

Jean Piaget, quoted in *Education for Democracy, Proceedings from the Cambridge School Conference on Progressive Education* (1988) edited by Kathe Jervis and Arthur Tobie

ESTABLISHING THE CONTEXT

Image originally from The South African, Available: https://www.thesouthafrican.com/wp-content/uploads/2012/04/education-exam.jpg

ESTABLISHING THE CONTEXT

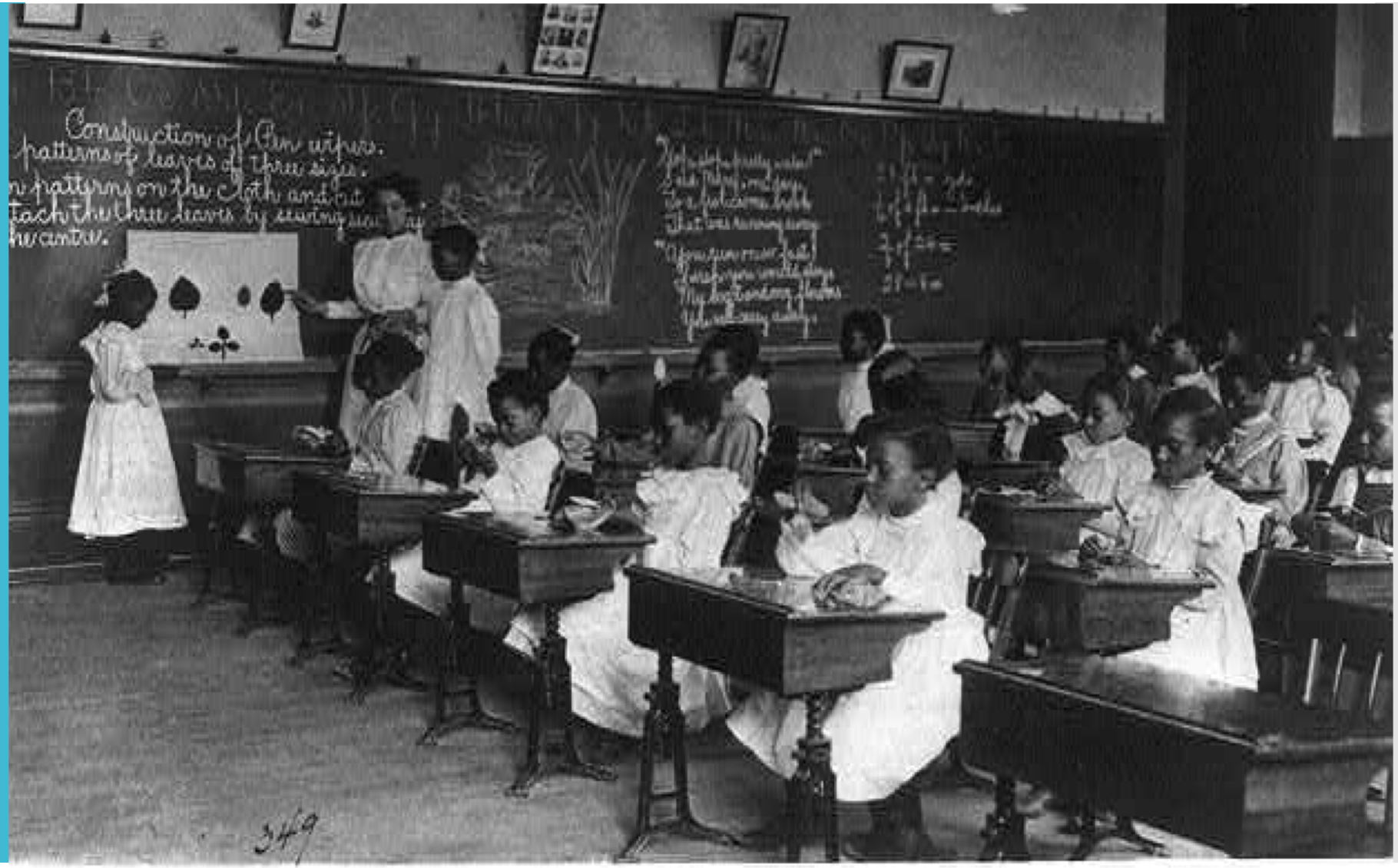


Image originally from The Library of Congress, Available: https://www.umbrasearch.org/catalog/c301149dc1ed004511814b5a5dbcb83d13c2b770

ESTABLISHING THE CONTEXT

“The freedom to make mistakes provides the best environment for creativity. Education isn't how much you have committed to memory, or even how much you know. It's being able to differentiate between what you know and what you don’t.”

- Anatole Franc (1844-1924)

“If I ran a school, I'd give the average grade to the ones who gave me all the right answers, for being good parrots. I'd give the top grades to those who made a lot of mistakes… and then told me what they learned from them.”

- Buckminster Fuller (1895-1983)

ESTABLISHING THE CONTEXT

2022 Skills Outlook

COMMITTED TO IMPROVING THE STATE OF THE WORLD

WORLD ECONOMIC FORUM

Growing

1. Analytical thinking and innovation
2. Active learning and learning strategies
3. Creativity, originality and initiative
4. Technology design and programming
5. Critical thinking and analysis
6. Complex problem-solving
7. Leadership and social influence
8. Emotional intelligence
9. Reasoning, problem-solving and ideation
10. Systems analysis and evaluation

Declining

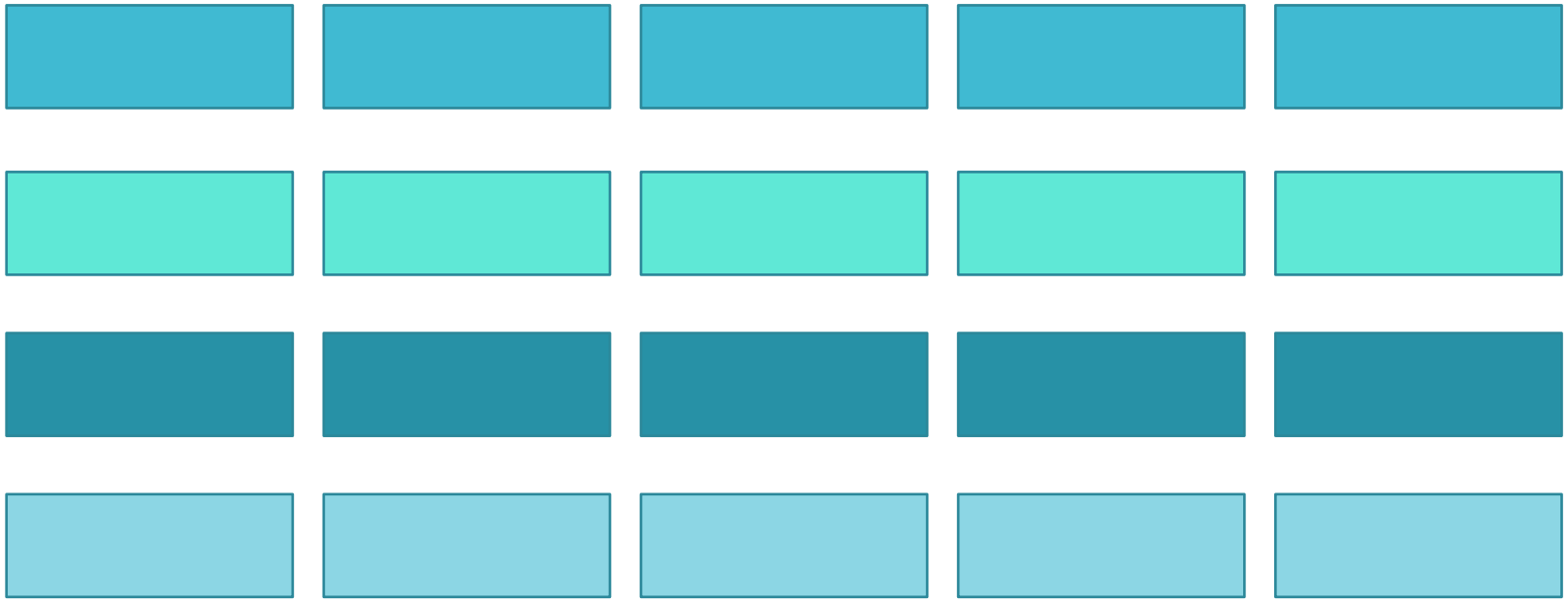
1. Manual dexterity, endurance and precision
2. Memory, verbal, auditory and spatial abilities
3. Management of financial, material resources
4. Technology installation and maintenance
5. Reading, writing, math and active listening
6. Management of personnel
7. Quality control and safety awareness
8. Coordination and time management
9. Visual, auditory and speech abilities
10. Technology use, monitoring and control

From the Future of Jobs report, World Economic Forum

ESTABLISHING THE CONTEXT

Assessment

Linear approach (often visible in SBA)



ESTABLISHING THE CONTEXT

Intermediate Phase: Mathematics

Grade 4-6 is assigned 6 hours a week?

"Assessment is a continuous planned process of identifying, gathering and interpreting information regarding the performance of learners, using various forms of assessment."

- **Baseline assessment:** To establish whether their learners meet the basic skills and knowledge levels required to learn a specific Mathematics topic will use baseline assessment.
- **Diagnostic assessment:** It is not intended for promotion purposes but to inform the teacher about the learner's Mathematics problem areas that have the potential to hinder performance. Psycho-social and content.
- **Formative assessment:** Formative assessment is used to aid the teaching and learning processes, hence assessment *for* learning.
- **Summative assessment:** Contrary to the character of formative assessment, summative assessment is carried out after the completion of a Mathematics topic or a cluster of related topics. Formal assessment Formal assessment comprises School-Based Assessment (SBA) and End of the year Examination. The only ones that counts!

ESTABLISHING THE CONTEXT

Mathematics SBA Challenges, Grade 9

"The problem with the weighting of SBA is its quality, reliability, validity, and credibility. Long, Dunne and De Kock (2014) confirm that there are no measures and systems in place in the South African education system to ensure that SBA is reliable, valid and credible in the General Education and Training (GET) band."

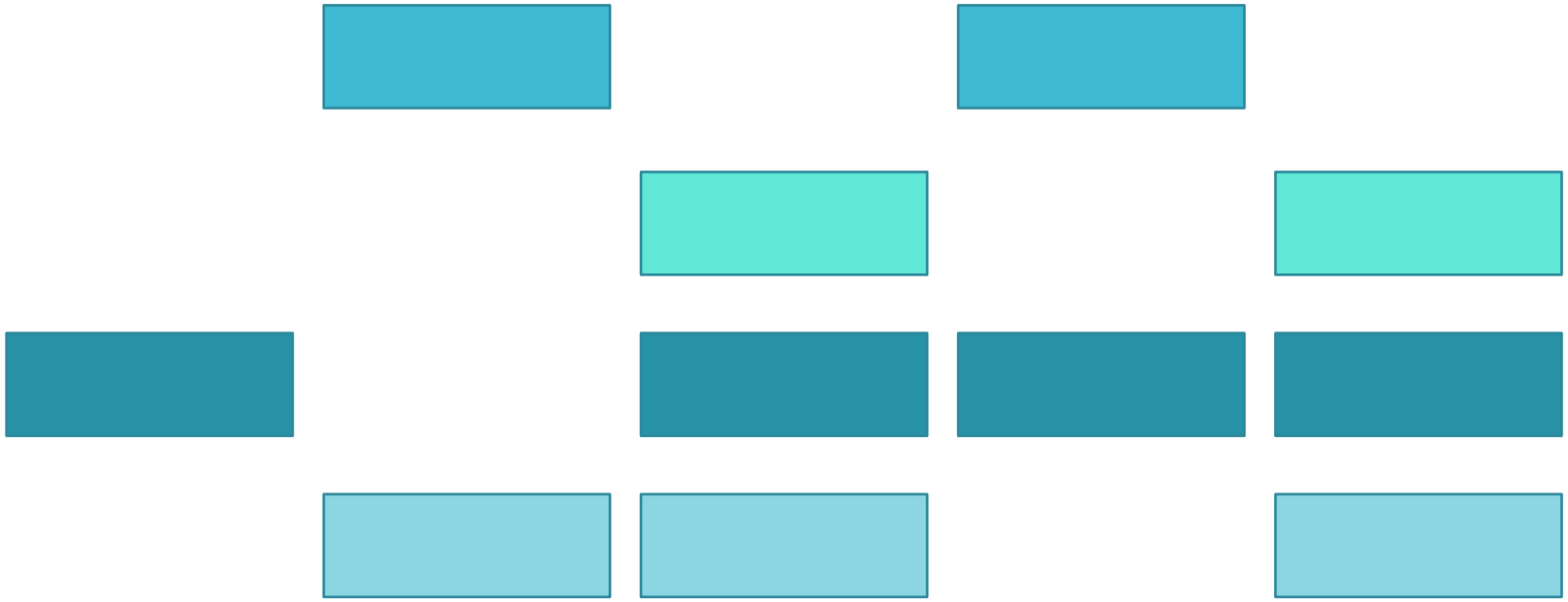
- Van Staden and Motsamai, 2017 "Differences in the quality of school-based assessment: Evidence in Grade 9 mathematics achievement"

Long, C., Dunne, T., & De Kock, H. (2014). Mathematics, curriculum and assessment: The role of taxonomies in the quest for coherence. *Pythagoras*, *35*(2), a240. https://doi.org/10.4102/pythagoras.v35i2.240

ESTABLISHING THE CONTEXT

Assessment

Linear approach – knowledge and skills missing.



ESTABLISHING THE CONTEXT

Assessment

If reviewing the assessment approach we must consider:

- *Are we producing learner who focus on writing tests and examinations? With all the pressure on teachers does this perhaps become more important than allowing learners to grapple with knowledge, find connections and truly understand what they are learning?*
- How can we hope to engage high order cognition when testing readiness and memorization is still such a focus?

ESTABLISHING THE CONTEXT

Assessment

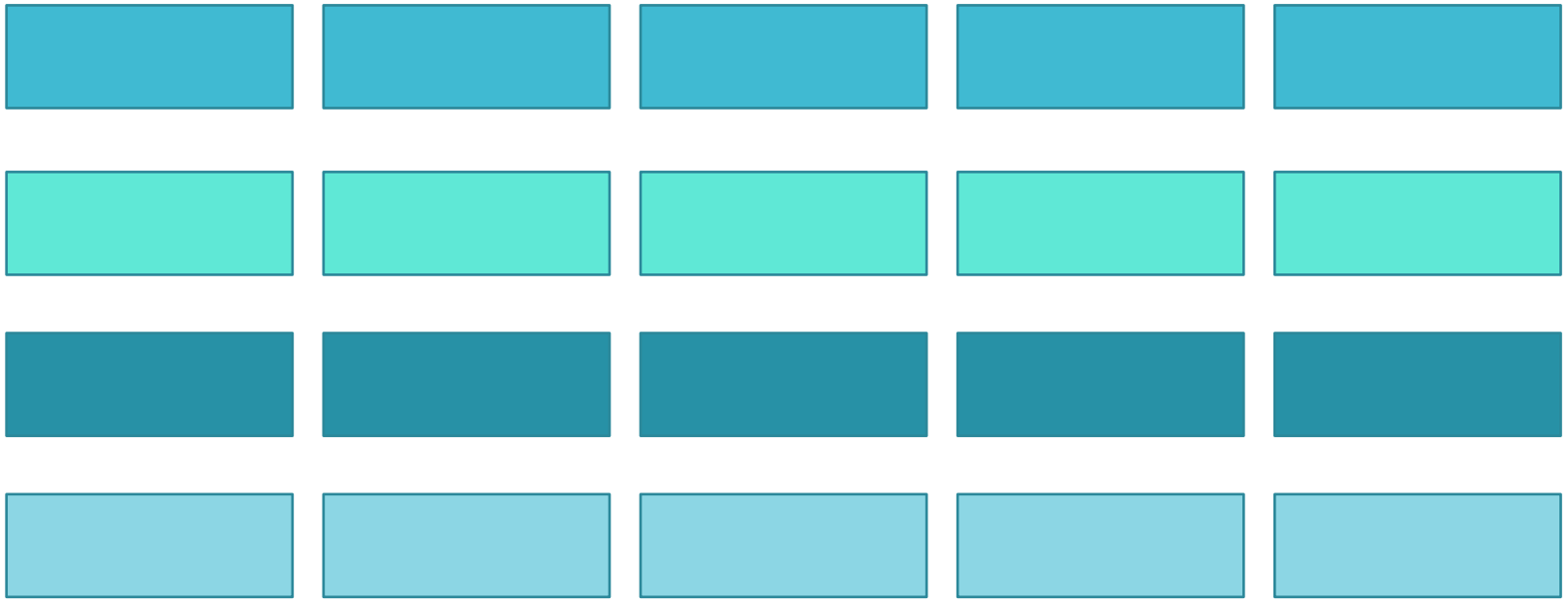
If reviewing the assessment approach the following influence factors must be investigated:

- How many assessments are being completed overall (in all subjects) and what is their purpose?
- How does assessment at a specific level relate to both the entrance level requirements (from a previous phase) and exit level requirements (into the next phase)?
- How does the current assessment strategy prepare learners for interconnected knowledge and skills required?

ESTABLISHING THE CONTEXT

Assessment

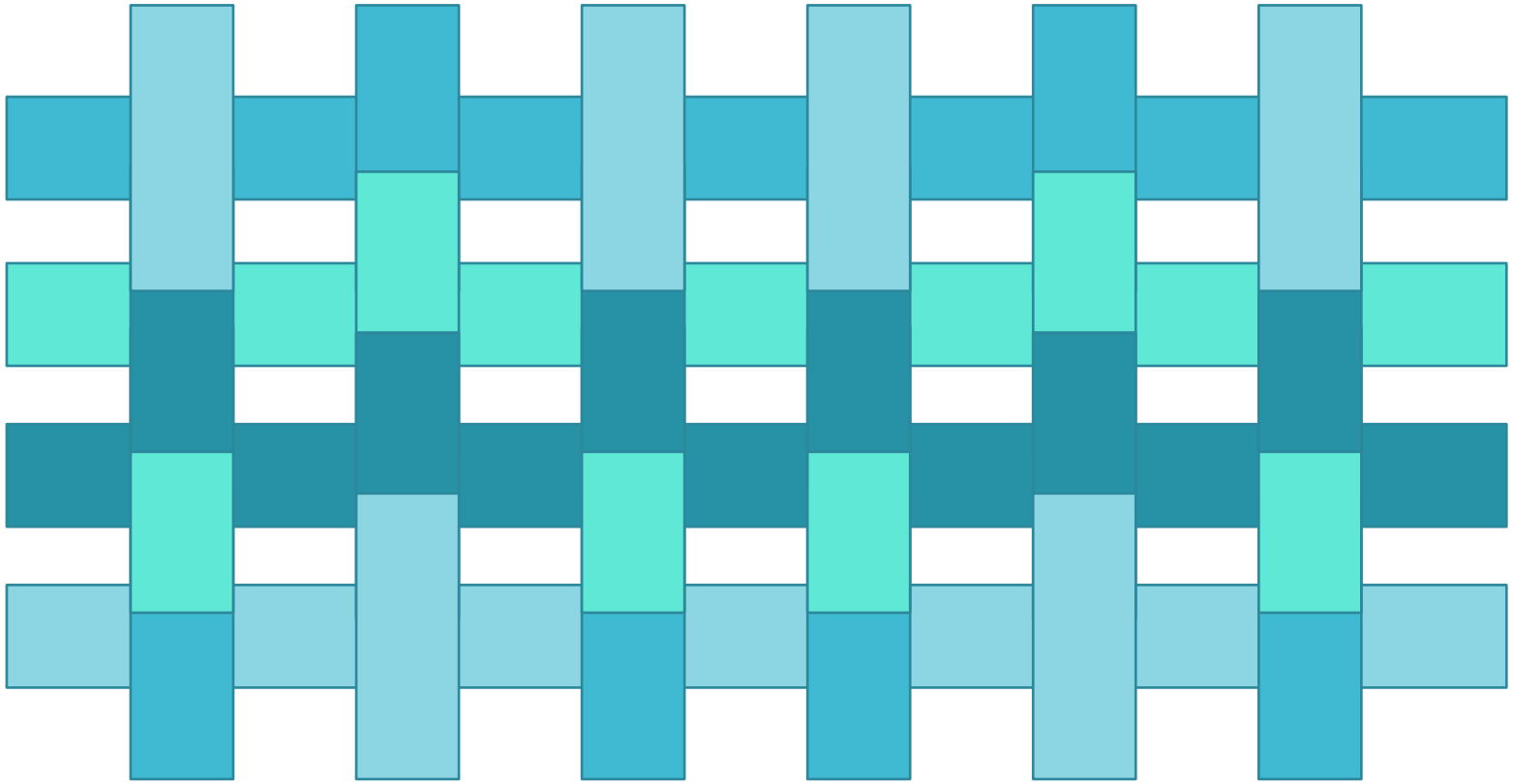
Assuming knowledge and skills can be taught as silos.



ESTABLISHING THE CONTEXT

Assessment

An interconnected way of thinking about content.



ESTABLISHING THE CONTEXT

“Standardized testing is at cross purposes with many of the most important purposes of public education. It doesn't measure big-picture learning, critical thinking, perseverance, problem solving, creativity or curiosity, yet those are the qualities great teaching brings out in a student.”
- Randi Weingarten (1957 -)

This is not to say that testing, when considered, at an appropriate cognitive level and positioned at key educational points does not have tremendous merit.

ESTABLISHING THE CONTEXT

Skills demand, Trending, 2022

- Analytical thinking and innovation
- Complex problem-solving
- Critical thinking and analysis
- Active learning and learning strategies
- Creativity, originality and initiative
- Attention to detail, trustworthiness
- Emotional intelligence
- Reasoning, problem-solving and ideation
- Leadership and social influence
- Coordination and time management

ESTABLISHING THE CONTEXT

Skills demand, Trending, 2022

Our ability to think holistically.

Our ability to address complexity and future global challenges.

Our ability to work with others.

Our ability to manage ourselves and our own knowledge and skills acquisition.

Process thinking and project-based assessment.

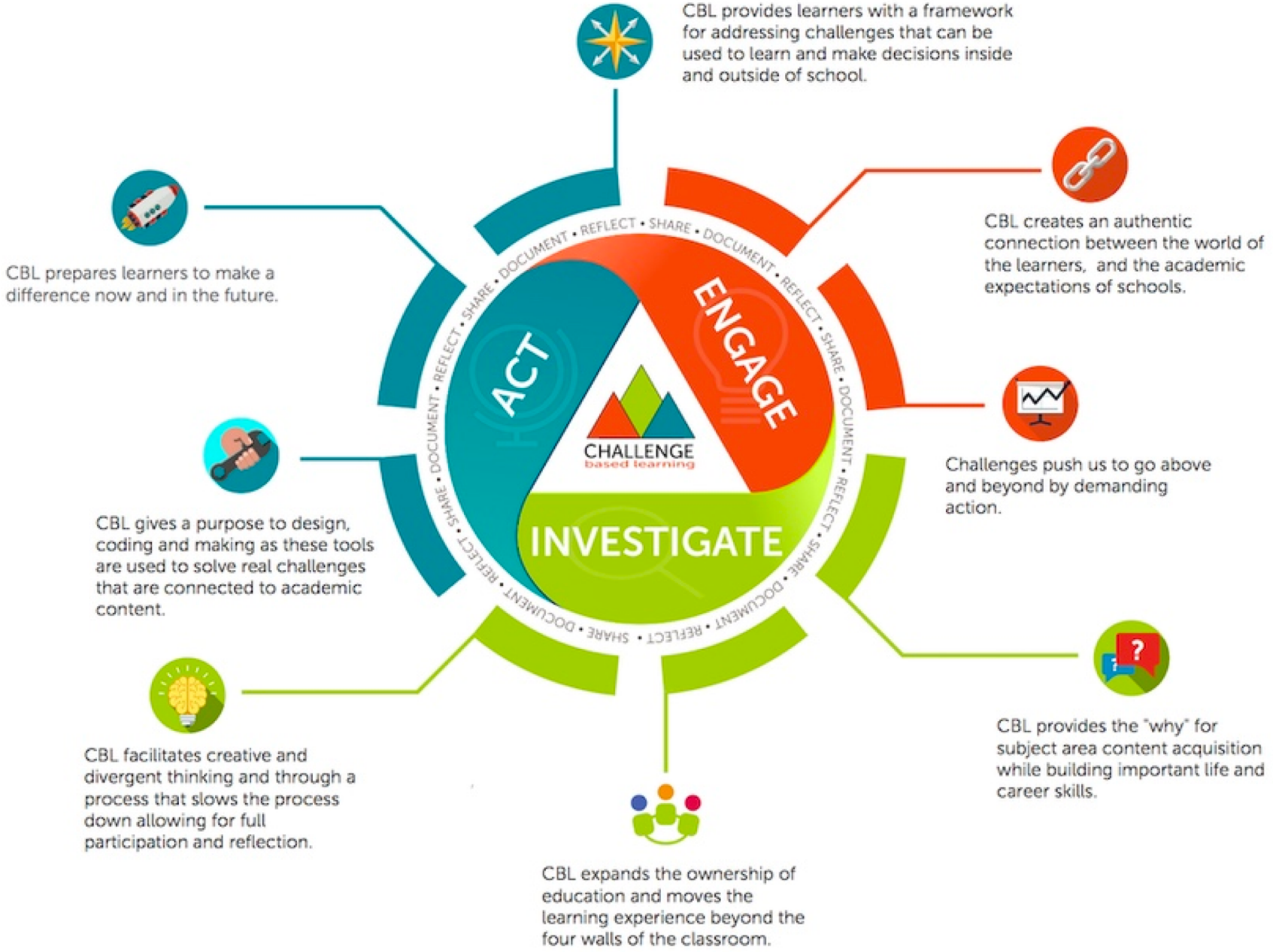
Viewing assessment as an integrated part of the learning experience.

ASSESSMENT in PROCESS-BASED APPROACHES

…there is a need for assessment to prioritise thinking skills, cognitive development, Bloom's psychomotor domains, complex problem solving and the development of emotional intelligence.

Particular research from Umalusi to substantiate: The 2010 self-referential research on the National Senior Certificate (NSC) at qualification level; the subject comparative research and the related international benchmarking (2012-2015); the PAT and ISAT analysis (2014-2015); the Senior Phase Technology and EMS research (2015); Investigation in Early Childhood Development in South Africa (2017)

ASSESSMENT in PROCESS-BASED APPROACHES



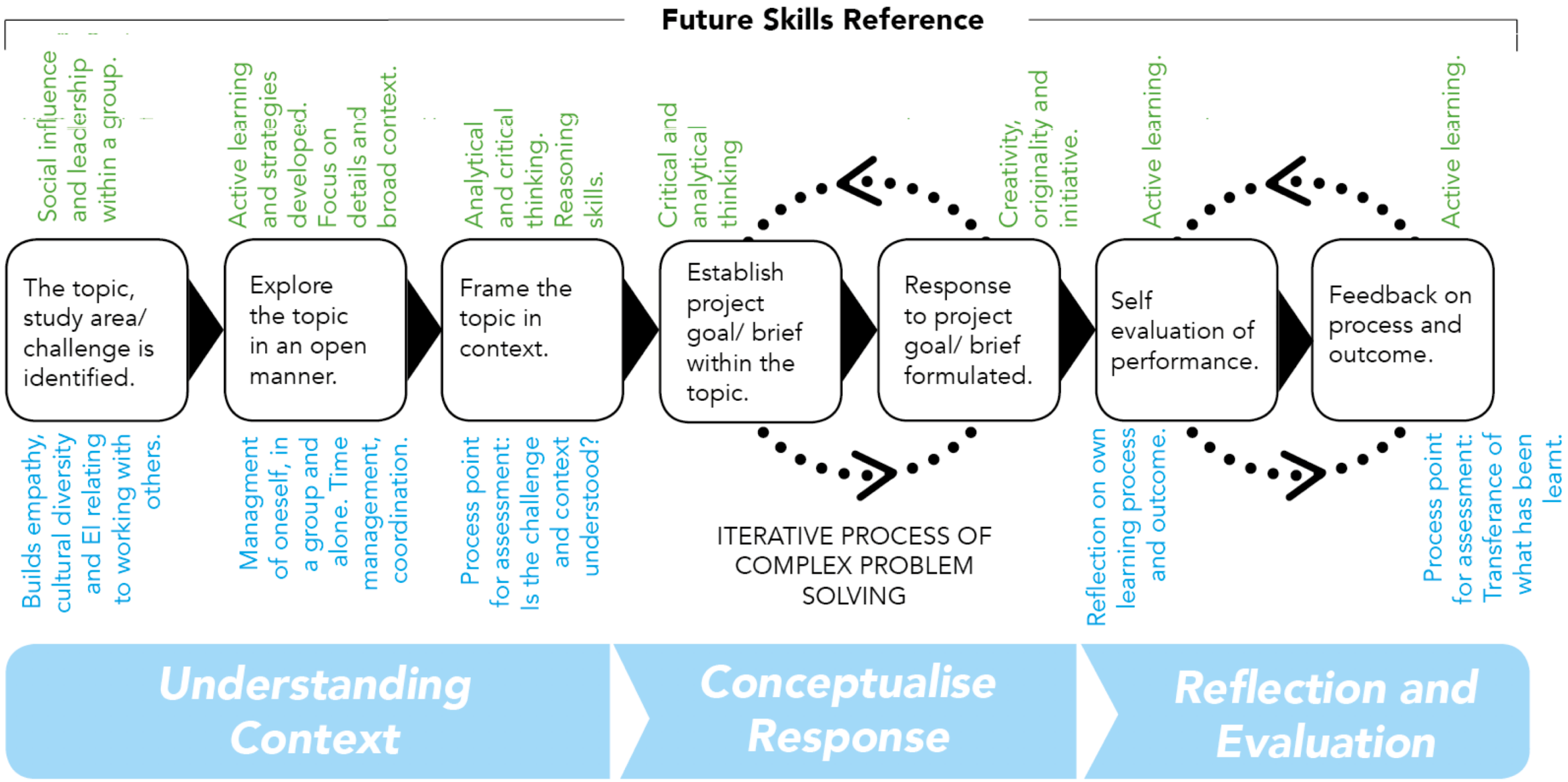
From Challenge Based Learning: https://www.challengebasedlearning.org/wp-content/uploads/2019/03/why_cbl.jpg

ASSESSMENT in PROCESS-BASED APPROACHES

Process thinking

By using a process-driven approach, different thinking modes and be introduced through assessment. Some activities may focus on a single thinking activity – such as brainstorming - while others may follow a more structured exploration such as **lateral thinking** or **abductive reasoning**.

Project-based learning and assessment supports this inclusion of multi-modal thinking and various 21st Century skills.


Future Skills Reference
Social influence and leadership within a group.
Active learning and strategies developed. Focus on details and broad context.
Analytical and critical thinking. Reasoning skills.
Critical and analytical thinking
Creativity, originality and initiative.
Active learning.
Active learning.
The topic, study area/ challenge is identified.
Explore the topic in an open manner.
Frame the topic in context.
Establish project goal/ brief within the topic.
Response to project goal/ brief formulated.
Self evaluation of performance.
Feedback on process and outcome.
Builds empathy, cultural diversity and EI relating to working with others.
Managment of oneself, in a group and alone. Time management, coordination.
Process point for assessment: Is the challenge and context understood?
ITERATIVE PROCESS OF COMPLEX PROBLEM SOLVING
Reflection on own learning process and outcome.
Process point for assessment: Transferance of what has been learnt.
Understanding Context
Conceptualise Response
Reflection and Evaluation
Process-based Learning and Assessment

PROJECT BASED LEARNING

Project-based learning & assessment

"Project-Based Learning (PBL) is an innovative approach to learning that teaches a multitude of strategies critical for success in the twenty-first century. Students drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflect their knowledge. From gleaning new, viable technology skills, to becoming proficient communicators and advanced problem solvers, students benefit from this approach to instruction."

- Bell, 2010

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. The clearing house, 83(2), 39-43.

PROJECT BASED LEARNING

Project-based learning & assessment

Building on a theoretical foundation, conceptualised by among others:

- The challenge drives the exploration and engagement in the learning experience (**Dewey, 1938; Rochelle, 1992**).
- Building opportunities for growth when experience cannot be assimilated in existing schema (**Piaget, 1977; Von Glaserfeld, 1989**).
- The interaction between the teacher and the student draws from the concept of the zone of proximal development as described by **Vygotsky (1978**).
- Knowledge is most viable interpretation of our experiential world (**Resnick, 1987).**
- An authentic learning environment is one in which the cognitive demands are consistent with the cognitive demands in the environment for which we are preparing the learner (**Honebein, et.al. 1993).**

PROJECT BASED LEARNING

Selection of modern studies - *from 2005*

- Savery, JR. *Overview of problem-based learning: definition and distinctions, the interdisciplinary*. 2006.
- ChanLin, LJ. *Technology integration applied to project-based learning in science*. 2008.
- Bell, S. *Project-based learning for the 21st century: Skills for the future*. 2010.
- Markham, T. *Project based learning a bridge just far enough*.2011.
- Yew, EHJ, and Schmidt, HG. *What students learn in problem-based learning: A process analysis*.2012.
- Boss, S. and Krauss, J. *Reinventing project-based learning: Your field guide to real-world projects in the digital age*. 2014.
- Walker, AE, Leary, H., Hmelo-Silver, CE. and Ertmer, PA. (eds). *Essential readings in problem-based learning*. 2015.
- Baş, G. and Ömer, B. *Effects of multiple intelligences supported project-based learning on students' achievement levels and attitudes towards English lesson*. 2017.

PROJECT BASED LEARNING

Project-based learning: Features

Bell, 2010, highlights the following:

- Learning to be self-reliant through planning and organization
- Social learning enhances collaboration skills
- Differentiation provides intrinsic motivation
- Technology enhances creativity within parameters
- Real-world connections
- Creating success from the beginning *(Link to learning by doing - Dewey, 1938, Experience and Education)*

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. The clearing house, 83(2), 39-43.

PROJECT BASED LEARNING

Project-based learning & assessment

Opportunities to expand the theoretical underpinning of assessment and learning experience.

- **Theories of play** – Bringing theories of play into the education experience, and into assessment.
  (Piaget, Vygotsky, Bruner, Dewey, Montessori and more)

- **Biomimicry** – exploring natural systems and process to support sustainable development.
  (Benyus, Hawken et al., McDonough and Braungart and more)

- **Socio-technical approaches** – exploring people, technology and the relationships between them.

PROJECT BASED LEARNING

Project-based assessment

Developing critical, creative and innovative thinking

"By welding together creative and critical thinking skills in PBL… to come up with different solutions and suggesting possible solutions indicate creativity whereas reasoning and suspecting skills, thinking analytically, looking at ideas without prejudices point out critical thinking… if we want to raise the learners who might be the possible young scientists of the future, both skills need to be developed…"

- Birgili, 2015, Creative and Critical Thinking Skills in Problem-based Learning Environments

THE WAY FORWARD

A cautionary tale…

The South African context must be acknowledged.

- **Learn from best practice** – explore international and national examples of assessment practice.
- **Learn from locals** – researchers, practitioners and organisations locally have a wealth of information to review and build on.
- **Learn from experience** – learn from our lived experience, the context of our learners (and teachers) to meet the needs of an unpredictable future.

THE WAY FORWARD