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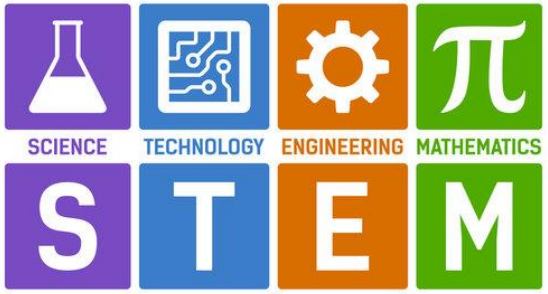

Integrating STEM Education with real-world contexts to enhance readiness for tertiary studies

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National Science & Technology Forum

From NSTF

Preparing today's learners with strong STEM foundations is key to building a future-ready society capable of thriving in an increasingly digital and interconnected world.

Key question

How can STEM be taught in high school settings to enable readiness for tertiary studies and facilitate swift mobilisation to TVET colleges?

Introduction

- How high school STEM education can be reorganised to better prepare students for the challenges of tertiary studies,
- Look into the role of real life context and integration of subjects and topics in STEM learning, and
- Make suggestions for assisting learners with the transition from high school to tertiary studies.
- Effective teaching and learner readiness

Teaching using Real-Life (RL) contexts

- Use of a real life issue to facilitate learning of new knowledge.
- Connecting the classroom education to practical, real-life situations.

Features of RL teaching

- Lessons address real-world challenges people may face.
- Involves learners in hands-on activities such as projects, experiments, and community service.
- Encourages analytical skills and problem-solving (critical thinking).
- Promotes working in collaboration – peer learning.
- Integrates multiple subjects to show real-world connections.
- Learner centred – considers learner interests and experiences.

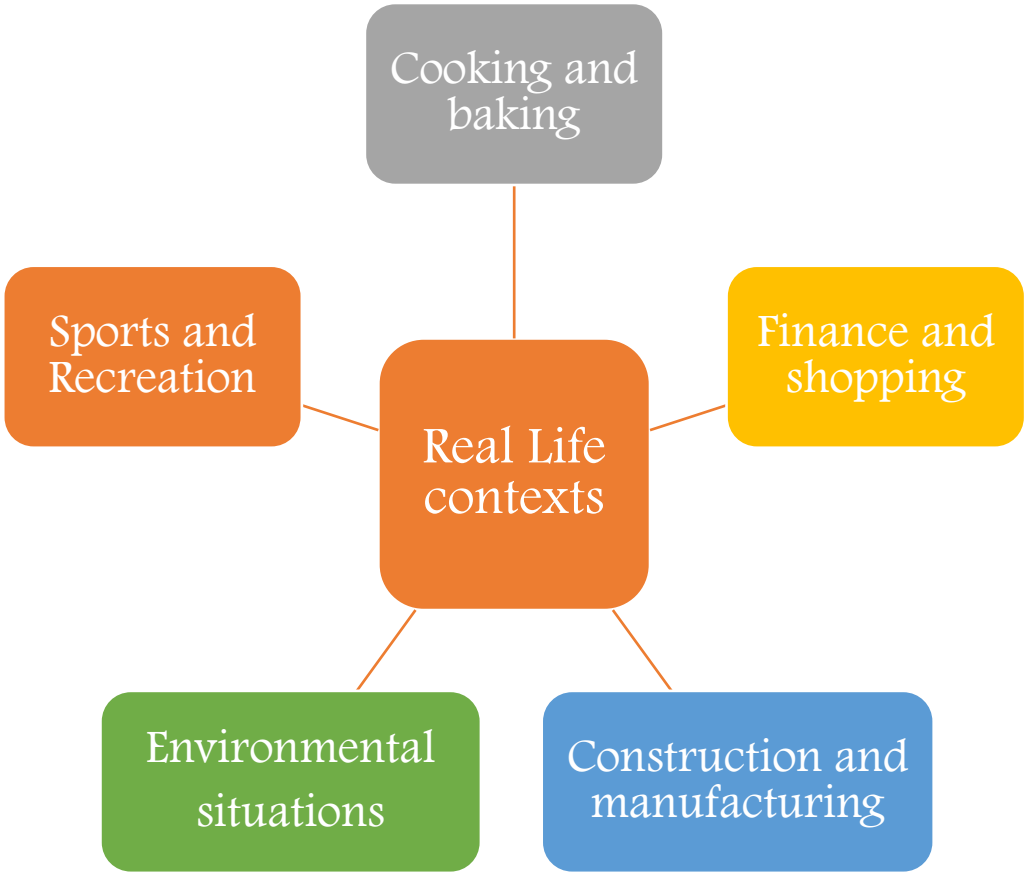
Roles / Benefits of RL teaching

- Life-long learning - prepares high school leaners for tertiary education.
- Makes learning relevant and engaging.
- Enhances understanding of knowledge learnt and the retention of that knowledge.

Challenge of RL teaching

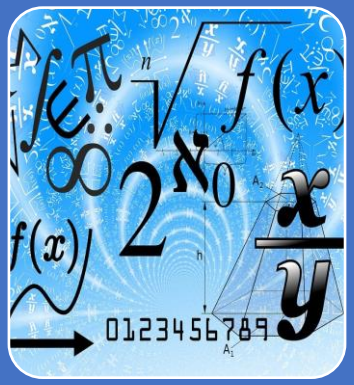
- Requires knowledge from multiple STEM disciplines.
- Often involves knowledge of chemistry, geography, mathematics physics and other sciences.

Examples RL contexts for STEM



RL teaching scenario

- Air pollution
- Probable integration



Mathematics

- Statistics: Analyze air quality and health data trends.
- Calculus: Model rates of pollutant dispersion.
- Algebra: Set equations for relationships between variables.

Physics

- Fluid Dynamics: Understand air movement and pollutant dispersion.
- Optics: Investigate light interaction with particulate matter.
- Thermodynamics: Analyze energy changes in pollution sources

Chemistry

- Composition of Air: Identify pollutants (e.g., CO, SO_2).
- Chemical Reactions: Study reactions forming secondary pollutants (e.g., ozone).
- Acid-Base Chemistry: Examine acid rain formation from SO_2 and NOx.

Environmental science

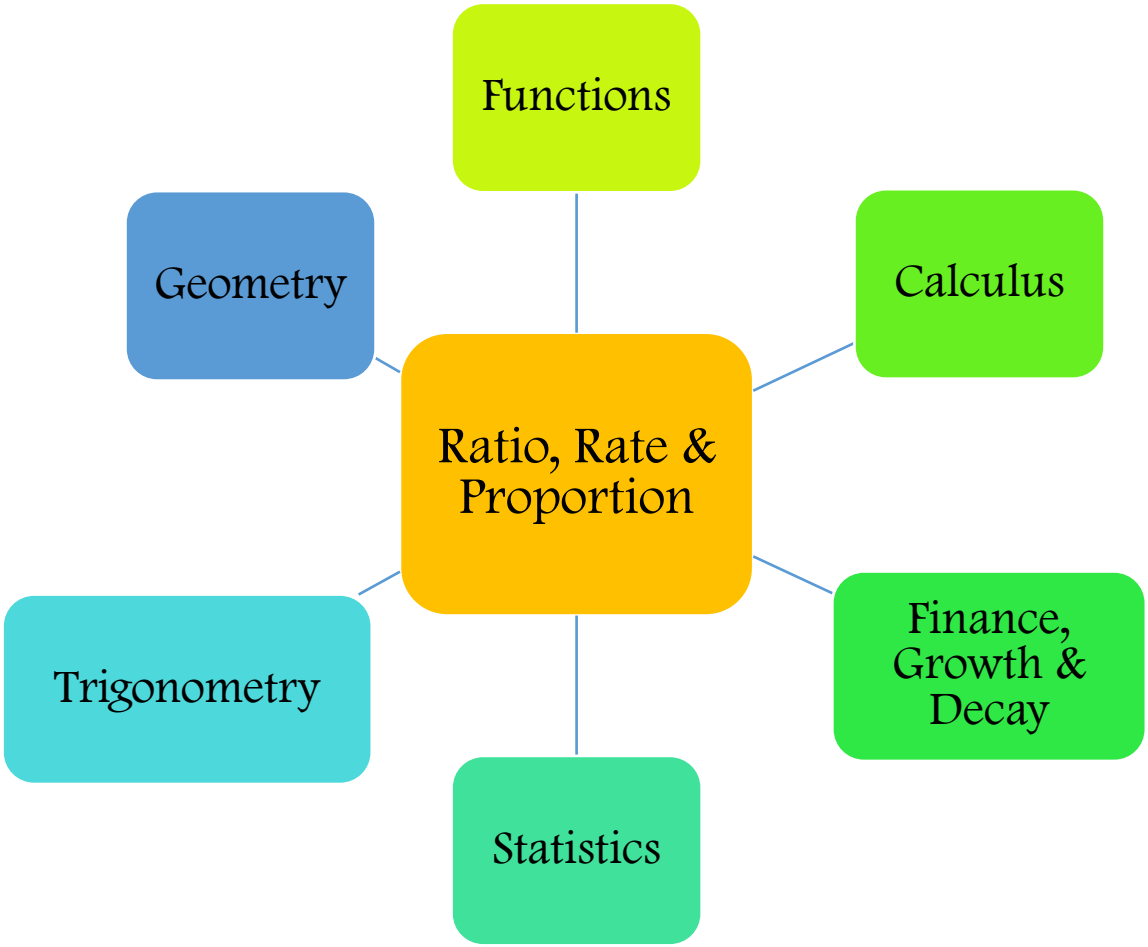
- Ecology: Assess impacts of pollution on ecosystems.
- Public Health: Explore health effects related to air quality.
- Sustainability: Learn strategies for pollution reduction.

Geography

- GIS: Map pollution sources and monitor air quality changes.
- Climate Studies: Examine pollution's effects on weather and climate.

Note:

- Cross-curricular projects
- Activities as contexts for others


Functions
Geometry
Calculus
Ratio, Rate & Proportion
Trigonometry
Finance, Growth & Decay
Statistics

Ratio, Rate and Proportion

Physical Science

- Mechanics: velocity, acceleration, power
- Particle nature of Matter: Boyle's Law
- Chemistry: chemical reactions, reaction rates, concentrations

EDG

- Design: Scale,
- Graphics: Constructions
- Manufacturing: Material proportions

Geography

- Population: Density, demographics
- Climatology: climate trends
- Geomorphology: Slope
- Settlement geography: urbanisation

Recommendations

- Teaching of STEM subjects for proficiency
- Situations that make them think deeply and critically about the core subjects.
- Ensuring that learners can identify links between the various STEM subjects.
- Extending learners beyond what is prescribed in the curriculum.
- Cultivating in them an appropriate mindset through mentoring.

Recommendations

- Establishment of interdisciplinary committees
- Connecting teachers with people in STEM careers
- Establishing organisations like NSTF that provide platform for interaction among educators.

Recommended apparatus for Air Pollution

Particulate Monitors

- Also known as **nephelometers**
- Are used to monitor particulate matter such as dusts, smokes, mists, and fumes.
- Can be used for monitoring the respirable fraction of dust, and are small enough to use for personal exposure monitoring.

Optical particle counter (OPC)

- Uses a light source to illuminate an air sample and a photodetector to count the number and size of particles that scatter the light.

Electronic noses (e-Noses)

- Compact instruments comprising of an array of sensors that respond to small variations in the odorous gas concentration in ambient air.
- Can detect trace gases in industrial gas emissions

Recommended reading

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