Developing student led inquiry, creativity, and problem solving

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Purpose

This project will involve developing science teachers' understandings of inquiry, creativity, and problem solving. The purpose is so they can implement these approaches in their own science classrooms.

The project will also involve developing training courses for the Department of Educational Training in Jeddah as part of my role as a collaborative coach.

Why is this change important?

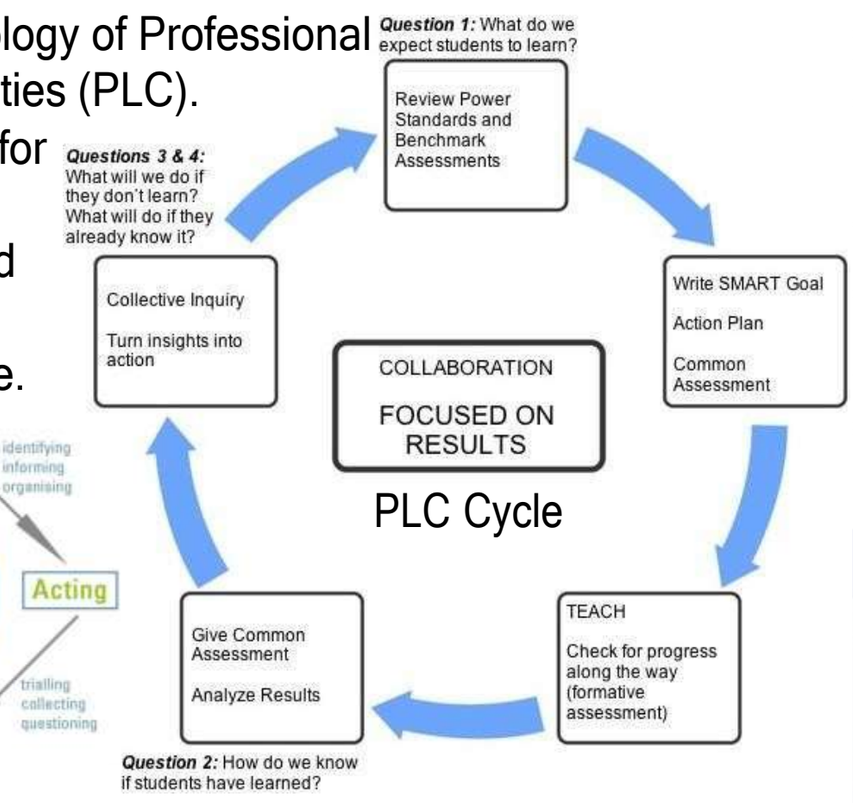
- To achieve the Saudi 2030 Vision and building understanding of STEAM.
- Inquiry learning and focusing on creativity and problem solving benefits students because it involves students in active and futures oriented learning (21st Century learning).
- Inquiry provides students with opportunities to develop their knowledge and skills in asking questions, investigating, and reporting results.
- Students have ownership of the work they do.
- Inquiry gives students a participatory voice as they can investigate what interests them the most, rather than following predetermined topics.

Key ideas

- Finding innovative solutions to challenges.
- Student centred learning (active, experiment and critical).
- Linking education with everyday life activities.
- Leadership development and confidence (entrepreneurship).
- Integrated learning (STEAM).

Implementation

- Utilise the methodology of Professional Learning Communities (PLC).
- Deliver workshops for science teachers.
- Develop student led inquiry projects in biology and science.



PLC Cycle

Outcomes

- Teachers will develop the capacity to teach inquiry learning and shift from teacher centred to student centred learning.
- Increased student voice will lead to an increase in student engagement.
- Increased motivation, empowerment, and lifelong learning.
- Students will become more creative in their thinking and problem solving, able to question and examine real life problems.

What does student led inquiry, creativity, and problem solving involve?

Two types of student led inquiry:

1. Finding creative and robust solutions to solve a problem e.g. STEAM project.
2. Generating results and reasoning e.g. heart experiment.

Inquiry skills and knowledge involve:

- Posing questions about real life problems, identifying and collecting information related to that problem.
- Using problem solving skills to analyse, assess and evaluate the information gathered from a range of sources. Students will develop communication and collaboration skills.
- Creatively designing and developing potential solutions and producing an artefact as their final product. E.g. students are posed the question, "How can we cross the river?". They identify possible solutions, gather information on how this could be done and develop a model. This STEAM activity requires students to use different knowledge including Science, Technology, Engineering, Arts, and Mathematics.
- Asking "why?", and then finding different solutions and justifying their choice, will help them develop their inquiry and problem solving skills.

Considerations

Student learning will need to be scaffolded so that they build knowledge and skills to successfully complete their own inquiry based project (e.g. using student friendly assessment criteria/ marking rubric, sharing example projects and topics, formative feedback).

Example assessment rubric and student work

Criteria	5	4	3	2	1	Not shown
Title					Original, clear and concise title provided.	
Inquiry Question		Can create a testable question without teacher assistance. Uses specific language and has a scientific context.	Can create a testable question with some teacher assistance. Uses specific language and has a scientific context.	Can create a testable question with some teacher assistance. Uses some specific language.	Needs teacher assistance to create a testable question.	
Aim and Hypothesis	Forms an aim and hypothesis that is based on an accurate understanding of the related concept and uses the IV and DV	Forms an aim and hypothesis that is based on a mostly accurate understanding of the related concept and uses the IV and DV	Forms an aim and hypothesis that is based on a good understanding of the related concept and uses the IV and DV.	Forms an aim and/or hypothesis that shows some understanding of the related concept and IV and DV are not explicit to.	Forms an aim and/or hypothesis.	
Variables			Independent, dependent, control and extraneous variables are identified. Discussion on how extraneous variables could be avoided.	Independent, dependent, control and extraneous variables are identified.	Included 2 of types of variables.	
Introduction		Introduction is in-depth and includes appropriate scientific language, key concepts/definitions and background research relevant to the inquiry questions.	Introduction includes appropriate scientific language, includes key concepts/definitions and background research relevant to the inquiry questions.	Introduction includes some scientific language, briefly explains key concepts and has some background research relevant to the inquiry questions.	Introduction includes limited explanation of key concepts and little background research.	
Materials			Select and use appropriate equipment, to systematically and accurately collect and record data. All materials used are clearly listed and organised.	Most equipment is appropriately selected to systematically and accurately collect and record data. All materials used are clearly listed and organised.	Equipment is not appropriately selected to systematically and accurately collect and record data. Not all materials used are clearly listed and organised.	
Safety				Identifies risks, modifies behaviour accordingly and formulates management strategies through using RiskAssess.	Identified risks but needs to review risk management strategies.	
Method	Student can construct and implement methods that identify and control extraneous variables. Procedure written in third person, in a step-by-step fashion that could be followed by anyone without additional explanations.	Student can construct and implement methods that mostly identify and control extraneous variables. Procedure is in a step-by-step fashion that could logically be followed and is mostly written in third person and/or is generally repeatable.	Student can construct and implement methods that identify and controls some extraneous variables. Procedure written in a step-by-step fashion that has 1 or 2 gaps that require explanation and is partially written in third person.	Student can construct and implement methods. Procedure is not written in third person and/or not written in a step-by-step fashion.	Student can construct and implement methods outlined in bit form but are not in a logical order or are difficult to follow.	

View the full Assessment Criteria from here

Strategies and processes for creating an inquiry driven classroom

Key resources and references

- Monash University lectures (BLCSI) Curriculum Development Program 2019.
- Brentwood Secondary College.
  1. SLIP: Student Led Inquiry Project. **2.** TLC: Thinking, Learning and Creativity.
- Australian Curriculum. https://www.australiancurriculum.edu.au/media/1360/lutheran-education-queensland-inquiry-based-learning.pdf
- Quote Master. https://www.quotemaster.org/community+learning
- Argef. http://argef.at/en/science/methoden/