Different Types of Inquiry to Support Teaching and Learning of STREAM

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Chaired by Thomas Chiu
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Your own lived experience of inquiry teaching and learning

Your own lived inquiry teaching / learning scenario

- Briefly recall and describe one of your own recent lived scenarios that you think you have practised inquiry teaching / learning.
- What are the salient characteristics that make your lived scenario inquiry?

Or

Refer to (one of) my seven suggested scenarios – (see from the end appendix of the ppt)

- Decide if it carries characteristics of inquiry teaching / learning.
- Rank your scenario to show if it is of low or high level of inquiry.

Low Level Inquiry

High Level Inquiry
What are some common characteristics of Inquiry Teaching and Learning in your scenario?
What are some common characteristics of Inquiry Teaching and Learning in the scenarios?

- Data, Context, Information Source (data based)
- More inductive sequence of teaching and learning
- From specific to general
- Individual and group work
- More high order thinking
- More realistic and practical (authentic)
- Teacher more as facilitators
- Students more as active learners
- Students are empowered
- etc
- etc
What is Inquiry?

Inquiry is about:

- engaging in 'work that matters' to students’ active learning.
- curiosities and interests of/about/within a meaningful topic/problem/question/issue.
- meaningful constructing, organizing, and refining data and ideas.
- building shared meaning through teacher and students' collaboration.
- questioning, research, thinking and communication skills.
- reflection on learning.
- taking the learning beyond the teacher's desk and the four walls of the classroom.
- etc.
- etc.
Inquiry: a districtwide approach to staff and student learning (2011) by Fichtman, Thomas & Boynton
Different types / forms of Inquiry

- Arrange the seven teaching scenarios from low Inquiry to high Inquiry
  (Full scenario descriptions are found in the appendix of this power point)
Types of Student Inquiry

By: @trev_mackenzie

Structured Inquiry
Students follow the lead of the teacher as the entire class engages in one inquiry together.

Controlled Inquiry
Teacher chooses topics and identifies the resources students will use to answer questions.

Guided Inquiry
Teacher chooses topics/questions and students design product or solution.

Free Inquiry
Students choose their topics without reference to any prescribed outcome.

https://www.edutopia.org/article/bringing-inquiry-based-learning-into-your-class-trevor-mackenzie
Changing Roles of Teachers and Students in different stages of Inquiry & SDL*
(modified from Grow 1991, graphically presented by Kwan 2002)

Teacher's Changing Teaching Role between Stages as:

- Guided Motivator
- Facilitator
- Co-Learner
- Consultant

Increasing teacher's input & control

Students Changing Learning Role between Stages as:

- Interested & Motivated
- Involved & Committed
- Co-learned & Critical
- Self Initiated to Inquire

Low-moderate SDL
Moderate-high SDL
Intense SDL
Empowered SDL

Structured Inquiry
Controlled Inquiry
Guided Inquiry
Free Inquiry


* SDL (Self Directed Learning)
# Different Forms of Classroom Inquiry

<table>
<thead>
<tr>
<th>Form of Inquiry</th>
<th>Inquiry Characteristics</th>
<th>Learning Experiences</th>
<th>Student Autonomy</th>
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<tbody>
<tr>
<td>Laboratory practical</td>
<td>Structured ↑ High ↑ Low ↑</td>
<td>The topic, materials and investigative procedures are usually prescribed in a laboratory manual and guided by the teacher.</td>
<td>Laboratory practicals usually involve the completion of predetermined activities to find a predetermined answer.</td>
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<tr>
<td>Problem Solving</td>
<td>Increasing openness</td>
<td>The context is largely set by the character of the problem that exists. One or more specific resolutions to the problem may exist. The degree of intervention by the teacher may vary.</td>
<td>Student problem-solving may adopt many approaches to solving the problem. They have to consider the relative effectiveness of these approaches in relation to the problem.</td>
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<tr>
<td>Discovery</td>
<td>Increasing student autonomy</td>
<td>This form of inquiry is not directed to the resolution of particular problems. What is discovered generally results from cognitive activity and different students may produce quite divergent results.</td>
<td>Students are free to try many approaches to reaching unspecified ‘ends’. These conclusions normally need some verification.</td>
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<tr>
<td>Creative Activity</td>
<td>open low high</td>
<td>This form of inquiry involves imagination, emotional responses, cognitive transformation, and sometimes manual dexterity and lateral thinking.</td>
<td>Students operate within few constraints.</td>
</tr>
</tbody>
</table>

(Source: Cox in Fien, Wilson & Gerber, 1989:65)
Sharing of Good Practices of Inquiry Teaching and Learning by Pat Huang

Using the strategy of “HUMAN LIBRARY” as an example to illustrate good practice of inquiry teaching and learning

• Overseas examples (from her Finland experience)

• Local examples (from her Global Education Project with Hong Kong Schools)
Teacher’s Role in Teaching Through Inquiry

In the process of learning and teaching through inquiry, teachers extend their role from knowledge transmitters to learning facilitators. As facilitators, teachers should:

• **help students** to formulate learning goals and identify the most appropriate means of achieving them;

• **assist students** to develop positive learning habits, master learning strategies and develop metacognitive skills to steer their learning;

• **create a stimulating and motivating learning context** so that students are intellectually curious;

• **provide a framework for students**, especially those struggling learners, to organize their study in a systematic way; and

• **develop a supportive, tolerant and mutually accepting learning community** to allow students to participate actively in learning without the fear of being criticized.
Students’ Role in Learning Through Inquiry

Instead of being passive receivers of knowledge in didactic expository approach, students should:

• set meaningful and realistic goals for their own learning;

• take the initiative to consult teachers, to collaborate closely with others and to share learning experiences with peers;

• develop a positive attitude towards learning by engaging actively and confidently in learning; and

• reflect on their learning experiences, and monitor and evaluate their own learning progress.
Tips on Inquiry Learning
http://www.teach-nology.com/currenttrends/inquiry/

• Give yourself time to prepare (data & resources)
• Use collaborative learning (jigsaw / groups)
• Design age (level) appropriate activities
• Develop and ask good questions
• Incorporate discovery / investigation into lessons
• Do experiment and use measurement in lessons
• Make model building exercises in lessons
• Encourage students to make design
• Incorporate hands-on activities
A Framework for Learning Through Inquiry

Creating a need to know, to:
- be curious
- speculate
- hypothesize
- use imagination
- generate ideas
- make links with existing knowledge
- identify issues
- ask questions
- plan how to research

Using Data
- Locate evidence
- Collect evidence
- Select evidence
- Sort data
- Classify data
- Sequence data

Reflecting on learning – To be critical in relation to:
- Data sources
- Skills and techniques used
- Criteria for making judgments
- Opinions
- What has been learnt
- How it has learnt
- How the enquiry could be improved
- How the enquiry could be further developed
- The value of what has been learnt

Making Sense – To make connections of all sorts including to:
- Relate existing knowledge to new knowledge
- Describe
- Explain
- Compare
- Contrast
- Analyze
- Interpret
- Recognize relationships
- Analyze values
- Clarify values
- Reach conclusions

Note: Inquiry is

• **NOT just** about asking simple factual descriptive questions.
• **NOT just** students doing simple class task such as copying or filling in blanks.
• **NOT just** letting students to go loose and have fun.
• **NOT just** ‘hands-on' learning but know the learning from ‘hands-on’.
• **NOT just** about using technology but how technology can enhance learning.
• **NEVER about** delivering lectures, distributing hand-outs, underlining textbooks or giving whole class instruction.
Conclusion

• We are all doing some forms / types of inquiry in our classroom ALREADY.
• We now know the different types / forms of inquiry with progression.
• We have good frameworks to strengthen our inquiry teaching and learning approach.
• Though it may look challenging, we do it step by step to stretch and prepare our students to make the C21st learners.
• Have confidence in yourselves and your students.
## Appendix – Scenario 1

### Scenario 1 – Location of HEP

<table>
<thead>
<tr>
<th>Key Questions of the lesson:</th>
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<tbody>
<tr>
<td>Why is HEP concentrated in so few locations?</td>
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<tr>
<td>What are the environmental conditions needed for a HEP site?</td>
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### Introduction:
- Students work in groups of 4 to 6. Each group chooses one example of a HEP dam site

### Lesson Development:
- Students analyse from data about the site requirements for HEP location
- Students look at further HEP examples
- Students confirm HEP location

### Conclusion:
- Teacher and students emphasize relation between environmental conditions and a preferred site of HEP.
Appendix – Scenario 2

Scenario 2 – Ring model in Urban Landuse

Key Question of the lesson:
• What and where are the different types of landuse found in Hong Kong?

Introduction:
• Students are asked to look at and decide the ‘major’ landuse in different parts of Hong Kong, e.g. Central, TST, Pokfulam, Wah Fu, Wanchai, Chai Wan, Sham Shui Po, San Po Kong, Tsuen Wan, Wong Tai Sin and their distance from Star Ferry.

Lesson development:
• Students work from the data and conclude that there are certain common landuse types from a focal point, e.g. Star Ferry;
• Students find out that certain common landuse types are located in certain common locations in Hong Kong; and
• Students look at and checks for further examples to see if what they find out from the data match with other ‘new’ location in Hong Kong.

Conclusion:
• Students able to induce the relation between land use and distance from the center (i.e. Star Ferry as the focal point) in a simple ring model.
Appendix – Scenario 3 & 4

**Scenario 3 – Jimmy and Susan were playing with a toy ukulele by themselves**

Jimmy: "Hey, look, the shorter the string, the higher the sound."
Susan: "How do you know?"
Jimmy: "Well, when I place my finger here on the string and pluck it, it makes this sound ... PLUNK. When I place my finger there, it makes this sound ... PLONK. And when I place my finger way down here, it makes this sound ... PLINK."
Susan: “They sound different. The shorter the string, the higher the sound. The longer the string, the lower the sound.”
Jimmy: “Exactly”, Shall we find out why is it like that? We can google find or we can ask our teacher. May be we should ask our Music teacher as well.

**Scenario 4 – Contour lines**

**Lesson focus:** Students have to learn contour lines and their spacing to show slope steepness.
**Introduction:** Teacher gives the definition of Contour Line. Contour is a line linking places of the same height above the sea level together.
**Development:**
- Teacher shows a contour map to the students telling them this is 50m contour line, the next one is 100m and 150m etc, etc
- Teacher then tells the students the closer the contour lines together, the steeper the slope is. The wider apart the contour lines, the slope is gentler.
- Teacher shows different contour maps to the students and ask them identify which map shows steeper slope and which map shows gentler slope.
**Conclusion:**
Teacher restates the lesson focus and gives more exercises to do as home work.
Appendix – Scenario 5

**Scenario 5 – Relationship between the sound made and the length of the string**

<table>
<thead>
<tr>
<th>Key Question:</th>
<th>How do guitars make relationship between string MUSIC?</th>
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</thead>
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**Introduction:**
- Teacher: today, we are going to explore the relationship between sound of the pitch and the distance of the musical strings.

**Development:**
- Students working in groups are given a toy guitar and a worksheet to record the sound of the pitch made by pressing at different position on the guitar string.
- Students have to draw a graph to show the relationship between the sound pitch and the string length.
- Teacher invites the students to describe and reveal the relationship between the sound of the pitch made and the length of the guitar string.

**Conclusion:**
- Teacher reiterates the relationship of the sounds of the vibrating strings to the students,

Appendix – Scenario 6

**Scenario 6 – River Landforms in the Upper Course of a River Valley**

<table>
<thead>
<tr>
<th>Key Question of the lesson: What and why are these landforms found in the upper course of a river valley?</th>
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**Introduction:**
- Lists and explains with the aid of an annotated diagram the various features found in the upper course of a river valley.

**Development:**
- The class looks at maps and photographs of the landform features found in the upper course and the head of Lam Chuen Valley in Hong Kong
- Teacher Q&A the class to explain why these features are found there in the upper course of the valley

**Conclusion:**
- Teacher emphasizes the characteristics of landform features and the river energy of the upper course of the river.
Appendix – Scenario 7

Scenario 7 – Contours

Key Question: How can contour lines on map tell height?

Introduction: Teacher draws students’ attention to read contour lines on map and ask how come the contour lines can tell us the height of land above sea level?

Development:

- Teacher gives each student (or groups of students) a paper cone to draw line on the cone to represent different height above sea level.
- Teacher guides students to cut the paper cone along different line drawn on the cone and draw the base on a piece of paper showing the contour line of a particular height.
- Teacher helps students to see how a 3-D cone, with different lines drawn on it representing different height, is transformed into a 2-D drawing of concentric lines representing different height.
- Teacher moves the contour lines to show different spacing of the lines reflect different slope steepness.

Conclusion

- Teacher and students work together to describe what contour line is and explain how the spacing of the contour lines can tell slope steepness.