SBA fine-tune Sharing

SBA Conference

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Today Focuses

- What are supposed to change?
- Why fine-tuning is proposed?
- How to conduct the fine-tuned SBA
  - Personal Experience Sharing
- What are the observations?
- What should be followed up?

Major Changes

- Whole SBA is divided into *two separate written assessment parts*
- -- Design part and Report writing part
- The assessment of design part bases on *students' written responses* of a *series of questions*, which are set to *prompt for students' understanding* of Scientific Investigation.

Major Changes

- Provide *more flexibility to teachers* in developing *innovative and challenging tasks*
- Lowering the *cognitive demand* / Increasing the cognitive demand of students ***????***

What should be unchanged

- ***Learning*** and Teaching always ***come first***
- Teachers are the one who understand students' need most.
- Task should be able to ***spread students' ability*** into a wide spectrum.
- Provide ***hands-on*** opportunities for students to engage in practical works ➔ ***Performance-based assessment***

Goals

- Students are observed to ***engage*** in the practical task
- ***Learning / Progress can be observed*** in practical work and/or written answers
- Performance Assessment ***catering learning diversity*** can be made

Tryout Background

Assessment task	Task sheet and prompting questions provided by HKEAA
Time	Tutorial Class during summer holidays 2 x 1.5 hour sessions
Students' prior knowledge and experiences on practical works	Very limited. Just 2-3 months face-to-face learning due to COVID 19. Have attempted some experiments on osmosis and enzyme actions. Scientific investigation has not formally learned in S4.

Tryout Background

Session 1	**Each group was given a tray of apparatus and a task sheet.** **-- They were encouraged to tryout their ideas.** **-- Extra laboratory equipment and apparatus were provided under requests** **-- *Discussion* among groupmates and asking questions to teachers *are allowed*. However, teachers would not answer directly but asked students to *test their ideas via experimentation.***

Tryout Background

Session 1	**-- 35 minutes before the end of class** **a. no further practical works were allowed.** **b.students were given *individual task sheet*. Each student had to finish the questions of the task sheets *without discussions* and without any reference books** **c. submission of completed task sheets in *25 minutes*** **-- After collection of student individual design and before dismiss of class** **a. teacher *provided feedbacks* on the students' common mistakes observed during their tryout**

Tryout Background

Session 1	**b. teacher taught students *pipetting technique* (2 ml and 5 ml)** **c. teacher *taught students to use colorimeter* and introduce the concepts of *qualitative design /measurements* and *quantitative design/ measurements*** **d. teacher distributed the detail procedures of the practical work to students as reference.**

Tryout Background

Session 2	**-- Each group started their own practical work after a 5-minute briefing from teacher.** **-- *Assessment of practical skills* was conducted, generally as a group and individually on *accurate measurement* by using suitable pipette.** **-- *Teacher asked questions* during the practical work** **-- Another task sheet on writing laboratory report was distributed and students were asked to *submit the completed report 3 days later.***

Performance

	Practical skills (10)	Principles of design (10)
Max	9	8
Min	5	3
Mean	7.15	5.35
SD	0.88	1.60

Observations

- Students can ***master most practical skills*** required in the assessment task, including newly taught ***pipetting technique and colorimetry***
- Students ***actively engaged in testing own ideas*** and attempt to make improvement on their ideas
- ***Collaborative effort*** was observed, both ***practically*** and ***conceptually***

Observations

- The new format ***can better assess students' understandings*** of design of scientific investigation
- The scores in the written answers show a ***wider spectrum*** than previous SBA
- However, it is still ***challenging*** for students to ***organize and express their understanding of difficult concepts*** within limited period of time

Reflections

- Students ***can learn*** if they are ***well equipped*** with the ***learning experiences***
- Students are ***willing to "think"*** if they are provided with ***suitable scaffolds*** from teachers
- Students ***enjoy learning by doing*** if they are provided with ***chance to tryout and amend***

Reflections

- Could it be possible that students ***could not learn well*** in the past SBA because
  - They have ***not*** been well equipped?
  - The tasks were ***too demanding***?
  - They ***could not get satisfaction*** from the learning experience?
  - ……..

Feedback to Teaching

- Using students answers as exemplars (e.g. comparison table) ***to illustrate clearly the requirement*** as stated in the assessment rubrics
- More practical tasks / authentic learning experiences should be arranged to consolidate students' conceptual understandings ***by doing and thinking*** (Experiential learning)

Example 1

Question 4 **Will you (1) put the same beetroot into different conc. of ethanol one after one, or, (2) put different beetroots into different concentrations of ethanol? Discuss the strengths and drawbacks of each design**	**Assessment rubric 28 (Excellent)** **Discuss the limitations and strengths of the alternative designs (e.g. within subject and between subject design)**

Example 1

Partially corrected answer	Partially corrected answer
Design (1), because we are going to compare how many the concentration of ethanol to damaged the vacuole and the cell membrane. If the beetroot are the same, it is a fair test and easy to compare will the ethanol affect the membrane permeability of beetroot	Design (1), this design could reduce the amount of beetroot needed but it will not be a fair test because the membrane was damaged by the previous ethanol. (2), this design is a fair test and each of the concentrations ethanol have a result but it is time consuming and need more beetroot and there are more factors that affect the results

Example 1

Suggested Answer

Design (1) has the problem that the membrane of beetroot has been damaged by the previous treatment of the ethanol and some red pigment has leaked out. It thus cannot show the effect of a concentration of ethanol. Design (2) avoids this problem, but the beetroot put into different concentrations of ethanol may be different, e.g. cells containing different amount of red pigment. It makes the comparison between different treatments unfair. (#28)

Example 2

Question 7 Apart from ethanol and the shape and size of beetroot, are there other factors that may affect the leakage of pigment from beetroot cells? Explain your answers. How can these factors be controlled?	**Assessment rubric 22 (Excellent)** **Explain why some important controlled variables can be controlled**

Example 2

Partially corrected answer	**Partially corrected answer**
Temperature may affect the leakage of pigment from beetroot cells. When the temperature of ethanol is higher than the rate of ethanol to damage the cell membrane is higher.	The temperature of the environment, because higher temperature will make particles move faster means can finish diffusion in shorter time. But we need to do fair test, so we can put these test tube in same place, such as freezer, Although it takes lot of time, but it must be fair

Example 2

Exemplars from students	***Exemplars from students***
Different temperature may affect the rate of diffusion of beetroot pigment. Because in a higher temperature, there will have a higher kinetic energy inside it and the rate of diffusion will be higher, the pigment can diffuse out rapidly. On the other hand, a lower temperature affects the rate of diffusion therefore it results in leakage of pigment. Temperature can be controlled by human effort e.g., air conc or measure the temperature to be the same.	*The temperature of the solutions since a high temperature can also damage the cell membrane and cause pigment leakage. This can be controlled by using solutions at room temperature and executing the experiment in a room-temperature environment. The freshness of the beetroot can also affect the leakage of pigment from beetroot cells, to control this, we should extract beetroot pieces from the same beetroot sample and avoid using different beetroot samples.*