Science Teachers' Beliefs on Performance Tasks as A Tool for Authentic Assessment

Abstract

This paper presents a case study of teachers' beliefs about assessment. An interview protocol was designed to capture science teachers' beliefs on performance tasks as a tool for authentic assessment. The interview protocol was based on questions developed into four categories: (i) General Beliefs on Assessment, (ii) Beliefs on Performance Task, (iii) Scenarios on the Performance Task, and (iv) Samples of Students' Work on Performance Task. Data were collected from 4 science teachers at an autonomous secondary school. The participants in this study came from 3 categories of teachers in the science department: (i) Classroom Teachers, (ii) Senior Teacher, and (iii) Middle Manager. The data collected were then used to evaluate the interview protocol in three categories: (i) Was the interview protocol and questions understandable to the participant, (ii) Did the interview protocol and questions yield the desired data about science teachers' beliefs, and (iii) Was the length of interview appropriate? The interview protocol proved to be useful for gaining insights into the beliefs of science teachers about assessment. Four preliminary themes of beliefs were extracted from the data: (i) Beliefs on Assessment, (ii) Beliefs on Students' Ability, (iii) Beliefs on Teachers' Competency, and (iv) Beliefs on Professional Learning Community (PLC). As participants from this study played different roles in the science department, the data indicated similarities, differences and the interactions among the beliefs held by the different categories of participants.

Submitted by : Muhammad Mubarak Bin Habib Mohamed
Afliation : Temasek Secondary School, Singapore
Designation : Subject Head Science
Email address : muhammad_mubarak_habib_md@moe.edu.sg
Alternative email 1 : mubarak@iamtemasek.edu.sg
Alternative email 2 : md786md77@gmail.com

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Introduction

The science curriculum can always be seen to be in a state of flux (Orpwood, 2001). Orpwood (2001) categorized these curriculum changes into two types. They are (1) normal curriculum changes that look at the content to be included in science curriculum and (2) revolutionary changes in the last 50 years that focus on the nature of science and process of the scientific discipline itself. These reforms are grounded on the principles of constructivism. In recent years, many of the national science education reform documents recommend constructivist teaching practice (NRC, 1996; Rutherford & Ahlgren, 1990). On the other hand, even though there has been an intensive call for instructional reform in the science classroom, research in science classroom has suggested that changes has not been extensive and teachers are still focusing on the rote learning of facts and algorithms whereby students gain decontextualised knowledge (Davis 2003; Weiss, 1997; Gallagher, 1991; Tobin & Fraser, 1989; Tobin & Gallagher, 1987). With many attempts at curriculum reforms, alignment with assessment is often forgotten. Orpwood (2001) mentioned that changes in goals of science towards inquiry skills have started in the 1960s, but changes to the assessment methods were matched only 20 years later. He added that a reason for difficulty in assessment reform is the professional inertia amongst teachers themselves.

There could be many factors contributing to such inertia. One possible factor is teachers' beliefs. Teachers' beliefs play an important role in decision making for classroom instructions, assessments and in education generally. Fortunately, teachers' beliefs are receiving increased attention from the science education community. Many scholars consider teachers as action agents and highlight the importance of identifying teachers' beliefs in order to successfully achieve any educational reform (Levitt, 2002; Haney, Bybee, 1993; Pajares, 1992; Nespor, 1987). Therefore, the purpose of this study is to acquire an insight into science teachers' beliefs about assessment.

Background

There are several key theoretical constructs underpinning this work. Firstly, changes that are taking place in the theories of learning where there is a move from traditional views of learning to a constructivist, with social constructivist forming the major construct of this work. Secondly, changes taking place in both the societal needs (21st century skills) and the science curriculum together with assessment. With these changes, teachers and students are affected in the education system.

Inquiry based (IB) has become the focus of science education in Singapore that hopes to provide the necessary 21st century skills to students through the learning of science. In an IB classroom, students will be (i) engaged in scientifically oriented question, (ii) giving priority to evidence in responding to question, (iii) formulating explanation from evidence, (iv) construct an explanation with scientific concepts and (v) communicating and justifying explanation (NRC, 2000).

These characteristics of an IB classroom demonstrate that learning science is not just about learning concepts and theories but also to acquire an understanding of how science functions as a discipline and skills associated with scientific investigation. With these objectives in mind, students are expected to be able to relate science to technology and ultimately, their impact to society and environment (Orpwood 2001). The dilemma faced by Singapore Science teachers would be how to balance between providing inquiry experience to students that could not be measured by traditional high stake assessment like GCE 'O' level and completing the syllabus and providing drill and practice so that they could perform well for the high stake pen and paper assessment. Science teachers are aware that to develop a disciplined mind, students have to acquire a deep understanding of concepts and an exceptional high amount of time studying the fundamentals (Gardner, 2006) of science. They are also aware of the limitation of the standardized testing that could not measure a student's ethics and attitudes intended by the Singapore Science curriculum framework.

The implementation of principles associated with assessments that are aligned to IB approach of teaching and learning science may be more complex than initially thought. Teachers play a significant role in the implementation of IB and aligning their assessment practices to the intended outcomes of IB. It is very critical to consider how to develop professional development opportunities for teachers to support them in the implementation of IB and its alignment with assessment. I believe that in order to design an appropriate system of professional development, it is critical to understand teachers' beliefs in IB implementation and assessment. Individuals' decisions are strongly influenced by their beliefs (Bandura 1986) throughout their lives. Pajares (1992) asserts that "beliefs are the best indicators of the decisions that individuals make throughout their lives" (p. 307). As teachers' beliefs play a major role in their decision making about curriculum, instructions and assessment tasks (Nespor, 1987; Pajares 1992), a closer examination and direct study on the relationship between teachers' beliefs and educational practices must be given due attention.

Purpose of the Study and Research Question

The main purpose of this study is to gain an insight of science teacher beliefs in assessment. This study will not attempt to be conclusive about the categories of belief but the data should still allow the researcher to get a sense of each teacher's perspective.
This study investigates the following question:

1. What are science teachers' beliefs in using Performance Task as an authentic assessment tool?

Method

This is an exploratory study meant to gain insight into Science teachers' beliefs in using performance task as a tool in authentic assessment. This study will not attempt to be conclusive about the categories of beliefs but the data should still allow a researcher to get a sense of each teacher's perspective.

Qualitative research methodology is selected to understand science teachers' belief about performance task as an authentic assessment tool to assess students' understanding. In the current study, there are two main reasons why a case study seems to be the more appropriate type of qualitative research method than others. Firstly, a case study provides distinct approach in answering the 'how' and 'why' question (Yin 1989). Secondly, a case is very appropriate when a researcher focuses more on the process rather than the outcome of the research (Merriam, 1998). In this study the boundary of the case is the science department in a secondary school as teachers' beliefs are influenced by the academic ethos of the institution and the people that make up the institution.

Participant

In this study, the participants will be selected from the science department. Three categories of teachers from the department will be selected: (i) Classroom Teachers (ii) Senior Teachers and (iii) Middle Managers. There are two main reasons why the researcher wants to examine these three groups of teachers. Firstly, curriculum and pedagogical changes in a school take place within a system. Within the science teaching process, each science teacher has different impact on science teaching and learning. This brings me to a more specific reason for the above categorization. Secondly, these three groups represent distinct roles that pose particular influences on the workings of the science department. The middle managers or head of department (HOD) and subject head (SH) are the guardians of the department's teaching and learning processes. They are the guardians of the overall results of the science subjects. They relay the school's direction and policy that are disseminated from the school leaders to the department teachers. They also act as the bridge between curriculum planning and development division (CPDD) and the classroom teachers. On top of this, the middle managers also have their own beliefs about curriculum, pedagogy and assessment that they developed over their years of teaching experience. How do they manage their beliefs as both a teacher leader and a classroom teacher, along with the other policies and initiatives passed down to them from the different authorities? Senior teachers play the role of mentors in

the department where teaching and learning matters are concerned. They act as the in-house trainers for the department teachers, following the direction set by the middle managers. Classroom teachers are at the receiving ends of new policy, new initiative, new direction, waiting to be guided and facilitated in improving their teaching so that it could impact students' learning positively. How do classroom teachers manage and enact their own beliefs in congruence with those that come form the middle managers or senior teachers? These categories will allow the research to look at the interaction of beliefs within the department.

Teachers in these categories will be selected based on the following criteria: (i) willingness to participate (ii) two classroom teachers, (iii) two Senior Teachers, (iv) one Middle Manager and (iv) approval by the school system. Each of these teachers will fill up an individual profile form, and teachers without prior understanding of performance tasks will be given reading materials on performance task prior to the interview.

School Context

The school where the study is conducted was officially opened in 1980. Since then, the school has developed into a school of choice in the Eastern part of Singapore. The school was awarded her autonomous status in 1996. She was awarded the School Distinction Award (SDA) in 2005. At the onset of the study, there are a total of 1524 students in 5 different levels. 75% of the students are in the express stream. There are a total of 7 Normal Academic classes and 4 Normal Technical Classes. 90% of the student population holds Singapore citizenship, with the remaining made up of permanent residents, PRC scholars and ASEAN scholars. The scholars joined the school from secondary three onwards. 80% of the express students take pure sciences with 3.5 classes of triple science and the remaining taking double science. Double science students study pure physics with pure chemistry or pure chemistry with pure biology. Every classroom in the school is equipped with a computer, a visualiser and a projector as teaching aid. There are a total of 17 full time science teachers. 13 science teachers straddle between the lower secondary and upper secondary levels, 2 science teachers teach only the upper secondary levels and two science teachers teach only the lower secondary level.

Data Collection Method - Interview

In the current study, a structured interview is used. Although a set of interview questions are developed, the interviewer has the flexibility to add or delete some questions as deemed fit. The interview questions are developed into 4 different categories: (i) general beliefs on assessment, (ii) beliefs of performance task, (iii) scenarios on the performance task and (iv) samples of students' work on performance task. The rationale for this design is to move the interview from an abstract conversation about assessment and performance task towards actual scenarios developed, so as to elicit responses when the interviewee sees samples of students' works. Appendix A illustrates the categorization of the questions, and what those questions are intended to probe. Additional questions based on the interviewee's responses were asked spontaneously during the interview.

Results

The purpose of the pilot research study was to try out the interview protocol to see if the protocol was able to answer these following three questions:

1. Was the interview protocol / questions understandable to the participant?
2. Did the interview protocol / questions yield the desired data about science teachers' beliefs?
3. Was the length of interview appropriate?

In looking at the data I related the participants' answers to the larger research question which is:

1. What are Science Teachers' Beliefs in Using Performance Task as An Authentic Assessment Tool?

The case is described in terms of teacher's background, general beliefs on assessments, performance tasks, reactions to performance task scenarios and reactions to students work sample. Based on the data collated, an analysis is carried out to answer the purpose of the pilot research study.

Teacher's Background

Mr. Cain[1] was a 35-year-old Head of Department (HOD) for Science, with 10 years of teaching experience. Mr. Cain received both his Master's and Bachelor's degree in Science from National University of Singapore (NUS). He started is teaching career as a Physics teacher at a junior college in Singapore. He taught there for 5 years. He then moved to Ministry of Education (MOE) as a curriculum officer in Curriculum Planning and Development Division (CPDD). He was in charge of the School Based Practical Assessment (SPA) training for 'A' level physics teachers. Since 2007, he is the HOD Science at the current school where the study was conducted. As a teacher, he was eager to improve his teaching and his students' achievement in science and developed scientific minds. He leads the department with the vision of developing inquisitive minds of students without compromising on the academic results measured through GCE 'O' level examination. At the time of study, Mr. Cain has just completed level 2 training on the use of Understanding by Design (UbD) in curriculum design. He was taught on how to align the big ideas of a curriculum with the modes of assessment. He also learnt the definition of performance task for the first time and was taught on how to craft performance task.

General Beliefs about Assessment in Science

Mr. Cain believes that there is no one best method to assess students' understanding in science. This is due to the different aspects of understanding that students are required to demonstrate in science. Form the interview data, different modes of assessment will measure different aspects of students' competencies. As science curriculum is generally made up of two aspects: (i) content and (ii) general investigation skills, Mr. Cain believes that the traditional pen and paper test can assess students' understanding of content and the general investigation skills are tested through practical assessment.

Beliefs on Performance Task

Mr. Cain indicated that he only knew about the comprehensive definition of performance task after attending the level 2 training on UbD. From the interview data, Mr. Cain mentioned that performance task is unable to assess all the different facets of understanding. Therefore performance task should serve as an effective tool that is linked to the enduring understanding and big ideas of the topic. However, it cannot be the only tool used to assess students' understanding of a particular topic.

Mr. Cain believes that teachers' content knowledge is vital if performance task becomes a major part of students' assessment. This is due to the need for teachers to be able to integrate different aspects of the learning outcomes with performance task. He also believes in group wisdom as it will add to the validity of the performance task when there are more teachers working together and providing critical evaluation on the performance task. Moreover, it reduces the burden of one teacher in the process of crafting the performance task as it requires a great amount of thinking during the process of integrating the various learning outcomes. However, he believes that performance task is more useful as a mode of assessment for learning. He mentioned that performance task will be able to provide teachers with the platform to identify gaps of understanding among students while they are doing a task. He added that, teachers must be able to provide timely feedback to students if they want to address those gaps before students submit their final product.

[1] The names of person and schools in this study are phepseudonym names.

Reactions to Actual Performance Task Scenarios

Mr. Cain indicated that the scenarios must meet the specific learning outcomes of the topic before we can determine its usefulness. From the interview data, Mr. Cain viewed scenario 1 as the most useful scenario, for it required students to connect circuit from nothing and it was coupled with the constraints of the house. He added that one of the learning outcomes of this topic is that students should be familiar with series and parallel circuits. The role that students will be playing in this scenario will require them to be familiar with series and parallel connections. He added that this scenario requires students to integrate the concept of energy and power in their calculations. This means that students must achieve a certain level of mastery of the conceptual understanding of current flow, and potential difference in series and parallel circuits. He mentioned that a pen and paper test does not provide the realistic setting as scenario 1. Mr. Cain compared scenario 2 with scenario 1 and commented that scenario 2 does not require students to command good mastery of circuit connections. They are not required to connect electrical components as they only need to explain the type of circuitry commonly found in HDB flats. The introduction in Scenario 3 bears no relevance to the topic on electric circuit.

From a student's perspective, Mr. Cain mentioned that if he is a student, he would prefer to work on scenario 1, so as to demonstrate his understanding as this scenario provides him the chance to be an engineer. He added that the other two roles are not useful for him as a student.

In assessing students' understanding via performance task, Mr. Cain indicated that it will have to match the learning outcomes. He mentioned that how well students are able to explain the concept of current flow in a circuit and the concept of potential difference will be used as criteria of assessment. Another criterion that he added is the circuitry diagrams of the electrical components and the energy consumption of the electrical component. Another criterion that is not featured in the learning outcome is the creativity of students in placing the lighting components in the house.

Through the interview data, Mr. Cain stated that in order for students to be able to do this task, the classroom lessons must provide them with thorough understanding on the concept of current and potential difference. They must be exposed to different situation on how these two concepts works in a series, parallel and combination circuit. Power and energy calculation must be taught to students.

Reactions to Students' works sample

Mr. Cain mentioned in the interview that the work sample showed that students are able to connect circuits in series and parallel. However, the work sample of students failed to demonstrate students' understanding of the concept of current and potential difference. This can only be confirmed by teachers during the presentation portion of the task. He added that the work sample showed that the intended learning outcomes that the performance task set out to measure is achieved. He explained this by stating that the integration of circuit connections with energy and power calculation is clearly visible through the work sample. He added that a pen and paper test will not manifest such a rigor of integration.

In terms of how lessons should be carried out in order to achieve this type of work from students, Mr. Cain stated that apart from providing students the conceptual understanding related to the topic, students must also be taught how to work as a team. They require guidance on how to carry out discussion and managing differences of opinion. Hands on sessions, where students experience working as a group and discuss their ideas must be incorporated into a lesson. Mr. Cain emphasized on two very important variables that could produce different outcomes to the learning experience of student and eventually, the final work sample should reflect: (i) class ability and (ii) teachers' competency. He elaborated by stating that a lower ability class may have more classroom management issues and therefore a teacher would prefer the transmission mode to a student-led discussion. Teacher's competency is also an issue as the same lesson plan given to two teachers will yield two different outcomes. He mentioned that beginning teachers might be more worried as they must be able to handle both content issues and classroom

management simultaneously. Chances of students having misconceptions are higher in these classes if students are allow to explore and use the constructivist approach as beginning teachers are not experienced enough to facilitate in-depth discussions. They might be more comfortable in just employing direct teaching to provide students the required content so that they are able to complete the task. Mr. Cain said that to expedite beginning teachers' familiarity is to provide them with structured and guided trainings. This could be done by asking them to observe a constructivist class that uses performance task as the mode of assessment.

Discussion

The purpose of the study was to try out the interview protocol to see if it could answer the following three questions:

1. Was the interview protocol / questions understandable to the participant?
2. Did the interview protocol / questions yield the desired data about science teacher beliefs?
3. Was the length of interview appropriate?

Question 1: Are the interview protocol / questions understandable to the participants?

From the interview data, the interview questions were understandable to the participant. The participant was able to provide comprehensive answers to the questions posed, and articulate the meaning of various terms. The participant was very familiar with the learning outcome of the topic that was tested in the performance tasks and he was able to compare the learning outcomes that the respective scenarios were able to measure. As the participant had just completed his level 2 UbD training, he is very familiar with the characteristics of performance tasks and how performance task is used to measure the different facets of understanding. He also was able to articulate the type of support that teachers will require if performance task becomes a major mode of assessment in science.

The ability to answer the questions is dependent on the participant's experience and exposure to the terms used in the questions. As this participant is a middle manager and leading the department, he is very familiar with the learning outcomes of the topic. Another participant without the same experience may not be able to compare the various scenarios with the intended learning outcomes. From the data, the participant mentioned that he only knew the definition of performance task and its alignment with big ideas after attending the UbD training, other participants without this prior training may not be able to understand the interview questions as well as him.

Question 2: Did the interview protocol / questions yield the desired data about science teachers' beliefs?

Yes, the interview protocol and questions yielded good data about teachers' belief. The conversation about belief moved from an abstract understanding of assessment to a more concrete conversation when actual performance task scenarios were presented and students' works were analysed. From the interview data, the research question gave rise to these preliminary areas of belief of science teachers in using performance task: (i) assessment, (ii) students' ability, (iii) teachers' competency, and (iv) professional learning community (PLC). We will be describing these areas by relating it to the interview data.

Assessment

From the data, it is clear that one of the beliefs of science teachers on assessment in general is that assessment must measure the intended learning outcomes of the curriculum. Be it for the specific topics or the general science curriculum. The usefulness of the mode of assessment is the ability to measure the intended outcome stated in the science curriculum. This point was repeated a few times throughout the interview. It was mentioned that no one mode of assessment can measure all the intended outcomes of the science curriculum. A combination of assessment modes must be deployed in the curriculum. Nevertheless, content in science must not be assessed in isolation. More ways to assess integration of content across chapters must be developed. From the data, teachers' belief that performance task is able to

outline the realistic context of the content and at the same time, integrate the different learning outcomes of different topics. But there are different facets of student's understanding. According to the teacher interviewed, performance task is unable to measure all the different facets. On the contrary, the crafting of the performance task starts from looking at the different facets of understanding. At the point of interview, the teacher had just completed his training in level 2 UbD, where he was introduced to the 6 facets of understanding, and the definition and crafting of performance task.

Students' Ability

Students' ability was associated to classroom management issues. It was mentioned in the interview that a lower ability class might pose more classroom management issues to teachers. Therefore, teachers may resort to a teacher-centered approach, as this will grant a teacher more control over the classroom situation. However, this could also mean that the probability of a teacher providing learning experiences that would challenge students in a lower ability class is lower, compared to a higher ability class.

Teachers' Competency

From the data, it was mentioned that teachers' competency is a variable for the success of using performance task as an assessment tool. It is apparent from the interview data that beginning teachers will find it difficult to carry out the constructivist approach and resort to alternative modes of assessment. This is due to their inexperience in handling content issues that may arise during students' discussion, as well as misconceptions when students are allowed to explore their mental models. Beginning teachers will also need to handle classroom management issues if they are given a lower ability class.

Professional Learning Community (PLC)

From the interview, it is clear that in implementing performance task, teachers need to work as a team. This is due to the complexity in crafting performance task that requires integration of topics with learning outcomes. With PLC, this will provide support for teachers to critique the performance task, thereby ensuring the validity of the performance task in relation to the different learning outcomes. Another point from the interview is that in order to help teachers to become more familiar with performance task or constructivist teaching approach, a more sustained training must be provided. By forming PLC, teachers can share their expertise and beginning teachers can observe classes taught by more experienced teachers using the constructivist teaching approach and performance task. PLC can also assist in improving teacher's competencies. When teacehr's competencies improved, teacher may be able to manage content and classroom management issues better.

Question 3: Was the length of interview appropriate?

From this pilot research study, the length of the interview which was approximately 30 to 35 minutes was very appropriate. This is due to the participants' familiarity with the terms used in the interview. Therefore, the duration of the interview might vary with other participants, depending on individual grasp of the interview questions.

Conclusion

Data from the research study indicated that the questions are understandable to the participants. But this might not be true for all other participants after further study, as the interview questions require participants to have certain background knowledge on the terms used in the interview protocol. The understandability of the questions is a function of participants' experience and familiarity with the terms used in the questions. The interview data provided a preliminary categorization of teachers' beliefs on performance task: (i) assessment, (ii) students' ability, (iii) teacher's competency and (iv) professional learning community. When further data are obtained through more interviews, these categories could be used as preliminary categories to analyse the data. The interview protocol was able to progress from an abstract conversation of belief to a more concrete conversation on integrating various modes of assessment. The timing of the interview was found to be appropriate for this particular pilot study.

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Appendix A
Interview Questions

Categories	Questions		Probing for…
General	What do you think is the best way to assess students understanding in science?		General belief on assessment
Performance Task	What are your views as a teacher if performance task is used as an assessment tool in science?		Belief in PT as assessment tool.
	What type of support do you require if performance task becomes a major part of students' assessment of learning in science?		Belief in relationship between curriculum, pedagogy and assessment.
Scenarios on the performance task	Do you think these scenarios are more useful to assess student's understanding than traditional pen and paper test?		Understanding on validity of assessment tool.
	If you are a student, which scenario would you prefer to demonstrate your understanding in this topic? Why?		Belief of assessment from student's perspective.
	What are some criteria that you will use to assess students understanding? What do you think is important to look at if you want to measure students understanding?		Familiarity with learning outcomes and belief in how students understanding can be demonstrated.
	How would you prepare students for this type of task?		Belief in relationship between curriculum, pedagogy and assessment.
	What are your criteria in marking this performance task?		Familiarity with learning outcomes and belief in how students understanding can be demonstrated.
Sample of students work on the performance task	**With Student's Sample**	**Without Student's Sample**	
	What are your views on this product?	Why do you think that students do not choose this scenario to demonstrate their understanding?	General perception of students work.
	What are the ingredients that are necessary during teaching that must be included so that students are able to produce this product / project?	Why do you think that this scenario will assess students understanding?	Belief in relationship between curriculum, pedagogy and assessment
	As a teacher, how do you	What changes	Belief in relationship

	plan your teaching if you are expecting students to produce this product as evidence of their understanding?	could be done to make this scenario more palatable to students?	between curriculum, pedagogy and assessment

Appendix B
Performance Task Scenarios

Scenario 1

Babuza Architectural Company where you are working for as an electrical engineer has just purchased a plot of land near the Integrated Resort. This plot is predicted to be the next area for development of terrace houses where the higher income Singaporean, upper middle income Singaporean and business expatriates will be staying. In three months time, the company will be having an open house and inviting people to view the design of the terrace houses.

You are required to design the electrical circuitry of the terrace houses and put in unique lighting system that will attract potential buyers. During the open house you must have a model that is able to demonstrate the design of the lighting systems of the house.

Your task is to make a complete presentation of the circuitry system with a model that demonstrates those features to the CEO of the company two weeks before the open house.

Standards and Criteria for Success

- Your presentation should
  - provide the circuit diagrams of the electrical connections illustrates how the connections work,
  - it must have at least 3 special features
  - provide cost effective and energy conservative ways to achieve those features
- Your model must indicate the position of where the switches and lights are to be situated and it can be tested by potential buyers.

Scenario 2

With the new alliance that Singapore's Government has forged with Middle Eastern countries, many Government officials from these countries are coming over to Singapore to study on her success. One such visit will be by Dubai, Qatar and other government officials to study on public housing development in Singapore. These officials are going around Asian countries to scout for special features and electrical safety in public housings. They will be bring these information back to their respective countries and evaluate before signing a multi million dollars agreement to build public housing in their countries.

You are a business development officer from the Housing Development Board (HDB) who is tasked to promote the special features in HDB flats in Singapore. You are to make an interactive presentation to them highlighting the unique electrical feature of our flats in Singapore. In your presentation, you are to show a typical circuitry connection in a 3 room flat and all the safety aspects that are in built in these connections. You are also to develop a colourful brochure that will summarise all the point that you are making in your presentation in a comic strips form.

Standards and Criteria for Success

- Your presentation should include:
    - Circuitry diagrams of the typical 3 room flat in Singapore
    - The safety features present in the wiring of the flat
    - Energy conservation practices HDB adopt base on Singapore's Government policies
- Your brochure should be colourful with comic strips that highlight the safety features of the HDB flat.

Scenario 3

H5N1 virus treats have been in the increase. In Singapore the authorities are not taking these outbreaks lightly. School Divisions have informed all principal to ensure that students are still able to learn if a school closure is necessary. Insight Secondary School has been very active is converting their lessons into e-lesson packages.

You are the Business manager of an online portal that host e-lesson packages for schools so that they can be accessed from anywhere around the world. You are tasked to develop an e-learning package on the topic electric circuit for lower secondary students of different abilities. The school will evaluate the package done by your company before deciding to engage you totally.

Standards and Criteria for Success

- Your e-lesson package should have:
    - a storyline where the students will be a character and learnt about the lessons as the story develops.
    - powerpoint slides
    - worksheets
    - self evaluation
    - video clips or applets
    - higher order thinking problems
- The lessons should meet the objectives required for the topic.