

# Design and Applied Technology

## CASE STUDY

### The Technology behind Game Console





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## Design and Applied Technology

Students should be made aware of the relevance of the technology they are studying to the real world. Case studies on technology and design enable students to put their learning into an authentic context.

**Authentic context:** Through the study of motion sensing game controller development, students could explore the development process and social impacts of an advanced technology product

### Topics Covered:

Compulsory Part	Strand 3 : Value and Impact
Elective Part	Module 4 : Electronics





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## 1. Background

Are you one of the fans, who queue till midnight to get hands on a newly announced game console? Have the revolutionary features and enhancements in these new game consoles attracted you? Underlying these features and enhancements are cutting-edge technology that the game console manufacturers developed to attract the game players.



Nowadays, video game represents a significant amount of business and revenue in a number of countries. Thus, it attracts quite a number of companies to develop products in this area and hence creates severe competition among them. To withstand the competition, manufacturers establish advanced research-and-development laboratory for game technology and result in new technological developments.

These technologies are very often cutting-edge technology that are invented originally for playing video game before a number of them find their ways into other mainstream electronic products. For example, 3D video cards were called graphic accelerators, which were invented for playing game in PC and they are now found in every Personal Computer.

Not only these cutting-edge technologies find applications in other electronic product, people discover the video game itself is a good means to facilitate student to learn.

For further information, you may refer the articles in the following two websites:

1. Video Games: Serious Business For America's Economy  
<http://www.theesa.com/newsroom/seriousbusiness.pdf>
2. Games based Learning: Serious business applications:  
<http://www.pixelearning.com/docs/seriousgamesbusinessapplications.pdf>



## 2. The Case

In this case study, you are supposed to be a technology consultant of an electronic learning solution provider. You are responsible to submit a government project proposal on behalf of your company, which requires the development of a solution on using electronic methods to help student learn better. As you are aware of

- the importance of game technology and its potential applications to motivate student to learn.
- motion sensing game controller is popular among the young generation



In your proposal, you suggest to use game console with motion sensing game controller from a local manufacturer (<http://www.sengital.com>) as the basis of your solution. After submitting the proposal, the government officials will call a meeting to discuss your proposal before they decide whether they accept your proposal. You are also advised that the following will be discussed in the meeting, including

- Given there are some limitations with the technology, is it good to use motion sensing game controller?
- Why the product from the local manufacturer is proposed?
- Why not to use mouse as it resembles the traditional ways of using computer?

Your boss asks you to seriously carry out a study before attending the coming meeting. He also tell you that one of his friends, who is a key member of parent association, express that a few parent associates will also be invited to the meeting.

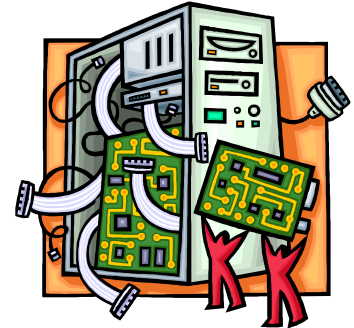
This case study provides a platform for you to study the issues related to an important game console technology from different perspectives including societal, ethical, business and technological. With the learning activities provided by this case study, you will have a chance to investigate the advancement of technologies and how the knowledge can help to improve the economy of Hong Kong.



### 3. The process

Case study is an investigating task. You are required to define the problems and issues, propose solutions, and defend your views among your classmates. You are required to carry out research by:

1. reading
2. product analysis
3. interviews
4. discussion



Furthermore, you are also required to:

- to discuss and explore various facets in this case study.
- to report and conduct oral presentations of outcome of your case study.

### 4. Activities

#### 4.1 Self-assessing Question 1 – Basic Understanding of Game Console



In this class activity, you are required to extend your understanding of micro-controller to a special type of micro-controller based system, namely video game console. Before you answer the question in the following worksheet, try to think about what is happening "inside the box" when you play game with video game console. Alternatively, you may relate the Resource Material in topic 3.3.1 to 3.3.3 of the Electronic Module to the information from the following websites:

1. How Video Game System Work?  
<http://electronics.howstuffworks.com/video-game3.htm>
2. How Joysticks Work?  
<http://www.howstuffworks.com/joystick.htm>



## Case Study: The Technology behind Game Console

Name: \_\_\_\_\_

### Self-assessing Question 1

#### Basic Understanding of Game Console Construction

1. What are the four main components of a computer?

2. In most consoles, it has a special integrated circuit to draw objects on the screen. How do people usually call this an integrated circuit? Which main component of a computer does it correspond to?

7. Give some examples of game controller that you think it could perform better than a joystick. In what way it is better than a joystick?

3. A personal computer is also required to draw objects on its screen. Is there any difference(s) between such integrated circuit for personal computer and that for a game console?

6. What is (are) the shortcoming of a joystick?

5. Why does a typical personal computer not come with a joystick?

4. Which part of computer do joystick in game console have similar function?



Notes and remarks:



1

2

3

4

5

6

7





## 4.2 Self-assessing Question 2 – Motion Sensing Game Controller



Most members in the meeting, including the parent association representative, the government officials are all laymen to technology. They do not understand technology well but are very profit conscious. In the meeting, you are required to provide a concise presentation on the technology driving the motion sensing game controller. Otherwise, they won't be able to appreciate the benefit of the employing technology in this technological advanced society. To facilitate your preparation of this part of presentation, please answer questions on the following worksheet. For this purpose, you may relate your understanding of section 3.3.5 of the Electronics Module (Simple Interfacing) to the information from the following website:

1. How do motion-sensing video game controllers work?  
<http://scienceline.org/2006/12/18/motioncontrollers/>
2. How does an accelerometer for Nintendo Wii work?  
[http://wiki.answers.com/Q/How\\_does\\_an\\_accelerometer\\_for\\_Nintendo\\_Wii\\_work](http://wiki.answers.com/Q/How_does_an_accelerometer_for_Nintendo_Wii_work)
3. The technology behind the Wii MotionPlus  
<http://arstechnica.com/gaming/news/2008/08/wii-motion-sensor.ars>
4. Designing games for the Wiimote  
<http://www.develop-online.net/features/58/Designing-games-for-the-Wiimote>





## Case Study: The Technology behind Game Console

Name: \_\_\_\_\_

### 4.3 Class Activity 1 – Basic Understanding of Motion Sensing Game Controller

## Motion Sensing Game Controller

1. What is the function of a game controller?

2. What kind of problem wills motion sensing game controller is intended to solve?

3. Why the problem mentioned in answer (2) is so important?

4. What kind of game are motion sensing game controllers made for?

5. What is the key technology used in a motion sensing game controller?

6. What is the essential function of this key technology in a motion sensing game controller?



Notes and remarks:

1

2

3

4

5

6.



#### 4.4 Class Activity 2 – Product analysis

Besides an introduction of technology behind motion sensing game controller, you are also required to justify the use of motion sensing game controller in the forthcoming project meeting. The objective is to present the advantage of the suggested motion sensing game controller relative to other alternatives, including the more commented motion sensing game controller, the Wiimote from Nintendo. Again, please note that most members of the meeting are laymen to technology. They do not understand technology well. Form a group of five for this activity. Refer to the information on the following website, think reflectively and complete the worksheet:

1. The Company Website of a Local Motion Sensing Game Controller  
<http://www.sengital.com>
2. Some websites that comments Wiimote's problem.

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## Class activity 2 – Product Analysis

# Product Analysis

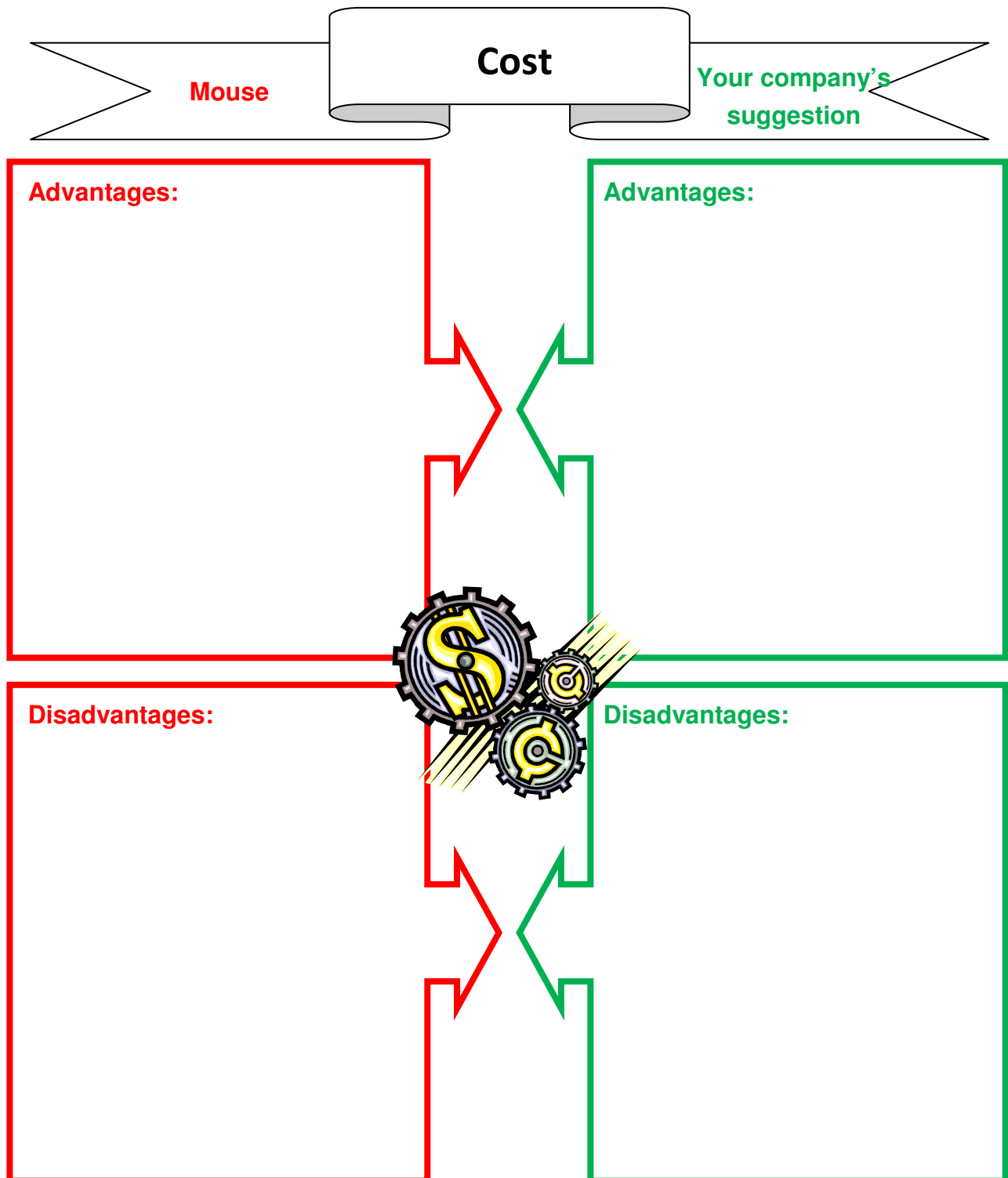


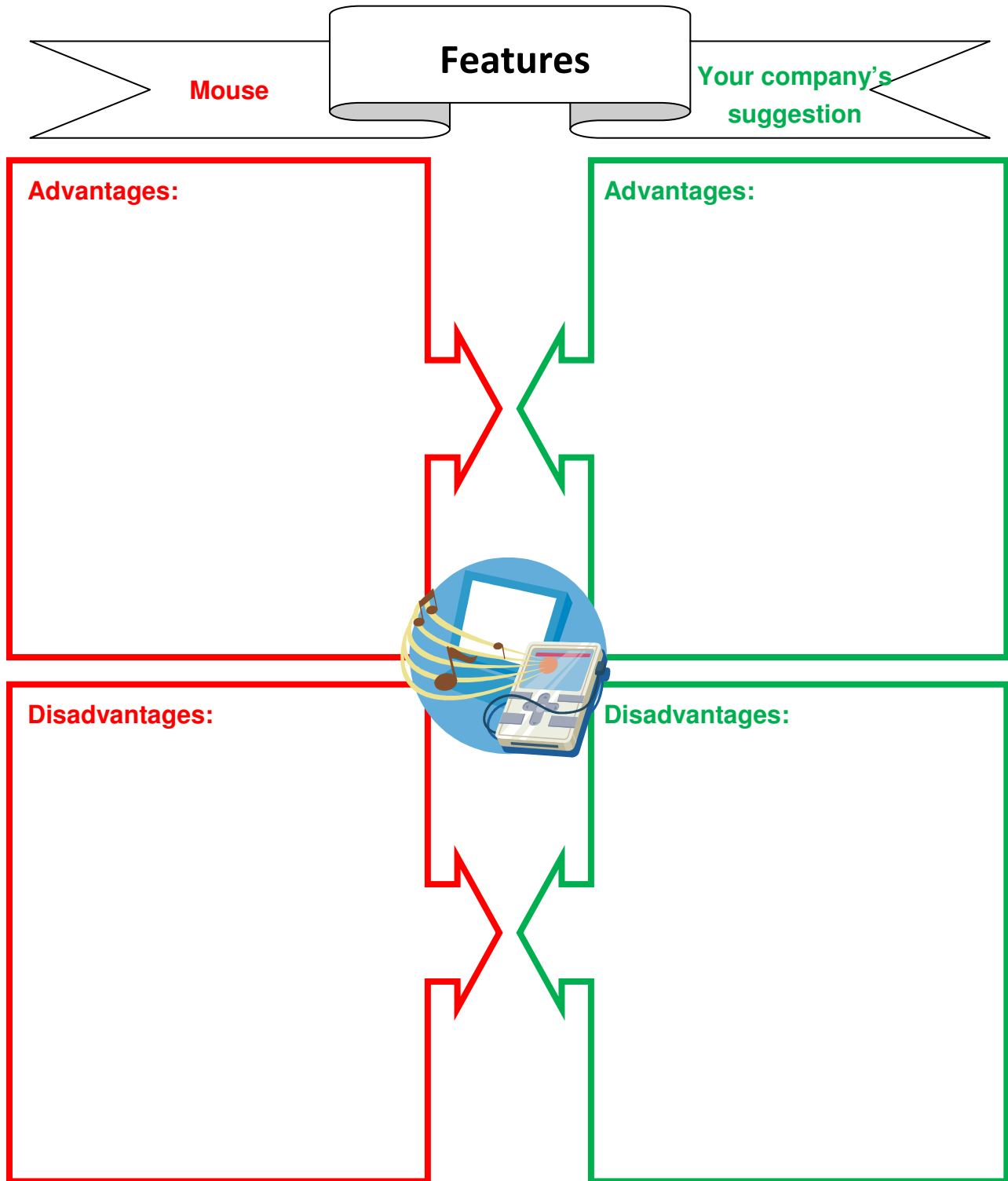
You are asked to compare two designs of motion sensing game controllers.

- 1) Arrange yourself into group of five students.
- 2) Analysis each alternative (traditional computer mouse, Wiimote, and your suggested motion sensing game controller) and write down the advantages and disadvantages concerning the following factors: (i) easy to use, (ii) cost, (iii) features, (iv) potential problem and any other factors that your group feel it is worth to consider

The diagram is a comparison chart with a central title 'Ease to use' in a white box. Below the title are two columns: 'Mouse' on the left and 'Your company's suggestion' on the right. Each column has a red-bordered box for 'Advantages:' and a green-bordered box for 'Disadvantages:'. A central illustration of a hand holding a mouse is positioned between the two columns. Red arrows point from the 'Advantages:' box of the 'Mouse' column to the 'Disadvantages:' box of the 'Your company's suggestion' column. Green arrows point from the 'Disadvantages:' box of the 'Mouse' column to the 'Advantages:' box of the 'Your company's suggestion' column.

Ease to use	
Mouse	Your company's suggestion
<b>Advantages:</b>	<b>Advantages:</b>
<b>Disadvantages:</b>	<b>Disadvantages:</b>

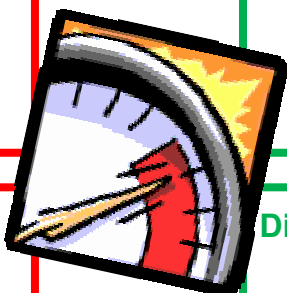






Mouse	Potential Problem	Your company's suggestion
<p><b>Advantages:</b></p>		<p><b>Advantages:</b></p>
<p><b>Disadvantages:</b></p>		<p><b>Disadvantages:</b></p>



Mouse		Your company's suggestion
<p><b>Advantages:</b></p>		<p><b>Advantages:</b></p>
<p><b>Disadvantages:</b></p>		<p><b>Disadvantages:</b></p>





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### Class Activity 3: Focus Group Meeting

#### Conduct a preliminary analysis for the potential customers

To prepare for the coming meeting, it is suggested to conduct a focus group meeting to collect opinions from potential customers, including game players and their parents. To this ends, you are required to carry out a focus group meeting, which you may identify a number of your classmates, who like to play video game, to carry out the meeting at class, as well as their parents, who are probably the one who actually pay for it, to carry out the meeting at home.

#### (1) Ease of Use

Situation

Recommendation



#### (2) Cost

Situation

Recommendation





(3) Features

Situation	Recommendation

(4) Potential Problems

Situation	Recommendation

(5) \_\_\_\_\_ (Any factor that worth to consider)

Situation	Recommendation



## 5. Authentic Learning Scenario

We are going to create a more authentic learning scenario, in which you are required to take greater responsibility of your learning through taking up roles in according to your interest, strengths and experience. In this activity, you are expected to learn how to compromise with participants of different roles.



### Class Activity 4 – Project Meeting

After going through the work mentioned in last few class activities, your group is now prepared for the project meeting with government officials. In this activity, it is expected that the whole class (including teacher) are involved as one big group, with each assuming different roles and responsibilities.

The objective of the meeting is for the government officials to explore whether your proposal should be accepted. Meeting members with different posts supporting different strategies are summarized in the following table:

Supporter	Strategy
Government Official	Invite comments and opinion from participants of different roles;
Parent Association Representative	Give comments from societal and ethical perspectives. In particular, the potential negative effect of student spending too much time in playing computer game will be raised;
Technology Consultant	Give comments from technological perspective. In particular, the underlying technology and the advantages of using your suggested motion sensing game controller will be explained;
CEO of your company (i.e. your boss)	Give comments from business. In particular, the economic benefit to the society will be explained;
User Group Representatives	Give comments from societal and ethical perspective. In particular, the concern on society's view and acceptance of computer game will be raised;



## Assign Role and Responsibility

Refer to the following table, select one role according to your interest, strengths and experience:

Post	Scope of Work	No. of persons
<b>Government Official</b>	<ol style="list-style-type: none"> <li>Chairman of the meeting, facilitates discuss among participants of the meeting so as to produce a fruitful discussion</li> <li>Monitor the progress</li> <li>Assurance of learning outcome</li> <li>Provide facilitation in resources</li> <li>Provide supervision and guidance</li> <li>Conduct assessment and feedback</li> <li>Provide commendation</li> </ol>	1 teacher
<b>Parent Association Representative</b>	<ol style="list-style-type: none"> <li>Prepare questions in the Q&amp;A session</li> </ol>	1 group of students
<b>Technology Consultant</b>	<ol style="list-style-type: none"> <li>Conduct intensive information search</li> <li>Present motion sensing game controller and results of product analysis</li> <li>Answer questions in the Q&amp;A session</li> </ol>	1 group of students
<b>CEO of your company (i.e. your boss)</b>	<ol style="list-style-type: none"> <li>Present and interpret focus group meeting result</li> <li>Answer questions in the Q&amp;A session</li> </ol>	1 group of students
<b>User Group Representatives</b>	<ol style="list-style-type: none"> <li>Prepare questions in the Q&amp;A session</li> <li>Have right to vote (peer assessment) in the meeting</li> </ol>	All (students)





## Worksheet: Presentation Mark Sheet

Name:	( )	Class:	
Case Study:	The Technology behind Game Console		
Group 1	Comments:		
Group 2	Comments:		
Group 3	Comments:		
Group 4	Comments:		
Group 5	Comments:		
Teacher Remarks:			



We encourage collaborative learning throughout this case study; therefore peer assessment and evaluation on their learning were suggested. It is recommended that you take a minute to evaluate and reflect on your own learning after each lesson. A simple checklist rubric is provided. You will also take responsibility to assess the performance of other groups during the final presentation with the scored rubrics. Teacher will take the role as a moderator. The assessment rubrics will make the assessment more accountable and let you have a clear goal to strive for your best.



## Self / Peer assessment (checklist)

This assessment rubric can be used to keep your learning progress and schedule. Put “Yes” or “No” after each lesson. Teacher can easily check whether you can meet the lesson objectives.

<b>Student Name:</b> _____		<b>Team:</b> _____	
<b>Focus of Assessment: Teamwork</b>		<b>Date:</b> ____/____/____	
Criteria	Self	Peer	Teacher
1. I understand the lesson objectives.	Yes / No	Yes / No	Yes / No
2. I work with team members cooperatively.	Yes / No	Yes / No	Yes / No
3. I give my views responsibly.	Yes / No	Yes / No	Yes / No
4. I respect and listen to other members' ideas.	Yes / No	Yes / No	Yes / No
5. I can draw conclusion after this lesson.	Yes / No	Yes / No	Yes / No
6. I am satisfied with my learning today.	Yes / No	Yes / No	Yes / No



## Assessment rubrics (Presentation)

Students can use these rubrics for peer assessment of the final presentation. Teacher needs to explain and discuss these criteria with the students.

Peer Assessment for Final presentation																	
Team:											Date:		___/___/___				
Assessors:											Class:						
Focus		No	Scores					Assessment Criteria					Scores				
Knowledge	1	1	2	3	4	5	← Understanding of the topic →					6	7	8	9	10	N/A
	2	1	2	3	4	5	← Content is consistent with the topic →					6	7	8	9	10	N/A
	3	1	2	3	4	5	← Content is supported with evidence →					6	7	8	9	10	N/A
	4	1	2	3	4	5	← Content is at appropriate level →					6	7	8	9	10	N/A
	5	1	2	3	4	5	← Show key concept in content →					6	7	8	9	10	N/A
Attitude	6	1	2	3	4	5	← Show effort in group discussion →					6	7	8	9	10	N/A
	7	1	2	3	4	5	← Show effort in information search →					6	7	8	9	10	N/A
	8	1	2	3	4	5	← Show effort in preparing presentation →					6	7	8	9	10	N/A
	9	1	2	3	4	5	← Show competency in IT skills →					6	7	8	9	10	N/A
	10	1	2	3	4	5	← Show organization skills →					6	7	8	9	10	N/A
Presentation	11	1	2	3	4	5	← Present their views and idea clearly →					6	7	8	9	10	N/A
	12	1	2	3	4	5	← Logical and consistent flow of ideas →					6	7	8	9	10	N/A
	13	1	2	3	4	5	← Have interaction with audiences →					6	7	8	9	10	N/A
	14	1	2	3	4	5	← Show appropriate use of visual aids →					6	7	8	9	10	N/A
	15	1	2	3	4	5	← Have eye contact with audiences →					6	7	8	9	10	N/A
Total Scores																	

\* Performance descriptors: 1 is incomplete; 5 is fair; 7 is good; 8 is very good; 9 is outstanding



An abstract graphic of a tunnel-like structure composed of numerous colorful rectangular blocks in shades of orange, purple, blue, pink, yellow, and green. The blocks are arranged in a curved, perspective view, creating a sense of depth and movement. The background is a light, neutral color.

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