Aligning Teaching with Intended Learning Outcomes

Introduction

With your intended learning outcomes at hand, you have to plan your teaching and learning strategies to support the attainment of these outcomes. This section will guide you to devise your plan for teaching and learning using an outcome-oriented approach, or in other words, to select teaching and learning methods which align with your intended learning outcomes. It starts with discussing some important questions that you need to take into consideration when selecting your teaching methods. It then takes you through a range of teaching and learning methods, showing typical scenarios of the methods and diagnosing the intended outcomes with which the methods could possibly be aligned.

Designing a Plan for Teaching and Learning – Some Important Considerations

You are recommended to make a plan to illustrate the teaching and learning methods clearly with some indications of when and in what kinds of subjects such methods are going to be employed.

Before we go into the specific teaching and learning methods, there are some important considerations when selecting teaching and learning methods. In light of this, three check questions are recommended for facilitating your plan.

Aligning Teaching and Learning Methods with Intended Learning Outcomes

When selecting any teaching and learning method it is obviously important to ensure that the method will enable the students to achieve what are intended as learning outcomes. There are different kinds of methods available. Some of them are more effective in building up subject knowledge while some make more contribution to developing generic skills. For more details on learning outcomes, please see the section Defining Intended Learning Outcomes.

Recommended check question: What outcomes does it promote?

Developing All-Round Students with Professional Competence

The institutional outcome for PolyU is all-round students with professional competence. As explained in the section Defining Intended Learning Outcomes, professional competence involves functioning abilities which are founded on a high level of understanding of academic knowledge and relevant procedural knowledge. Teaching and learning should be able to develop abilities to apply knowledge to solving real-life problems. It is crucial to encompass, in teaching and learning, elements of authenticity such as real-world examples, problems which resemble those in the professional world etc.

Recommended check question: How related is it to real life?

Key Features of the 'Active Classroom'

Additionally, the idea of the 'active classroom', which the PolyU advocates, entails educational concepts and strategies that are relevant to the development of a high level of understanding of academic knowledge and functioning abilities.

The four key features of the 'active classroom' are (1) Thinking; (2) Task-Focused; (3) Teamwork; & (4) Transcendence (beyond the normal classroom).

Thinking

The methods are able to motivate students to think deeply with and about the important concepts and theories in their respective disciplines, and to apply the new understanding and skills in exploring and dealing with real-life problems in their future professions. We need to consider and whether they give students enough space to come up with their own 'burning questions' to which they want answers, and are interested and able to grapple with the questions put to them.

Task-Focused

The methods provide students with opportunities to engage themselves frequently in meaningful learning tasks where they are challenged to ask questions, think, discuss, apply and evaluate their new understanding and skills.

Teamwork

The methods require students to work with their peers in teams, both inside and outside the classroom. And the methods can encourage students to become active members of the wider learning community of the real world.

Transcendence (beyond the normal classroom)

The methods encourage students to learn not only through interacting with their teachers and peers in the scheduled face-to-face sessions, but also through interacting with other people in different kinds of out-of-class activities such as technology-enhanced discussions and forums, workplace and/or community-based experiences in workplace, partnership with professional, and international exchanges, etc. The teaching and learning methods should also encourage students to make connections with and appreciate a broader context of learning.

Recommended check question: How active is it?

Check Questions for Teaching and Learning Plan

To sum up, when selecting teaching and learning methods, keep asking yourself these 3 check questions:

- How active is it?
- How related is it to real life?
- What outcomes does it promote?

Teaching and Learning Methods

This section explores a total of 13 teaching and learning methods and uses the three check questions to discuss conditions justifying their use. Each method has three core elements: (1) A description of

what this method looks like in practice; (2) Examples of how this method can be used; and (3) Review alignment using the 3 recommended check questions. The 13 methods will be presented in this sequence:

- Interactive Lecture
- Case-Based Learning
- Problem-Based Learning
- Simulation
- Role Play and Fish-Bowl Observation
- Tutorial
- Self-Directed Learning
- Experiential Learning
- Laboratory Work
- Fieldwork
- Peer Tutoring
- PISER
- e-Learning

Interactive Lecture

Description

As the name suggests, the interactive lecture is characterised by interactions, both teacher with students and students with their peers. It breaks the information presentation into several sessions so that frequent learning activities can take place to foster deeper processing of content. The key is to activate thinking and encourage participation. A diverse range of activities, such as brainstorming, case study, open-ended discussion and teamwork exercises can be integrated into the lecture. It is suitable for both small and large classes – some teachers have used it successfully in tiered theatres with over 100 students.

Example 1

Introduction. Start the lecture by introducing some essential basics on the topic.

Individual Work. Students individually study a real-life case and attempt to answer some questions about the case.

Group Activity. Then students form into groups of three to four with those sitting next to each other. The groups share and discuss their answers.

Debriefing. Invite answers from a few groups and conduct discussion around these answers to build up the major teaching points. Provide supplements for the points missed by the students.

Refocusing. Bring them back to focus on the learning objectives, reiterate the central viewpoints and introduce alternative perspectives.

Making Connection. Close the lecture by making a connection to the next session by giving students an outside class assignment.

Example 2

Introduction. Start the lecture by introducing some essential basics on the topic.

Individual Work. Students practise solving numerical problems.

Explanation. Invite a few students to present their solutions on the board, with the teacher eventually giving the model answer.

Diagnostic Activity. Give a short quiz to summarise the key issues that have been covered.

How Active?

In an interactive lecture, learning activities are made possible at frequent intervals so that students are not passive information receivers. In both Examples 1 and 2, students engage themselves in 'thinking' and work on the 'task'. However, limiting the activities to individual problem solving in Example 2 cuts short of the experience of interaction and learning in a 'team'.

How Related to Real Life?

The activities in an interactive lecture, if well chosen, are good vehicles for introducing relevance. Example 1 is a good example as it engages students in applying theories to discuss and work on real-life phenomena. On the other hand, the numerical problems lack authenticity.

What Learning Outcomes?

Moving from passively receiving information to actively thinking enhances understanding to a high level. An interactive lecture with well-chosen activities is able to develop various characteristics of an active learner. These characteristics include being able to make inquiries, examine issues and solve problems.

Case-Based Learning

Description   A case describes typical issues or problems. It gives students the opportunity to place themselves in the position of the decision maker in a specific simulated situation. The scenarios are usually taken from real life and presented from the standpoint of the decision maker. A successful case is one which offers debate on alternative courses of action, rather than offering a single settled outcome or solution.

Example   A case scenario is presented to the whole class and some questions are provided for discussion.

-- Case Scenario --

E-commerce gives corporate gift company welcome boost

This case study describes how an advertising gift distributor is boosting sales through use of e-commerce.

Based in Windsor, Healey Williams is an advertising gift distributor. The company supplies a wide range of business and promotional gifts to corporate clients within the UK, but also reaches a worldwide audience through the internet.

Founded in 1987, Healey Williams started life in a small room with two partners, a desk, phone and typewriter. Today, it employs 10 people and is one of the first companies in the UK to offer a fully integrated online ordering service for business gifts. Their customers are mostly blue chip companies, especially within the IT and financial sectors.

Founding partner, Nigel Williams, explains: 'We believed that e-commerce would provide us with a competitive edge in an industry that has a reputation for being lethargic in adopting new technology. We also hoped that it could bring genuine benefits and additional services to our customers, something that has proved to be true. We experienced a rise in sales in excess of £200,000 as a direct result of our ability to offer online catalogues for new and existing customers.'

Through the use of e-commerce the business was able to introduce its own online catalogues for its range of business and promotional gifts. They have taken this …

(source: http://bcs.businesseurope.com/cmn/viewdoc.jsp?cat=ec&ct=cs&docid=BEL1_Casestudy_0000003655)

Questions for Discussion:
- Ask students to make an analysis on the present case scenario, e.g., What is the strategic goal this company is trying to achieve? Analyse how this company tried to achieve this goal.
- Ask students to design a new model based on the information in the case material, their creativity and their prior knowledge in relevant areas, e.g., If you're the Marketing Manager, what methods including online solutions would you use to expand your company's business plan?
- Ask students to evaluate each others' models and give comments.

How Active?   Cases provoke action plans. In the example, students place themselves in the position of the Marketing Manager and seek solutions to expand the company's business plan. This method also offers debates amongst the

students on alternative courses of action, and that demands high order thinking in evaluation, analysis, decision making and reasoning, etc. This method is therefore ideal for group work.

How Related to Real Life?	Case scenarios introduce into the classroom a simulated professional context in which students make hypotheses and negotiate for appropriate actions. For example, the context of 'e-commerce' is provided for students to discuss about strategic marketing and other related economic issues.
What Learning Outcomes?	Since the case scenarios are authentic, open-ended and the questions provide a large space for investigation, students are encouraged to critically analyse and interpret the issues raised in the case and later apply prior knowledge into the situation in order to formulate and solve the key problems. When analysing the issues, students bring in and reflect on their own experience. In other words, this method is effective in generating high levels of reasoning, involvement and group participation.

Problem-Based Learning

Description Problem-based learning (PBL) is characterised by the use of real-life and ill-structured scenarios, those that are complex and generally have multiple responses as starting materials instead of the teacher simply assigning readings, providing lectures or walking students through a solution. Students identify problems associated with the scenario and use these problems to drive their learning process. Their inquiry and exploration leads to learning key concepts, principles, content knowledge, and strategies necessary to solve the challenges presented by the problem. The teacher's main role is to support student inquiry.

Example 1 **Pure PBL**
- In the first session, present the problem case scenario to the students. Identify and clarify unfamiliar terms presented in the scenario.

❧ The Problem ❧

> A Memo from the Manager of Coronary Care Unit dated July 16, 2004:
>
> Recently our hospital admitted a 40-year-old Chinese female by the name of AhYan, who lost 50 lbs in 6 months. Her previous weight was 160 lbs. Her primary physician admitted her with the diagnosis of malnutrition. She thinks she looks wonderful and is happy that she can wear a size 5 dress. Her haemoglobin was 3.3 and hemocrit 17. Patient shows little concern with her diagnosis. She has visual signs and symptoms of someone malnourished. I am requesting a comprehensive evaluation of her condition and interventions to assist her with future diet and weight management. I would like to have the evaluation by July 31, 2004. Thanks again for any assistance you can offer.

- When encountering the authentic scenario, students have to define the problem(s) and identify the issues to be discussed. They formulate learning objectives and research consensus on appropriate and achievable learning objectives. After class, they conduct private study.
- In the following session, students bring in and share the results of their private study. They discuss to reach the best solutions, present them and justify them altogether. Then they keep revising hypotheses through the application of newly acquired knowledge. In the process, the tutor prompts them for more clarifications and explanations. At the end, the tutor lists the concepts missed and the pertinent data that contribute to finding the best solutions.

Example 2 **Hybrid PBL**
- In the first session, the teacher gives a mini lecture on the theories and principles.
- Then the teacher presents the problem case scenario which is written around the theories and principles covered in the mini lecture.
- When encountering the authentic scenario, students have to define the problem(s) and identify the issues to be discussed. They examine the details with reference to the theories and principles learned in the lecture.
- Students discuss to reach the best solutions, present them and justify them altogether. Then they keep revising their hypotheses through the application of newly acquired knowledge. In the process, the tutor prompts them for more clarifications and explanations. At the end, the tutor lists the concepts missed and the pertinent data that contribute to finding the best solutions.

How Active?	• Pure PBL is an excellent example of active learning that engages students vigorously in problem formulation, information seeking and actual problem solving. On the other hand, students in hybrid PBL approach the problem issues with basic knowledge given by the teacher in the mini lecture.
	• Both examples illustrated above are able to reinforce the inquiry process in which students think critically and deeply about the problem and issues and apply knowledge to situations. These inquisitive activities are effective in promoting student's deep thinking and convergent thinking.
	• The entire process of PBL is a big task in itself. The task is to solve the ill-defined problem through a range of different kinds of activities.
	• PBL develops students' collaboration and communication as they work together towards the best solutions.
	• PBL engages students in learning new knowledge through different types of activities that are similar to the ways in which they will be likely to recall and use it in future situations.
How Related to Real Life?	PBL is renowned for its potential to bring authentic problems to the classroom. The key objective of PBL is to find appropriate solutions to the real, ill-defined problems that are happening in the professional context. The situation that occurs in pure PBL is closer to the real-world situation in which people have to solve immediate problems with very little information at hand. For this reason, pure PBL is more suitable for experienced learners while hybrid PBL is better for inexperienced learners.
What Learning Outcomes?	PBL is recognised as highly appropriate for developing professional competence and a wide range of generic abilities. It develops deep understanding and the higher-order thinking skills of critical thinking, application and problem solving, etc. Students also learn to make use of different resources to solve real problems. It also provides conditions for the development and practice of self-directed learning while small groups provide conditions for the improvements in communication and teamwork skills.

Simulation

Description
Simulation provides experiences for students without the constraints of a real-life situation. With a simulation students can think through the scenarios and seek solutions to a hypothetical problem in order to experience what it moght be like in the actual situation.

Example 1
PatientSim System (for Health Sciences)
A patient simulator is a fully computer-programmed robot, functioning as a real patient *who* reacts automatically to every single change (particularly the medicines injected into its body). This is widely used in health sciences education for students and trainees to carry out medical experiments (e.g., trying new drugs or therapy) which are not possible to do on real patients.

Example 2
Merger Plan (for Business)
The Merger Plan Simulation is a computerised business simulation in which players are exposed to a number of issues addressing the challenges and trade-offs typically found in post-acquisition integration planning contexts and other major change management situations, including the consensus building process with a plurality of internal and external stakeholders. It can be run with 6 to 60 players. All data are processed in real time mode so that the information is ever changing, depending upon the actions taken by the players.
(source: http://www.insead.edu/facultyresearch/teaching_tools/merger_plan_simulation.htm)

How Active?
Simulation is a powerful way to engage students in practical tasks as they are highly motivated to try different alternatives to solve problems. Students take action mainly in accordance with the reactions of the objects and environmental factors in the simulation. For instance, students can try different drugs on the patient simulator to lower the blood pressure caused by unknown reasons. In Example 2, players need to identify the determinants of each stakeholder's opinion of the merger scheme, and use the available actions to find a trade-off between the maximisation of theoretical value generation and of stakeholder support.

How Related to Real Life?
A simulation game mimics a complex real-life situation, where students hypothesise and modify their actions through trial and error. But still it is a simulation that does not entirely represent the complexity of the reality. The situation can be high-risk as in Example 1 or low-risk as in Example 2.

What Learning Outcomes?
Simulation provides a development scenario where students interact with different factors in the simulation package and/ or other players. They engage themselves in specific tasks, make assumptions and evaluate alternative methods upon the direct instant feedback as a result of the actions taken in the process. These repeated steps of decision making and interaction with the factors in the simulated environment helps them construct deep thinking and knowledge so that they know how to solve real-world problems.

Role Play and Fish-Bowl Observation

Description   In a **role play** the learner portrays a certain role as a way of experiencing that role. In **fish-bowl observation**, while students are portraying the assigned roles, other students observe and analyse the behaviours. These two activities can be separated and combined as shown in the example below.

Example   1. Students are divided into two groups. One group of students, as performers, plays different roles and another group, as observers, watches the role play.
2. Students are provided with a scenario that each of the performers has to describe and portray his/her role in a simulated setting.
3. Students as observers take note of the key findings regarding the behaviours of the performers.
4. At the end, form a discussion about the role play with focus on the behaviours observed and how the role play reflects the learning outcomes.

How Active?   Role play is effective in making the class more interactive as students are given chances to act out their roles, actively respond to each other, and perform a number of tasks which are designed based on human interactions. Therefore, it is widely used in the health sciences and social sciences disciplines.

How Related to Real Life?   Role play creates a particular situation where students experience different roles and view the situation from different perspectives. They can practise techniques required in the professional practice particularly for the clinical and social sciences disciplines. However, in role play, students are not interacting with real practitioners in the real situation.

What Learning Outcomes?   In role play and fish-bowl observation students act out the roles and view the situation from different perspectives so that they build up rapport and empathy for each other. This is important in improving interpersonal skills. They also become more critical when they evaluate the role players' behaviours.

Tutorial

Description

The tutorial is a session that is additional or supplementary to the lecture. It is normally intended for further exploration of concepts, theories, principles and inquiries arising from the lectures so as to help students to develop deep understanding of the topics and skills and to apply of knowledge to solve problems. Tutorials can also be conducted differently by using various kinds of interactive activities mentioned earlier in this chapter.

The tutorial, used as a discussion platform, can be administered in many formats such as buzz groups, pyramids, debates, fishbowls, etc. In order to facilitate active discussion amongst the students, it is preferable for the teacher to use a series of pauses, prompts and probes to encourage students to think deeply so that they reach the interpretations, conclusions, and answers for themselves. The following examples delineate different approaches to managing the discussion process in a tutorial.

Example 1

Teacher recites the issues covered in the lecture, ask questions and invite volunteers for answers. The teacher gives answers if there is no volunteer. The teacher wraps up the tutorial by giving explanations and demonstrations.

Example 2

Students form groups of 4 to 5 and each group is given a question for discussion. A leader is chosen to record and report important ideas to the whole group. Students 'buzz' for about 5 minutes. Leaders take turns to report important points of their groups to the whole class. During reporting, teacher prompts students for explanations and suggestions. Students post up ideas and inquiry, if any. Lastly, the teacher gives feedback and invites the whole class for solutions.

How Active?

Teacher dominance is obvious in the scenario depicted in Example 1 in which students are discouraged from thinking or speaking up in the class. In contrast, in Example 2, students are given a larger space to take active part in the learning tasks, discuss actively with their teacher and peers, and think deeply and apply what is learned to solve problems. Group discussions like 'buzz groups', as illustrated in Example 2, are effective to build up teams and enhance interpersonal communication.

How Related to Real Life?

Whether the tutorial is conducive to authenticity or not really depends on the materials used for the discussion. Bringing more real examples into the explanation helps explain abstract concepts and principles. Likewise, bringing real cases into the discussion helps students to apply book knowledge into near real-life situations.

What Learning Outcomes?

It is difficult to know what outcomes students can achieve in Example 1 as students are given very little chance to engage themselves in any activity. They might only be able to recite what is said in the textbook. However, in Example 2, students are able to explain, compare and contrast ideas and concepts with reference to the knowledge previously learned and, based on these negotiate for the answers, decisions or solutions later. They are also more active in criticising different information and making suggestions.

Self-Directed Learning

Description

Self-directed learning is a general term for an approach rather than a specific medium or method. The teacher encourages students to become actively involved in the activities which are structured by the students in their own way. In this kind of learning, the responsibility for learning is shifted from the teachers to the students.

Example

Many activities mentioned in this chapter such as project, problem-based learning and peer tutoring are good examples that capture the essence of self-directed learning. A learning contract is commonly used as a tool to assist students in planning for their learning goals and learning actions.

Learning Contract
Each student writes an agreement with the teacher or supervisor that details what is to be learned, the resources and strategies available to assist in learning it, what will be produced as evidence of the learning having occurred and how that product will be assessed. It also specifies a commencement and completion date for the activity. The contract provides a focus for learning activities that are largely self-directed.

How Active?

A self-directed learning approach shifts the responsibility for learning from the teachers to the students. In doing projects, solving problems in PBL, etc., students learn to work independently and devise their learning plans for themselves. Likewise, to complete a learning contract, students examine their expectations and capabilities, shape their own opinions and ideas, make their own decisions, choose their own activities, and generally take more responsibility for themselves. More than that, they actively find information themselves to construct the meanings.

How Related to Real Life?

All kinds of self-learning activities like the learning contract help students to set their goals based on their needs, interest and abilities, and that makes learning more relevant to themselves.

What Learning Outcomes?

Self-directed learning is effective in developing lifelong learning abilities as it allows students to explain and design their action plan, learn what and how to learn and lead themselves towards the goals. Students achieve the agreed learning outcomes through studying and thinking independently. At the same time, they learn to regulate their learning habits for higher achievements, and that develops them to be lifelong learners and self-evaluators.

Experiential Learning

Description Theory (the thinking) and practice (the doing) are commonly taught separately.
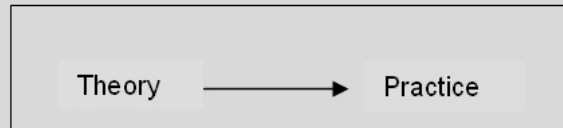
Experiential learning is a method to help students build up links between the thinking and the doing so that they learn to apply theories into practice with a deeper understanding of the concepts. It can be seen as a learning cycle of 4 distinct stages: Abstract Conceptualisation (e.g., students study the theories); Active Experimentation (e.g., students prepare an action plan to test out or apply the theory); Concrete Experience (e.g., students engage in carrying out the plan, i.e., practice); and Reflective Observation (e.g., students reflect on what is observed in the activity, relating it to the theory which are learnt).
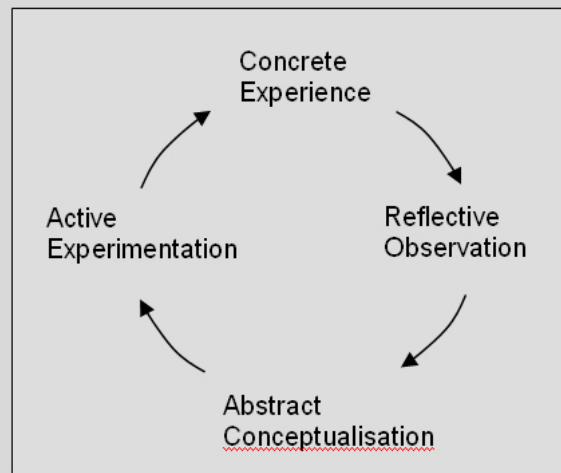
The two links (Active Experimentation and Reflective Observation) are important in the experiential learning model as they allow students to make action plans for their learning based on the key points of the principles and later internalise the knowledge by reflecting upon their experience.

The two examples below are adapted from Gibbs (1988). Try to identify which one is experiential learning and which is not.

Example 1 1. Theory about welding is introduced in a lecture which is followed by a practical class in which the tutor demonstrates the welding technique.
2. Students attempt to practice the technique, under supervision.

Example 2 1. Theory about welding is introduced in a lecture which is followed by a practical class in which the tutor demonstrates the welding technique.
2. The students discuss and devise criteria for assessing the quality of a finalised weld with reference to the theory presented in class.
3. Students attempt to produce a weld and then to bend the weld and assess its quality using the criteria they devised in stage 2.
4. Based on the self assessment of the quality of the weld, students make a conclusion about how to avoid the weakness in their weld next time.

It is obvious that Example 1 is a typical approach to teach theory and practice separately. There is no feedback between the two phases of learning. Thereby students' conceptual understanding and practical skills cannot be enhanced in the process. On the other hand, in Example 2, which encompasses the essence of an experiential learning cycle, students are engaged in applying theory to evaluate their practice and, also, to make use of their practical experience to reinforce their understanding of the theory.

How Active?

The four stages of the experiential learning cycle definitely represent highly active learning opportunities for the students. Vigorous and high-level thinking is involved when planning out the action and when reflecting over the practice. The inclusion of an application action ensures that the approach is task-based.

How Related to Real Life?

By nature of an experiential approach, learning goes beyond understanding of the theory to planning for application which enhances the authenticity of the teaching and learning of the topic.

What Learning Outcomes?

With this approach, students learn to apply theories and principles to practice and they have a deeper understanding of the concepts upon experience and reflection. Apart from conceptual knowledge, this approach is effective in enhancing student's critical thinking ability.

Laboratory Work

Description Laboratory work is commonly included to provide learning of the practical aspects of science and technology.

Example 1 *Cook-Book Laboratory Work*

The conventional laboratory work is designed to be fully-structured, i.e., students follow instructions to collect data and analyse results to prove material previously discussed in the textbooks. Finally, they report their findings to the tutor.

Example 2 *Inquiry-Based Laboratory Work*

On the other hand, laboratory work can be designed in a more open-ended approach. The practical session itself can include asking students to design the procedures themselves by referring to relevant theories and principles. Students will need to adjust the procedural design to solve any problems encountered in the experiment. Throughout the whole process, they keep examining the relationship between what is observed in the experiment and the theories and principles in the books, and they are prompted to explain any discrepancies that are found.

How Active? Laboratory work by nature is task-based and engages students in a substantive learning task. However, the extent and depth of thinking that is required depend on the nature of the laboratory work. Obviously, open-ended experiments demand much more active and in-depth thinking than cook-book experiments.

How Related to Real Life? A good scientific laboratory session should provide students with hands-on experience of handling practical work by using apparatus and machines used in their future profession.

What Learning Outcomes? In both examples, students develop practical skills but there could be a big difference between the two examples in the level of understanding and professional competence. In Example 1, students mainly learn how to follow instructions, use specified items of apparatus and equipment, and process and present data. In Example 2, other than the mastery of the protocols and equipment, students also learn to actively apply theories into practice and the essential skills for a scientific investigation process such as making hypotheses, planning, designing and evaluating, etc.

Fieldwork

Description   Fieldwork is simply 'learning by doing'. It comprises different extensive hands-on activities that provide students with lots of opportunities to learn in the field. In short, students do a real job on their own in the real world. The field may be a factory for engineering students or a clinic for health science students or a restaurant for catering students or a foreign country for language students.

Example 1   *Shipboard Field Experience*

Students are sent to the wharf and then a cargo ship to learn daily logistic operations. The officers working on the wharf and the crews of the ship give demonstrations with explanations while students mainly act as observers. Later, students are assigned to work in different parts of the wharf and the ship alongside the crews to operate the machines and carry out daily duties assigned by the field supervisors.

Throughout the whole programme, students need to take notes and write a diary to reflect upon their observations and experience. At the end, a debriefing session is conducted for students to share experience.

Example 2   *Fieldwork in Marine Studies*

Students, in groups, work on one 'real world' job: 'Power station outfall' in which they are asked to conduct surveys of the Tamar Estuary to assess the potential damage of the discharge of thermal effluent into the Tamar by a power station planned by a power company, for which background data are available. Students have to take a great deal of trouble to organise themselves for this a complex multifaceted task. (Gibbs, 1992)

How Active?
- In fieldwork, students keep thinking deeply about their actions and plan for the next actions. For example, students in a host family need to take cultural difference into account when they react and respond to the foreigners in the host family.
- Fieldwork is composed of different interactive tasks that interlock tightly with one another. These can be interactions with people such as communication, reflection or reporting; and interactions with the environment including site investigation and data collection and data analysis.
- Fieldwork brings students out of the classroom to apply textbook knowledge in the real situations. In Example 1, students gain experience through observing how real practitioners handle daily problems and later practise on their own. In Example 2, students have to devise their own action plan to solve real problems. Teamwork is also built up as they work together as a group.

How Related to Real Life?   Fieldwork, by nature, puts students through experience of working in the real work place. However, the extent to which the experience resembles how a professional functions in the job depends on the design of the fieldwork task itself. Example 1 provides opportunities for skills development in the actual work place. It will benefit students by allowing them to experience the full range of technical realities which are difficult to replicate in laboratories on campus. However, the learning experience is limited to skills training. On the other hand, Example 2 puts students through problems that professionals

tackle in the real world. It provides students with opportunities to visualise the actual environment and to integrate and apply professional knowledge into this real and complex situation.

What Learning Outcomes?

- Different designs of fieldwork facilitate different levels of thinking and different kinds of cognitive skills. If it is designed to be 'working on-site under the supervision of real practitioners' as illustrated in Example 1, students learn the procedural skills required in the field and apply textbook knowledge into real practice. In Example 2, students devise a scheme to solve complex problems in the real world through the process of critical analysis and evaluation of the data collected by themselves in the field.

- Besides strengthening students' academic and procedural knowledge, fieldwork is also a good vehicle for developing a whole range of generic skills such as teamwork, communication, professional attitudes and ethics, etc., when they work alongside the real professionals in the field.

Peer Tutoring

Description
Peer tutoring is cooperation between two or more students, where one individual as the tutor teaches to the other(s) as tutees. This can occur between students of the same year of study or between students of different years.

Example 1
Reciprocal Peer Tutoring

Two students from the same subject of the same year form a dyad (pair). Both of them take turns at being the tutor while the other serves as the tutee. The instructor can have them switch roles for each skill, class, week, or unit.

Example 2
Cross-Year Peer Tutoring

Cross-year peer tutoring occurs when the students are from different year-groups. In this type of peer tutoring, the 'older' students as tutors are usually more capable than the 'younger' students as tutees so that tutors can pass their study tips to the tutees.

How Active?
In peer tutoring, since the tutors and the tutees are about same age, it is easier for them to participate in the activity and to be motivated to learn. Before the tutors meet with their peers, they need to prepare the tutorial materials and to approach the teachers to sort out problems and remove misunderstandings.

How Related to Real Life?
The major benefit of peer tutoring is in engaging students in peer teaching and learning. Bringing in real life relevance is not the prime focus of this method.

What Learning Outcomes?
Peer tutoring helps students strengthen their own understanding of the subject matter. It develops generic skills such as communication and leadership skills. In Example 1, all students have the equal opportunity to be the tutors and experience the valuable leadership. However, in Example 2, only the 'older' students can have the leadership opportunity while the 'younger' students experience personalised instruction and feedback. Peer tutoring also develops character virtues and personal attitudes such as respect, responsibility, empathy, cooperation and persistence, and that is important in affective development.

PISER

Description   PISER stands for <u>P</u>eer <u>I</u>nstruction and <u>S</u>tudent <u>E</u>lectronic <u>R</u>esponse. It is a specially designed classroom based activity which integrates two elements: Peer Instruction (PI) and Personal Response System (PRS). Peer Instruction is the central thrust of the activity while the Personal Response System is only a machine which collects responses from remote transmitters. The design of the PISER method makes use of the convenience of the PRS to enhance the effectiveness of peer instruction in class as illustrated in example 1 below. On the other hand, the PRS is sometimes used simply for displaying answers from students as in Example 2 which misses the essential spirit of the PISER method.

Example 1   A conceptual question like the one shown below is presented to the students.

Conceptual Question
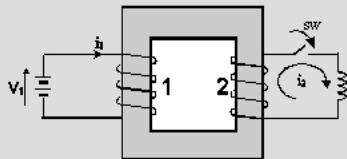
Two mutually coupled windings are arranged on a ferromagnetic core as shown in the adjacent figure. Winding 1 is connected to a DC voltage source V_1 and winding 2 is connected through a switch to a resistor.

When the switch SW closes, the current induced in winding 2 will be:
a.   clockwise
b.   counter clockwise
c.   zero
d.   depends on when the switch closes
e.   need to know number of turns

(Snider, 2001)

- Students tackle the question individually in the first place.
- They submit their answers by using the PRS, which displays the result pattern of the whole class on the screen immediately.
- Prompted by the results, students are given a few minutes to discuss their answers with their peers through the process of explaining and justifying their answers, listening to and challenging other peers' answers and critically examining other alternatives.
- Then, they answer a second time by using the PRS.
- This will be followed by a micro lecture dealing with the theories and principles behind the correct answer.

Example 2
- Students tackle a question individually.
- They submit their answers by using the PRS.
- Students tackle another question and submit their answers again by using the PRS and so on.
- All responses are transmitted to the machine and scores are calculated.

How Active?
- Example 1 shows clearly that the PISER method allows students to make their first attempts at the question and then engages them in critically evaluating their answers and discussing with their peers to rectify errors and refine their answers. The spontaneous display of the answer statistics serves as a quick and helpful feedback to the students, which motivates them to debate and clarify their answers.

	• While Example 2 also provides opportunities for working on problems in class, it misses the most important point of peer learning.
How Related to Real Life?	The PISER has been used successfully to bring in authentic and conceptually difficult problems and real-life issues for discussion in the classroom and even in the mass lecture.
What Learning Outcomes?	PISER is an effective method for increasing interactions amongst students. However, if used in a wrong way as depicted in Example 2, the concept of Peer Instruction can be overlooked. In this example, PISER is employed solely as a tool in a quiz where students are encouraged to memorise information in order to get the marks. In contrast, in Example 1, students do not only learn to solve conceptual problems but also to become more critical and analytical when they justify their choices and challenge the others. When discussing with their peers, they also learn to communicate effectively.

e-Learning

Description

The use of technology provides a range of possible learning experience which is difficult to achieve in the face-to-face classroom. There is a wide range of activities of different levels of sophistication, ranging from as simple as email question and answers, or online forums to highly sophisticated simulations. The following are just a few common ones.

Example 1

Online Module

A common but NOT recommended use of the technology is to post the course materials to an online platform for students to download.

Example 2

Online Peer Critique

Students upload their assignments to the website so that everyone in the class can view and evaluate the assignments. Students are asked to write comments on two pieces of assignment work done by other classmates and then post them up to the website to facilitate ideas exchange.

Example 3

Virtual Laboratory

This is a highly interactive 3-D environment generated by computer programming. It provides for virtual visits and free exploration of different equipment and machines in the laboratory. Some buttons are usually created to allow 360-degree rotation and close-up examination of selected items.

How Active?

- Online discussion and sharing makes interactive learning more convenient for students. They can form virtual communities to discuss and work together actively regardless of space and time, and that gives the best solution to the busy students who have the difficulty of finding time to fulfil any teamwork activities.
- With the advance of technology it is possible to extend the learning far beyond the campus-bound classroom. Students can always get in touch with the most updated information and exchange ideas with overseas students via more advanced audio-visual facilities as used in video-conferencing.

How Related to Real Life?

The accessibility to the outside world opens up rich sources for information about the real world. The use of programming techniques also allows real life scenarios which are normally difficult or impossible to be brought to the experience of the students

What Learning Outcomes?

While the intellectual outcomes depend on the design of the learning tasks, the active use of the technology for learning in itself is important for enhancing students' IT skills which are so essential in this modern world.