

# The New Era of e-Learning - Volume II

Interactive Learning and assessment for learning



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# **The New Era of e-Learning Vol. II**

Interactive Learning and Assessment for Learning

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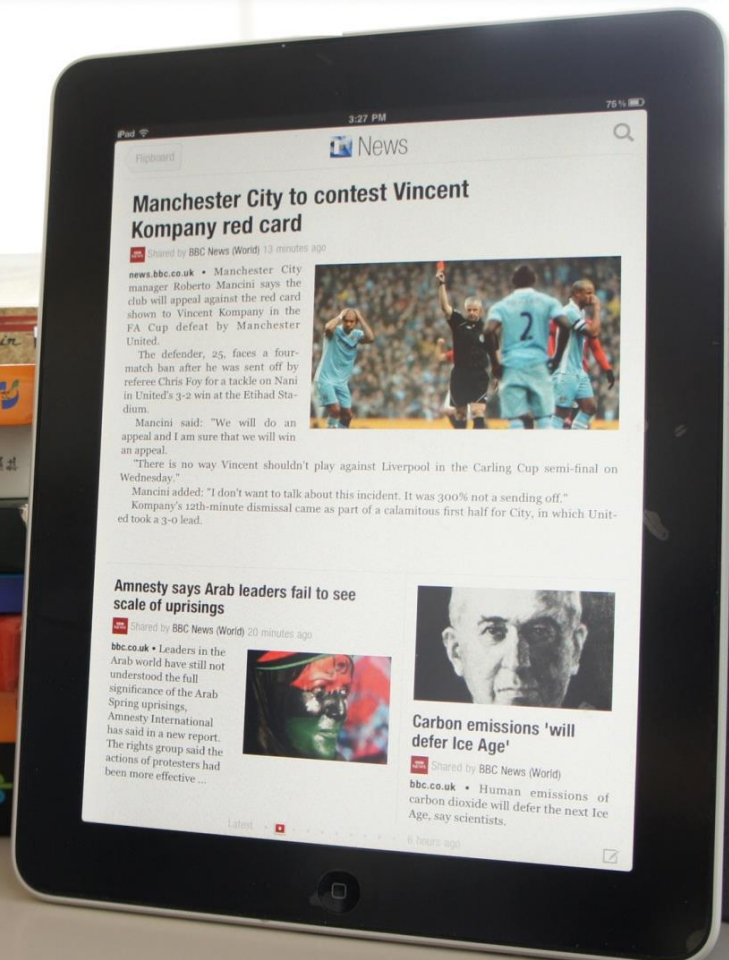
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# Chapter 1: Introduction



## 1. Introduction

Traditionally, e-Learning tends to be considered as supplementary to teaching and learning by bringing technology into the classroom. Computers, smartphones or other electronic devices are often taken as technological tools applied in class to assist lesson flow, rather than as the main focus of either teaching or learning. E-Learning has yet to be reckoned or explored by teachers and schools as a serious pedagogy that has vast potential in elevating the classroom experience to a whole new level.

Teaching and learning with a special focus on e-Learning includes the process of designing, planning, sequencing and coordinating learning tasks through the diverse use of various e-Learning tools. E-Learning not only enhances the effectiveness of learning but more importantly, supports and promotes the development and design of other learning tools. The benefits are manifold. While students are better engaged in class, teachers also have the chance to review their teaching strategies and have more interaction with their students.



*Evolution of learning device: from desktop to tablet*

The growing popularity of iPad, iPhone, other tablet PC and smartphone devices has explained the increasing importance of their roles in the e-Learning process. iClass, as an effective tool to facilitate e-Learning and bring about an interactive class experience, is now employed in some of our classes for trial. The system has prompted us to see its potential in

being developed as a useful platform to connect and coordinate different stages of the learning process, from class preparation, inner class interaction, task implementation to after-class assignment and performance review.

With iClass providing functions such as drawing and peer review, we are now proposing and developing a task-based approach for teaching and learning as opposed to the conventional problem-based one. Problem-based learning (PBL) is a student-centered pedagogy in which students learn about a subject in the context of complex, multifaceted, and realistic problems. The goals of PBL are to help students acquire and apply flexible knowledge, as well as develop effective problem solving skills, self-directed learning, effective collaboration skills and intrinsic motivation. On the other hand, task-based approach (TBL) brings about an alternative classroom experience. Instead of having the teachers brainstorm and decide what will be studied, TBL promotes learner-based learning and encourages collaboration among students through completing multiple tasks in pairs or groups.

Besides improving the classroom dynamics, iClass enables teachers to give timely feedback to the class. After students submit their answers using the keywords or MC functions of the system, pie charts or bar charts displaying the results can be generated immediately. This gives teachers a clear picture of the overall progress and understanding of the class, allowing them to clarify points or provide remarks to answer doubts and correct misunderstanding, at the time when students still have fresh memory of the issues discussed in class. Furthermore, with the introduction of a peer review function, not only teachers have the opportunity to review students' performance but also students themselves. Students can view and rate their classmates' work to get inspirations from them, learn from others' strengths and improve their own works. These functions, in allowing students to have immediate response and feedback from teachers and fellow classmates, help to shorten the feedback loop

and thus promote self-learning and evaluation awareness among students. With iClass, students can personalize their learning experience and adopt whatever study pace they feel comfortable with, thereby encouraging them to be independent learners who take the initiative to learn, evaluate and improve. Learning is no way restricted to the confines of a classroom, and we aim to extend the system beyond the walls of a classroom so that it will also be accessible from home, allowing students to learn at anytime, anywhere.

## **1.1. Evolution of e-Learning Models**

E-Learning as the latest mode of teaching and learning has become more and more familiar to the general public in recent years. Thanks to the rapid development in computer science and information technology, real-time communications via mobile devices ranging from PC, laptop to smart-phone has been integrated into our daily life, further liberating e-Learning from temporal and spatial restrictions. The concept of “interactive class” promoted and realized by our iClass system is a vigorous sprout growing on the giant tree of e-Learning. Before entering the world of iClass, let’s have a journey through the history of e-Learning.

### **1.1.1. Student-to-Machine Model**

E-Learning can support various study modes, such as distance learning, self-study or independent learning, edutainment, interactive learning and so on. Computer and internet can lead us into the universe of knowledge where multimedia technology has revolutionized the form of information and web 2.0 interactivity has enhanced our learning experience. However, when e-Learning was still in its infancy, it was not as colorful or interesting as the ones we see nowadays.





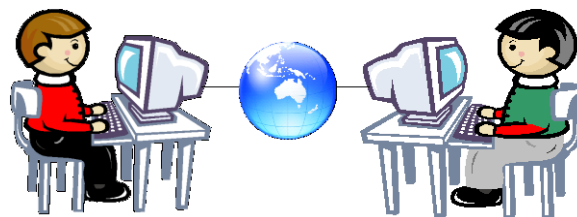
### *Student-machine Model*

Traditionally, e-Learning systems always adopted the Student-to-machine (S2M) model. Students learned from PC without any human interaction or internet connection. Learning materials were stored in a floppy disk, a CD or a DVD. Students could insert the disk into the computer, go through the materials on the screen or complete the exercises.

Later on, as the internet was further developed, students were able to access online information with their computers. However, at this stage, real-time communications or interactions were still unavailable, which meant that the internet was a huge library with computer as the browser, while readers in the same library could not share their experience or knowledge.

### **1.1.2. Student to Student (S2S) Model**

You may still remember the time when everyone was talking about BBS, online forums and chat rooms, when people had the fantastic experience of communicating with someone living on the other side of the globe. At this stage, e-Learning entered the Student-to-Student (S2S) model. With the help of instant messaging websites, students could share their opinions and knowledge with other students and even teachers. This was the first time when e-Learning entailed elements of person-to-person interaction via computers.

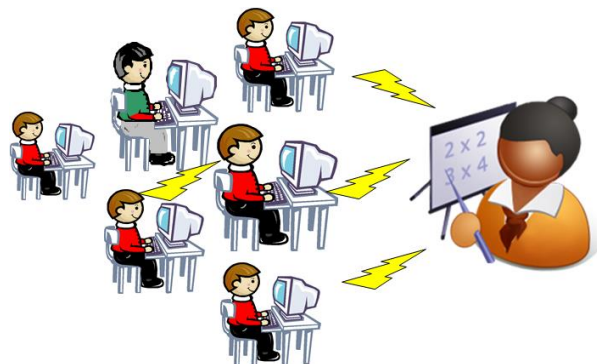


### *Student to Student (S2S) Model*

Up till today, e-Learning of this form is still active in daily teaching practices. Learning management systems such as Moodle and Blackboard are able to group teachers and students from one class together. Teachers can put up syllabus, announcements, assignments etc. on the forum while students can express their ideas on a certain topic by replying to the questions posted. They can share their views and learn from each other's ideas.

#### **1.1.3. Interactive Class**

Can online interaction become an organic part of routine class? iClass is the answer to this question. Aiming to provide a convenient, user-friendly and efficient platform for everyday interaction, iClass makes real-time communication and knowledge sharing between teachers and students and among students handier and more interesting.



*Interactive class model*

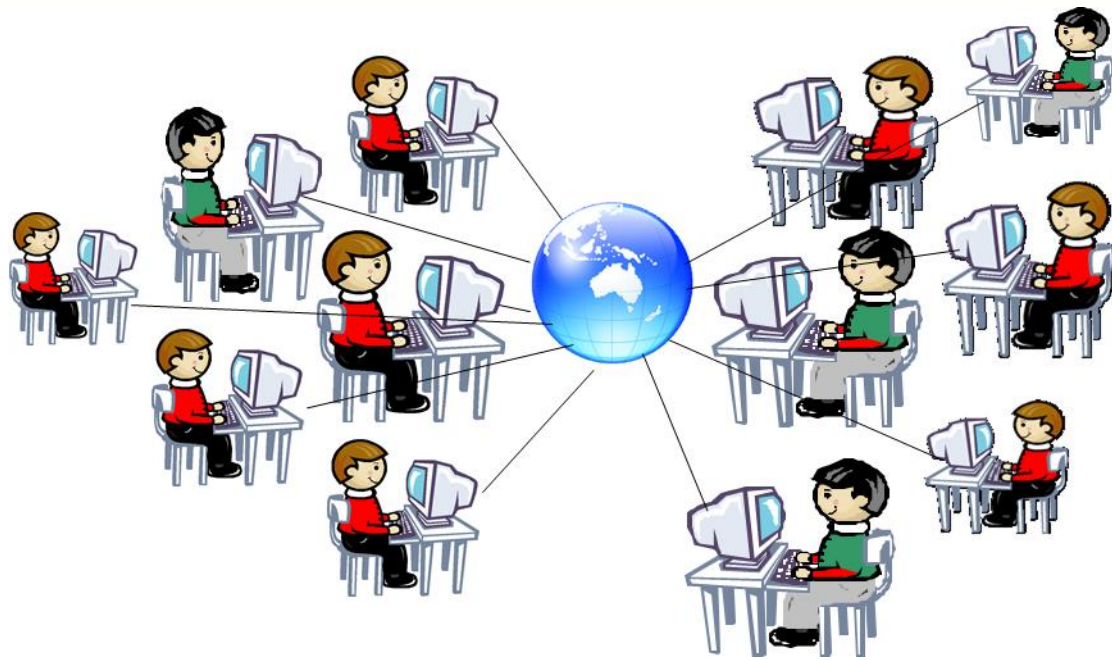
Using mobile devices such as iPhone, iPad and Android smartphones, teachers can post questions or assignment in class and students can respond immediately. Moreover, teachers can review students' work as soon as they submit it. Students can view peers' work and share their works via social platform like Facebook. With modules such as Drawing, Keywords, MC Questions, Peer Review and Web Browser, a wide variety of in-class activities can be conducted. Other than academic activities, extra-curriculum activities or groups such as Mobile Quiz Game or debate team can be well-supported by the system. More examples will be provided in the Case Studies session in this book.



*Conducting interactive class at HKU*

## **1.2. Interactive Massive Open Online Courses**

Since last year, the interactive class model has been developed one step further with the emergence of MOOCs, the latest higher education buzzword. In a MOOC, students participate in an open class accessible to all for free. The pedagogical approach of most MOOC is simple: students view video-taped lectures online, complete assignments which are then marked by a digital auto-grader or peers, and in some cases participate in discussion forums after class. As Laura Pappano notes in her article in New York Times, while traditional online courses charge tuition, carry credit and limit enrollment to a few dozen to ensure interaction with instructors, MOOC is often free-of-charge, non credit bearing and massive. In other words, class size is expanded on an unprecedented scale, and the level of interaction is greatly heightened with the increased enrollment quota.



*MOOC Model*

MOOCs have revolutionized higher education and its benefits are well recognized. For instance, quality education is made accessible to virtually unlimited students across the globe at a low unit course (Wall Street Journal), empowering them with education in pursuit of better livelihood. Moreover, taking a course online increases the level of interaction and creates a dynamic environment for learning. As Mitchell Duneier, a professor of sociology at Princeton University observed from his experience teaching MOOC, discussions were more vigorous and lively online than in traditional classroom settings. As he writes, “when I give this lecture on the Princeton campus, I usually receive a few penetrating questions. In this case, however, within a few hours of posting the online version, the course forums came alive with hundreds of comments and questions . . . later there were thousands. The software allowed me to take note of those that generated the most discussion . . . to see the issues that were most meaningful to my students” (The Chronicle of Higher Education). In other words, MOOC serves as a useful tool for the teacher to identify students’ learning interests while at the same time provides a favorable setting for students to participate in productive discussions.



MOOC encourages collaborative learning not only between students, but equally importantly, between institutions by promoting the distribution and exchange of knowledge. Expertise no longer resides with the few elite universities but can be shared by all, enabling professors to learn from others how the same course materials are approached and taught. In today's highly networked and globally connected world, online learning is becoming the new paradigm in teaching, and collaboration and communication between peer institutions will help develop better pedagogy and practices in making use of this new medium to improve classroom experience.

Due to the large amount of student enrollments, the instructional design of MOOCs has to be supported by a system that enables large-scale feedback and interaction. To achieve this, it often relies on peer review and group collaboration, as well as automated feedback through objective online assessments. In light of this, iClass has the potential of being developed as a MOOC provider that gives an interactive platform for elite institutions to offer their education to the rest of the world. While most of the existing MOOC models still feature one-way learning in which students listen to the lecture passively, iClass enables institutions to host an interactive MOOC that allows immediate feedback. It encompasses a variety of interactive and multimedia features such as drawing and peer review, allowing students to conduct discussions and share their work on the platform. The Multiple Choice Question feature also enables lecturers to design online quizzes for assessment purpose. While MOOC model is often critiqued for its lack of interaction between teacher and student, the interactive functions of iClass, such as Keyword, could address this limitation by promoting real-time, direct interaction between students and instructors. More details on these features are introduced in this book's later session as well as the user manual published earlier.

In a latest report titled *An Avalanche is Coming: Higher Education and the Revolution Ahead*, David Glance, in discussing the pedagogy of MOOC, rebuts its critics by reaffirming the possibility of interaction in a virtual environment. As he writes, "people will argue that you don't get

the same interaction [in MOOC] as in a face-to-face environment. But the vast majority of our students elect never to show up on campus as we record our lectures and don't force participation. In terms of project work – they organize themselves digitally – they set up a Facebook group, meet over Google+ hangouts and Skype, and occasionally in person. This really changes the need for face-to-face interaction.” Just as how the proliferation of social networking sites dramatically transforms the dynamics of social interaction, it will not be long until the emergence of MOOCs revolutionizes the conventional classroom experience in this digital era.

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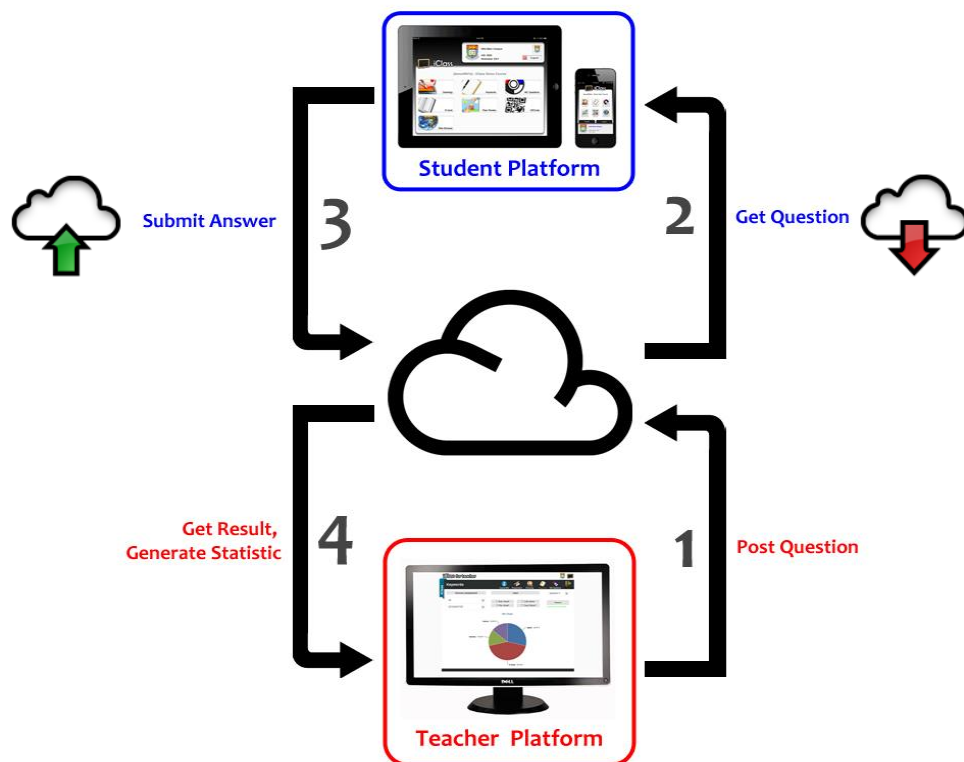
# Chapter 2: iClass

## An Interactive Mobile Learning Platform

## 2. iClass – An Interactive Mobile Learning Platform

iClass is an e-Learning platform on cloud. It is a revolutionary tool that can change the dynamics of teaching and learning in the classroom. By using tablets and smartphones, interaction between teacher and students becomes more interesting and efficient than ever.

In the past, it is neither convenient nor effective to conduct an interactive class in a real-time environment, especially in a large class. Feeling intimidated or embarrassed, students are often reluctant to share their ideas or answer questions. With iClass, students can use their smart devices to express ideas. They can write text, draw pictures, share photos, record audio notes, or even work on an interactive e-book or online quiz. Once submitted, their finished works can be shared in the classroom's projector screen for further discussion or elaboration.



All the activities created are stored in the LMS (learning management system), through which the teacher can manage all learning materials in different courses or topics conveniently and systematically. Teachers can also share multimedia resources with the class, including video and audio



clips, images, and various kinds of files such as PowerPoint, Word, Excel, PDF etc.

Teacher Platform collects responses from students. Data will be processed and marked automatically in real time, and the resulted text or image will be posted on the screen. Different kinds of presentation methods, such as pie chart, tag cloud or list view, help teachers visualize the textual ideas of the class. Results can be exported in ZIP or CSV format and saved for future use. By the end of the class, students can learn from their peers by rating, sharing and commenting on one another's works.

## 2.1. Features of iClass

Some of the modules and features of iClass are listed as follows:



### Drawings:

Teachers can upload graphics or worksheet to the platform while students can complete the worksheet in the built-in canvas. After that, students can submit their work to the cloud for marking. Teacher can project the students' work to the projector's screen to facilitate class discussion or other kinds of interactive activities.



### e-Book:

Teacher can upload the notes to the cloud in PDF format. Students can download the e-book using their smart devices. They can jot notes during the lesson and share their notes to the class anytime they wish.



### Keywords:

This module is particularly useful for brainstorming activities. Students can submit keywords to the platform. iClass generates real-time statistic in different graphical formats,



such as tag cloud or pie chart. This presents a clear view of the overall ideas of the class, enabling students and teachers to conduct in-depth discussions more effectively.

### **Audio**

This module is helpful in language learning. Students can read a passage, record their voice and submit their clips to the system. After receiving the audio clips from students, teachers can listen to them, correct their pronunciation or provide other kinds of feedback.



### **MC Questions:**

Teachers can post multiple-choice questions to the cloud at anytime, anywhere. The platform marks students' answer automatically and generates statistics instantly to reflect the learning progress of a student and overall performance of the class.



### **Quiz:**

Teachers can create a quiz with a time limit. Question types include matching, fill in the blanks, multiple choices and numerical questions. The system automatically marks the paper based on the model answers provided by teachers. Data analysis is carried out at the same time, producing a class report for the teacher's reference.



### **Peer Review:**

Students can view, share, rate and comment on fellow classmates' works. This mode of collaborative learning differs from the traditional top-down or one-way mode of knowledge transmission, encouraging students to be active learners who learn not only from their teachers but also peers.



## Web Browser:

Teachers can upload videos to YouTube or post relevant links to the platform. File storage, as well as the distribution of videos or other teaching resources, will no longer be a problem as they can be done with an easy click or tab.



## Offline Mode:

Teachers can set any topic in a course as an offline topic. Under the offline mode, students can download all the materials in that particular topic when Internet connection is available, and upload their responses once the connection is on again. This function enables flexible learning beyond the classroom, even at times without Internet access.

In order to enhance its compatibility, iClass is developed as a cross-platform application. Users with different smart devices can access the platform freely. As all data is stored in cloud, users can access the platform at anytime, anywhere. It is also developed in different languages versions to accommodate the needs of users from different areas.



The detailed features and operation of iClass can be referred to the user manual downloadable from <http://elearning.eee.hku.hk>

# Chapter 3

## Using iClass for Assessment



**Assessment**





### 3. Using iClass for Assessment

#### 3.1. Mode of assessments

Generally speaking, assessment could be categorized as follows according to the different purposes for which they are designed:

- i) Assessment for learning
- ii) Assessment as learning
- iii) Assessment of learning

Mode of assessment	Supportive iClass tools
<b>Assessment for learning</b>	a Peer Review module for students to view, rate and comment on fellow classmates' works
<b>Assessment as learning</b>	a real-time online interactive quiz platform for students to test their understanding, with analytical tools for teachers to monitor the learning progress and quantitative results
<b>Assessment of learning</b>	Pen-based assignment marking module for teachers to mark and provide feedback on students' works

##### 3.1.1. Assessment for Learning – Peer Review

Assessment for learning can be carried out based on a variety of information sources, such as portfolios, in-class work submission and continuous coursework. Using the interactive tools provided by iClass, students can submit their works to the teachers' screen to share their ideas. The Peer Review module enables students to view and evaluate their classmates' work, which in turn encourages collaborative learning. They can also rate their peers' work and the score can be recorded as part of the peer assessment result.



### 3.1.2. Assessment as Learning – Interactive Quiz

The Interactive Quiz module incorporates real-time analytical functions to facilitate the analysis of students' learning performance. Students can use iClass to answer quiz questions of different types, including multiple choices and fill-in-the-blanks. Different question can be assigned with different attribute. By the end of the assessment, students' individual performance and overall class performance can be displayed in a histogram (see Figure 1) or radar chart (see Figure 2), presenting teachers with a clear view of students' learning progress.

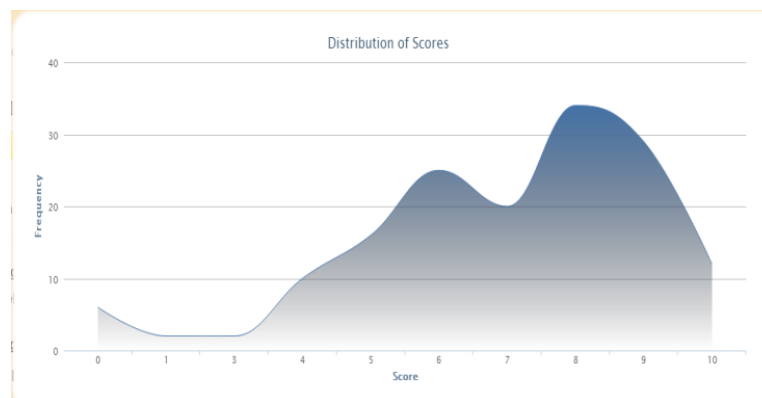


Figure 1. A histogram showing the distribution of the class performance result (Total score (x-axis) vs No. of students (y-axis))

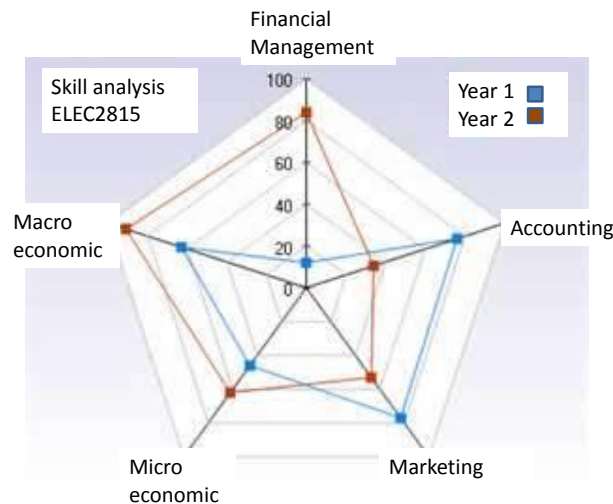
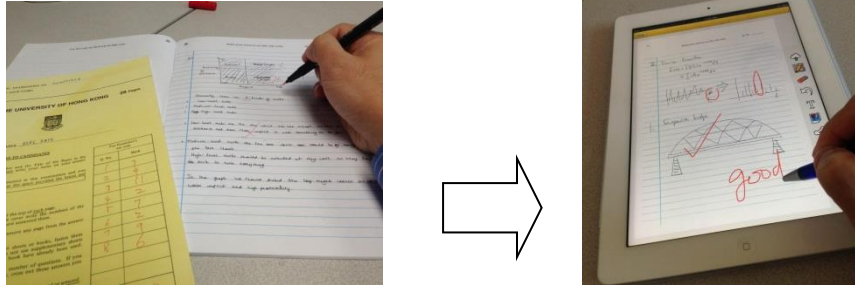


Figure 2. A radar chart showing the performance of different attributes of each student. The corresponding score of the different attributes can be shown on a radar chart with performance history indicating improvement progress.

### 3.1.3. Assessment of Learning – Pen-based Written Feedback

One of the main aims of assessment is to provide timely and adequate feedbacks so that students learn from their mistakes and know how to improve their performance next time. However, the current homework submission function in Moodle only allows teachers to give textual feedback on students' assignment. It is often difficult or time-consuming for teachers or tutors to mark directly on the softcopy. They have to first print the assignment and mark on the physical copies, then scan the marked copies and upload it to the system again. With their busy schedules and other lesson preparatory work, such complicated procedures often make it difficult for teachers and teaching assistants to give timely and quality feedback to students.

Using the online pen-based assessment tool in iClass, teachers can use the system conveniently to mark assignments, write comments, identify mistakes, or underline keywords on the assignment, in a way similar to what they do on a hardcopy assignment. These are especially important for courses and topics involving diagrams, graphs or flowcharts.



Teacher can use the proposed tool to assess and give feedback on the e-assignment, as convenient and detailed as marking a paper answer script.

Some useful features such as standard answer stickers, highlight pen, standard comments, are available in order to simplify the feedback writing process and encourage teachers and TA to provide more in-depth comments. With just one click, the feedback is distributed to students right after the assessment process.

### 3.2. Assessment for Learning

In order to empower and cultivate students to be a well-rounded person and life-long learner, it is recommended that greater emphasis should be placed on assessment for learning, which encourages teachers to identify students' learning problems and provide constructive feedback on improvement. This approach to assessment underscores and recognizes the uniqueness of every student whose potentials could be unleashed when given appropriate guidance and support.

Every student has different need in different aspects, from cognition, emotional development to social skills and learning styles. One of the effective ways to foster a favorable learning environment is to provide diversified teaching and assessment activities, such that students can achieve the learning objectives according to their own learning mode and pace. For instance, it is recommended by the Education Bureau that more interesting and challenging class activities could be incorporated to stimulate students' interests and potential, thereby encouraging self-directed learning.



### 3.2.1. Formative Assessment and Summative Assessment

To promote more effective learning, assessment stands as an integral part of the curriculum, learning and teaching, and feedback cycle. Assessment is a process through which the effectiveness of student learning is measured by assessing the expected learning outcomes and processes. If assessment is one-dimensional and only produces a mark or grade, students will only compare themselves against each other, which does little in enhancing their motivation to learn. Rather, focus should be directed to the learning process by providing students with the opportunities to learn and exhibit their achievement while appreciating their own and others' efforts.

As suggested by the Education Bureau, diversity is one of the essential features of assessment, and such diversity could be reflected in the different modes of assessment, parties and strategies. For instance, besides using the traditional written tests to assess students, other multi-media modes of assessment such as creative projects could be introduced. Assessment should also involve different parties, including self, peers, teachers and parents. In this case, the peer review function in iClass supports assessment as it not only enables students to get actively involved in their own learning but also encourages peer learning by providing a platform on which students learn to listen and reflect on classmates' answers in a class setting.

The functions of iClass aim to support different kinds of assessment by providing a comprehensive understanding of student learning in multiple aspects. More importantly, the feedback generated could serve as reference for both teachers and students to devise better teaching and learning approaches.

Learning is always more than about acquiring knowledge, and the objective of assessment should not merely focus on testing the ability of students or whether they have achieved the Intended Learning Outcomes. Assessment involves the process of collecting data about students'

learning and this may be carried out in different forms via a range of activities, from classroom observation to written examinations. Common types such as formative and summative assessment entail different procedures and focuses, and iClass is a user-friendly and compatible tool that supports both forms of assessment.

The most common type is summative assessment, which is carried out at the end of the learning and teaching process to measure students' attainment. The main purpose is to evaluate student learning against a particular standard or benchmark. It is often conducted in the format of tests and examinations, held by the end of the semester or year, assigning grades and levels to students' results.

In this regard, the Multiple Choice Question feature of iClass supports summative assessment. Teachers could use it to set questions for Mid Term or Final Examination. Papers will be marked automatically and the system will generate real-time data once students submit their answers. Information collected from summative assessment can then be used formatively to guide students' and teachers' efforts and activities in future courses.

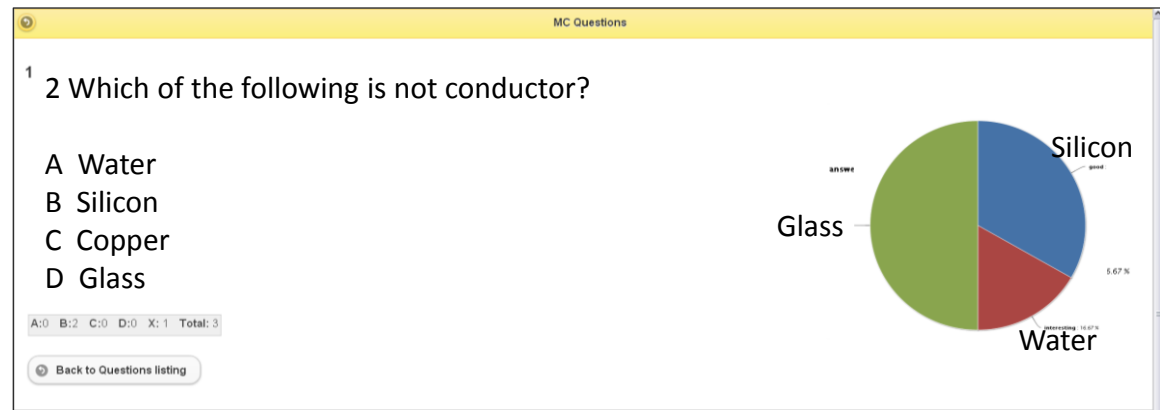
### **3.3. Formative Assessment and Data Analysis**

On the other hand, formative assessment is conducted informally or formally in daily classroom learning throughout the academic year. The primary goal of formative assessment is to monitor the progress of students' learning by providing ongoing and timely feedback, which in turn informs teaching and learning. Teachers can review their teaching practices while students improve their learning styles. Typical examples of formative assessment include in-class quiz or asking students to answer real-time questions based on the lesson content.

For instance, iClass features an End of Module Quiz which is a short test with matching, fill-in-the blanks and multiple choice questions. During the quiz, students simply have to click the arrow icon to proceed to the previous or next question if they want to modify their answers. After finalizing their choices, they click the cloud button to submit the quiz to

the system, which will then automatically generate different levels of analysis. Different types of assessment analytic tools are available, from question level, student level to class level, providing specific and useful angles of analyses regarding students' learning progress.

### 3.3.1. Question level analysis



For a question level analysis, the teacher can simply click on any question number for a quick and clear view of the answer distribution. As illustrated in the diagram above, a pie chart with the percentages of all four options will be displayed. This allows the teacher to immediately assess the students' understanding of the subject matter discussed in class. If the majority of students in class choose the right answer, then it reflects positively on the effectiveness of the teaching and demonstrates the students' thorough understanding of the topic. On the other hand, if the chart shows that more than half of the students opt for a wrong answer or choose otherwise, the teacher can easily identify the common mistakes of the class and provide more detailed explanation accordingly. It may also be a sign that the teacher has to consider refining the teaching methods or styles to better suit the class, or to make certain clarifications and restate the main points to ensure students can grasp the core ideas before leaving the classroom.

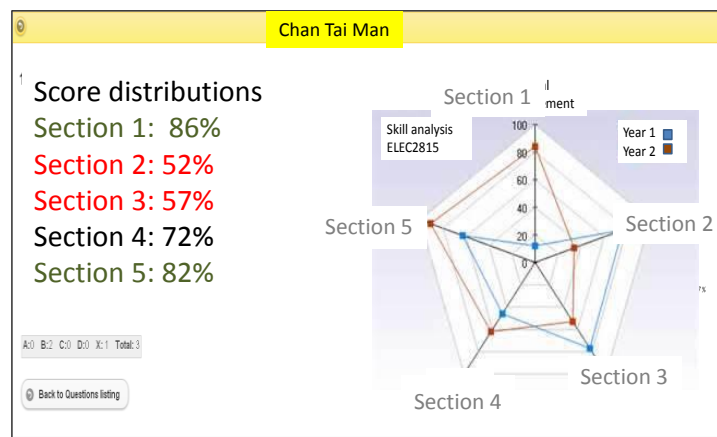
### 3.3.2. Student level analysis

In addition to showing the answer distribution of the class a whole, iClass can categorize different question types and analyze students' performance in respective aspects by showing their different attributes. For instance, the subject Integrated Science includes topics from Physics, Chemistry

and Biology. By showing the score performance of the student in different types of questions, the teacher can identify their strengths and weaknesses and advise them on further drilling in some target areas.

To illustrate, the diagram below shows the performance of the student Chan Tai Man. Section 1 may be questions on Physics, while Section 2 and 3 may include questions on Chemistry and Biography respectively. By displaying his score distribution in the quiz, teachers and parents can obtain a clear picture of Chan's academic performance in different subjects. A 86% score in Physics means he is probably performing above average in class, whereas lower scores in Chemistry and Biography, highlighted in red, indicates he is performing slightly below par in these subjects which need more attention on.

Nowadays, with students having many subjects to tackle and teachers having many students to attend to at one time, iClass helps both students and teachers to keep track of the learning process and ensure students are not slacking off. With the in-built student level analysis function, iClass stands as an effective tool to address individual learning needs, enabling not only teachers but also students to devise effective learning solutions by developing strengths and improving weaknesses.



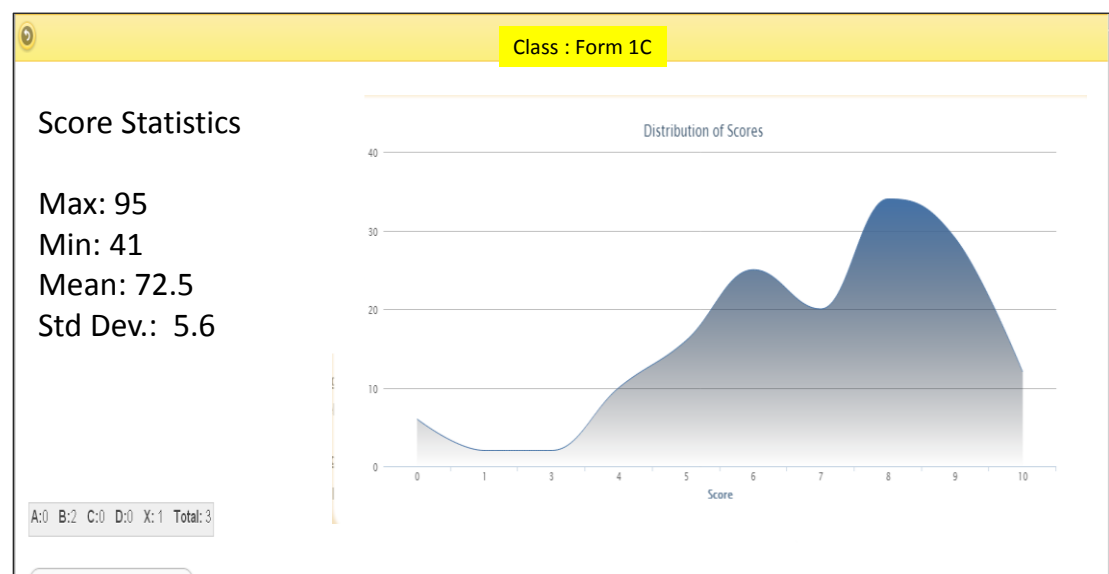
### 3.3.3. Class level analysis

Notwithstanding the importance to personalize the learning experience by attending to individual learners, the overall performance of the class also affects learning effectiveness. In light of this, iClass provides statistical

analysis at a class level in order to help teachers obtain an overview of the performance of the class.

Below is an empirical study based on a common core class in our university with over 100 students. With its two peaks, the line curve shows a binomial distribution, indicating that there are two groups of students with uneven standards in class. The highest score is 95 while the lowest is 41, which is less than half the score attained by the best student. While this may not be surprising given the diverse class composition, it is still telling of the overall effectiveness of classroom teaching.

By showing the distribution of scores in the class, teachers can readily evaluate the students' performance and have a concrete idea on how well students are digesting the lesson content. If the curve shows an uneven level of performance, such as the case cited below, teachers will be prompted to review and modify the level of difficulty of the learning materials. Teaching approach may be adjusted to improve the delivery of class materials. Teachers may also be alerted to the need of follow-up actions such as holding supplementary classes to address the needs of students who are currently performing below average.



Besides showing the maximum and minimum scores, the system generates the mean score and standard deviation of the class. The mean score here is 72.5, which suggests that the majority of the class is performing at an average level. However, if the mean score happens to be



generally low, such as below 50, then the material or assessment is probably too difficult for most students to handle, and the teacher may have to consider fine-tuning the level of the assessment. By showing a range of statistics that stand as useful indicators of the class performance, it is hoped that the system will help teachers adjust and refine their teaching approaches and eventually narrow the gap between the high and low performers to foster a more effective learning environment for all.

# Chapter 4: New Features for New Pedagogy



## 4. New Features for New Pedagogy

In the previous book, a number of basic modules of iClass are outlined. The following session introduces a few newly developed features that are designed to better fit the learning needs of students in today's digital era.

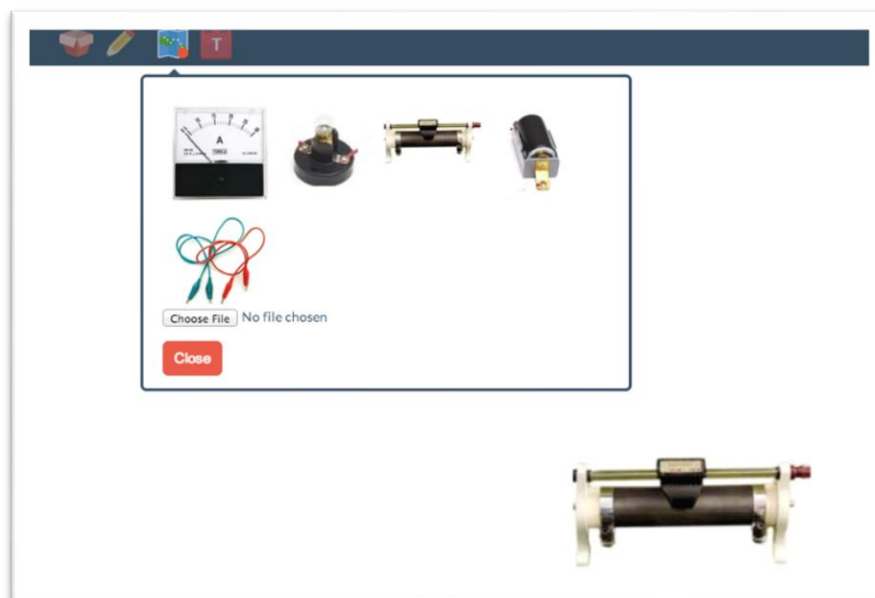
### 4.1. Learning with e-stickers

E-stickers effectively enliven the learning process by providing students with things in hands to work on. Simple in-class activities can be conducted with the use of e-stickers, enhancing the level of interaction in a traditional classroom setting. Prior to the class, teachers can first prepare an image or graph to serve as the backing paper or background. The images can be taken from existing albums or downloaded from the web. Alternatively, the pictures can be taken instantly with the camera in electronic devices like iPad or tablets. In addition to the background image, the teacher may prepare different e-stickers for students to choose.

To illustrate, simple matching exercises can be carried out with e-stickers to teach basic geographical knowledge. The teacher may first download a map of China from the web and upload it to the system. E-stickers, which may be iconic images or landmarks of different Chinese cities, such as the Summer Palace from Beijing or pandas from Sichuan maybe prepared and preloaded in iClass. During class, students can click into the corresponding activity and perform simple matching by dragging the images to the geographical location of different cities on the map. Given actual tasks to work on, students remain engaged throughout the process. Teachers may also check the students' progress and answers immediately after their submission of answers. In the past when matching exercise only exists in paper, it is rather difficult for teachers to track students' progress, especially when the class size is large. With the availability of e-stickers, matching exercise can be conducted easily with just a swipe or tab, and answers can be checked instantly. At the same time, the use of electronic resources saves a lot of paper and excessive printing, which is more environmental-friendly compared to the traditional pen-and-paper mode.



The use of e-sticker is not limited to matching exercises that aims at testing students' knowledge. In fact, it can be used flexibly to conduct a variety of class activities to suit the curriculum requirements of different subjects and topics. To give another example, e-stickers can be used as diagram labels for students to draw the laboratory set-up for experiments in science subjects. In the example below, e-stickers can be used to draw an electric circuit. Before the activity, the teacher may prepare the images of different components and upload them to iClass.

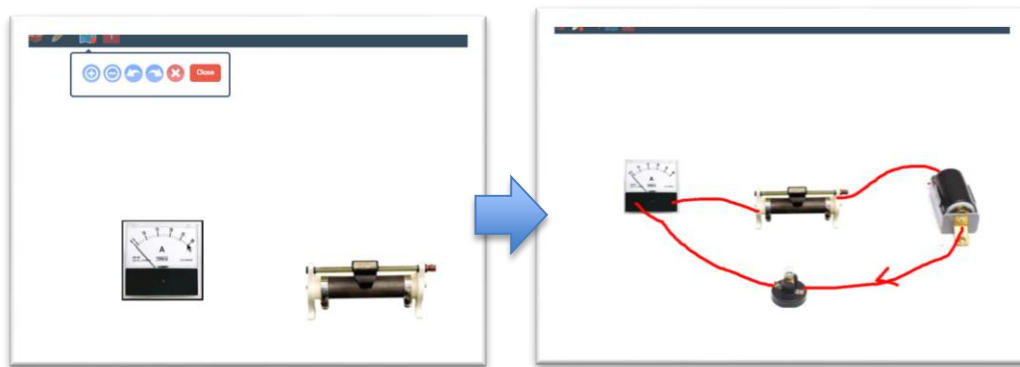


Choosing different e-stickers to draw a diagram



During class, students can first drag and drop the relevant component, such as the battery or the light bulb, to its corresponding position on the backdrop, then use the Drawing function to draw lines to link up the components.

Alternatively, the e-sticker function may be applied in teaching Mathematics, such as the unit on shapes. For instance, the seven pieces of a Tangram may be represented by e-stickers of different shapes and sizes. Students can learn how to fit different shapes together by dragging, dropping and arranging the components in the backdrop.



Drag and drop the components to their positions and then draw lines

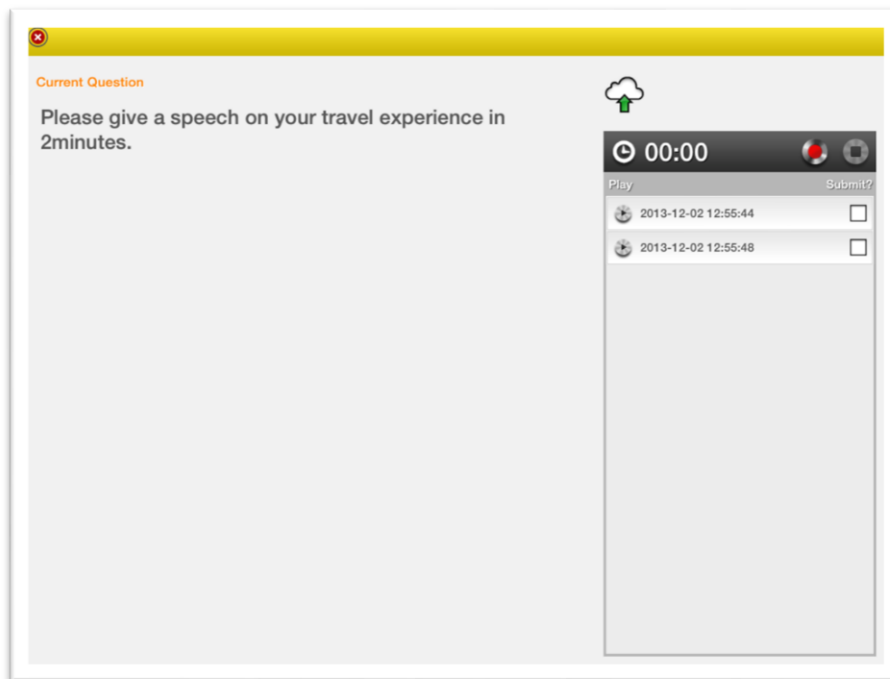
Use Drawing function to add lines to link up the components.

## 4.2. Recording your answers

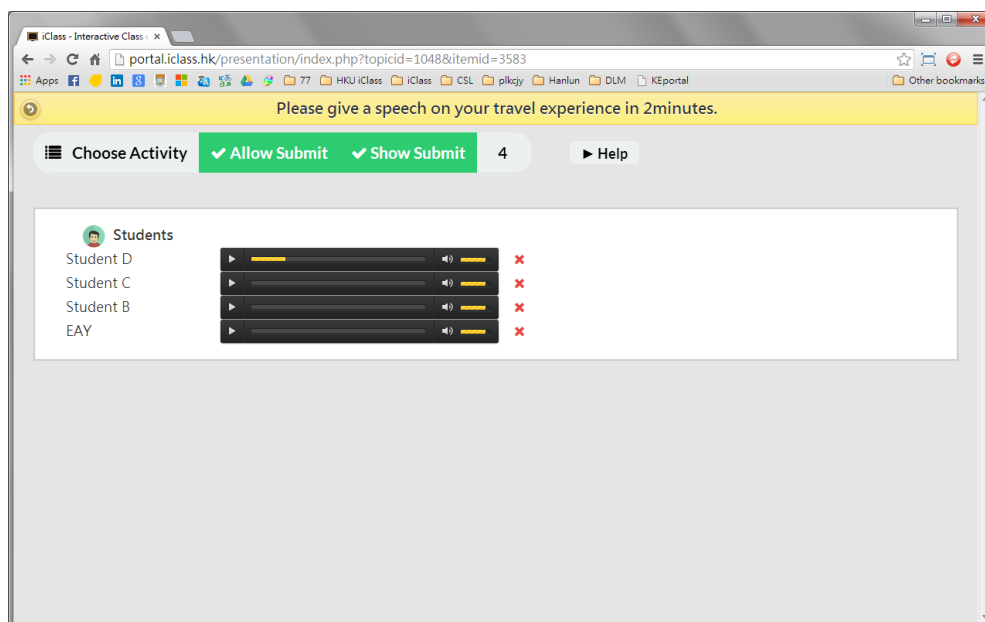
With iClass, answering questions no longer means putting everything in written words, but articulating them in an audio file. The recording function in iClass encourages students to record their voice and submit them to the teacher or class for sharing. For instance, the teacher may post a topic or question, such as asking students to share their memorable travel experience. To respond, students first click the recording button and verbalize their answers. They may try out as many times as they like and save a number of recordings, play back to listen to each, then select the most satisfactory one for final submission. Once uploaded, the teacher



may listen to their recordings immediately and provide feedback to students.



The student's interface



The teacher's interface – listening to the tracks submitted by students

This feature is particularly useful for language teaching that often requires oral practice session. In the past, when students want to practice

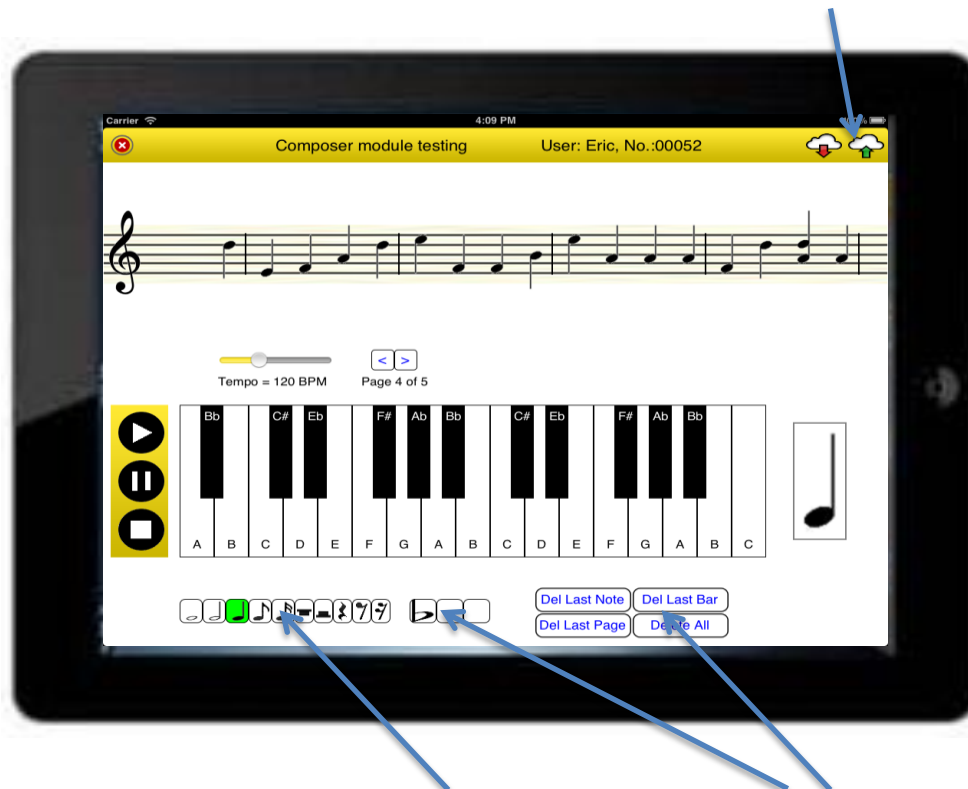
oral skills and receive feedback from teachers, they need to wait quite some time for their turn as each student takes up at least 3-5 minutes. The recording function enables more effective use of class time, providing students with more opportunities to articulate their ideas to practice oral speaking. Instead of attending to students one-to-one within the limited lesson time, teachers may encourage students to do their own recordings first, either during class or at their leisure, and upload it to the system. Teachers could then review the tracks efficiently and give comments for improvement. The digitalization of data also keeps record of the students' oral speaking performance so that relevant information may be retrieved for teachers' reference later.

### **4.3. Co-creation of music**

As an interactive platform, iClass does not only accommodate science or language subjects but also music. iClass Composer, which can be integrated with iClass for real-time interactive teaching, enables a group of students to collaborate and create music on-the-go with a device as simple and accessible as an iPad.

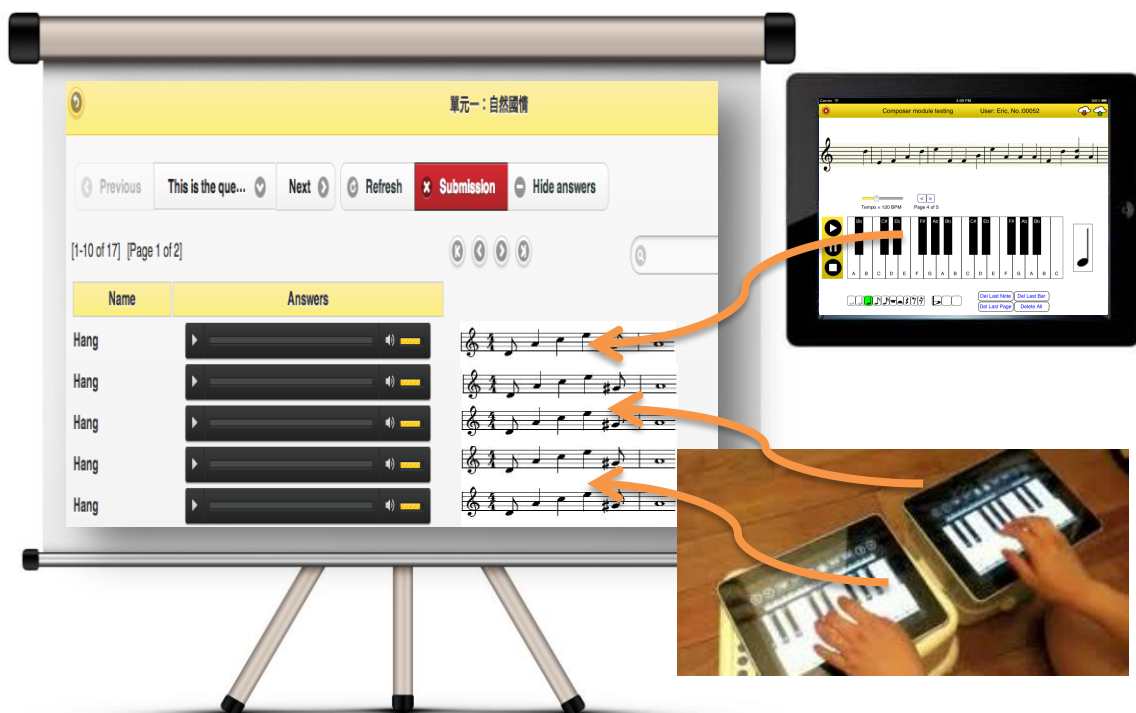
Students can input notes using the staff or virtual keyboard, and then instantly render their pieces using a wide variety of sounds from the sound bank. Their finished works can be shared seamlessly between iPads, printed out in the sheet music format, or exported to MP3/WAV. This promotes collaborative learning and encourages students to explore their creative potentials by interacting and experimenting new things with their peers. In addition to being an easy tool to compose music with friends, the system enables students to gain basic musical knowledge. Users can receive feedback on music spelling and grammar, which helps them grasp a better understanding of the theories underlying music composition.

Submit the staff and music notes to iClass



Selection of music notes

Delete note/bar



#### **4.4. Learning in Off-line Mode**

The resources in iClass can be accessed in an off-line mode, including previously uploaded documents or image files. All functions, except peer review and web browser, are able to work properly without Internet connection. In this way, collaborative learning is no longer limited to the classroom setting, allowing students to learn anywhere, anytime, at their own desired pace. Under the off-line mode, students can participate in interactive activities outside the classroom. For instance, in an activity such as drawing route maps, students may take their iPads or tablets with them, mark down the landmarks and make notes on-the-go using the Drawing function. They may also collaborate with other groups or classmates through the sharing platform. Case Study 6.2 provides more details on how the off-line mode is used to conduct class activities.

#### **4.5. Conducting Multidimensional Discussion**

Despite the advocacy of small class teaching and its recognized benefits to learning, many classes in universities or schools are still held in big lecture halls and classrooms, which may not be the most desirable environment to carry out effective class discussions. Some students may not be as outspoken as others and prefer expressing their opinions in written words rather than verbally in front of the whole class. Moreover, with the limited time scheduled for each class, it is sometimes difficult to ensure every student gets a fair share of time to articulate their ideas. iClass thus comes in timely as an interactive system that facilitates classroom discussion of various sizes and styles, gathering opinions from all classmates in an organized manner that is conducive to effective and fruitful discussions.

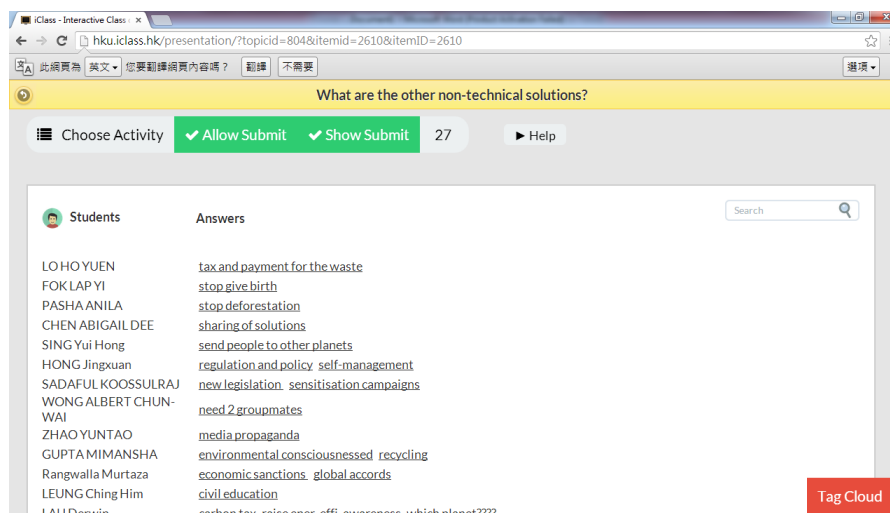
##### **4.5.1. How does it work**

With its keyword function, iClass accommodate different types of discussion and teaching styles to address the learning needs of different subjects. To initiate a class discussion, the teacher simply has to add a new topic, put in the question concerned and the aspects to be discussed. Students, with their smartphones, tablets or computers, can then log into

their accounts, click in the class and topic and contribute their ideas by typing relevant keywords.

After submission, their answers will be available to the teacher as well as fellow classmates, which can be shown in either tag cloud or list view. For a tag cloud view, students' ideas will be presented in a big box similarly to that of a mind map. By displaying the pool of ideas from the entire class, it is especially helpful in the brainstorming stage of any discussion. If more than one student put in the same keyword, the system will automatically enlarge and bold that particular keyword to indicate that it is a popular idea shared among students. The teacher may begin the discussion by first referring to those general ideas to arouse students' interest and stimulate thoughts, then move on to other interesting points in the pool.

Alternatively, teachers can obtain a list view of students' ideas, which shows all the keywords and points in a clear and orderly manner. The ideas are grouped under respective columns according to the different aspects assigned by the teacher. In addition to getting an overview of the ideas collected under different aspects, the teacher can also see the ideas contributed by each student. This is particularly useful for follow-up discussion, as the teacher may refer to an interesting point and then call upon the student to elaborate, clarify or substantiate the idea to enrich the discussion. As with the case cited below, the teacher may invite the student Derwin to explain his rationale behind suggesting 'carbon tax' as the non-technical solution to climate change.



The screenshot shows a web browser window with the URL [hku.iclass.hk/presentation/topicid=804&itemid=2610&itemID=2610](http://hku.iclass.hk/presentation/topicid=804&itemid=2610&itemID=2610). The page title is "What are the other non-technical solutions?". Below the title, there are buttons for "Choose Activity", "Allow Submit", "Show Submit", and "Help". The "Show Submit" button is highlighted in green. The page displays a list of students and their answers:

Students	Answers
LO HO YUEN	tax and payment for the waste
FOK LAP YI	stop give birth
PASHA ANILA	stop deforestation
CHEN ABIGAIL DEE	sharing of solutions
SING Yui Hong	send people to other planets
HONG Jingxuan	regulation and policy self-management
SADAFUL KOOSSULRAJ	new legislation sensitisation campaigns
WONG ALBERT CHUN-WAI	need 2 groupmates
ZHAO YUNTAO	media propaganda
GUPTA MIMANSHA	environmental consciousness recycling
Rangwalla Murtaza	economic sanctions global accords
LEUNG Ching Him	civil education
LAU Derwin	carbon tax raise ener. effi. awareness which planet????

A red button labeled "Tag Cloud" is visible in the bottom right corner of the interface.



### **4.5.2. Facilitating different types of discussion**

Different subjects and topics require different modes of discussion. Some need a general pool of ideas while others expect a two-sided or even six-sided view on the issues under inquiry. iClass provides support for different types of discussion, ranging from one-dimensional to six-dimensional.

### **4.5.3. One-dimensional Discussion**

If the teacher wants to generate general points on a certain topic, he or she can initiate a brainstorming session using iClass. For instance, in discussing the topic on sustainable development, the teacher may ask students to give examples of renewable energy. The student can then type in keywords such as ‘wind power’, ‘hydropower’ and ‘solar energy’ and submit their answers to the system. Every student can contribute as many examples as possible at the same time, and the system will display all the ideas gathered on the screen. The teacher can refer to the examples raised and pick up a few to follow-up on. Instead of feeding ideas to students, this style of open discussion makes learning a more engaging experience, which is especially helpful when the class size is large.

### **4.5.4. Two-dimensional Discussion**

Other than stimulating general discussion, the system enables teachers to conduct class debates effectively by offering a clear view of the two sides of the same issue. This is relevant and important in subjects like liberal studies or social administration which often demand students to hold a balanced view on the issues concerned. For instance, in evaluating the effectiveness of a social policy, such as the legislation of standard working hours, the students have to brainstorm the positive and negative impacts of the policy. Under the tab on positive impacts, students may input keywords such as ‘work-life balance’, ‘less exploitation’. On the other hand, negative impacts may include ‘lower productivity’, ‘less welfare’ and so on. After listing out both sides of the issue, the class can carry out a debate on the implementation of the policy based on those

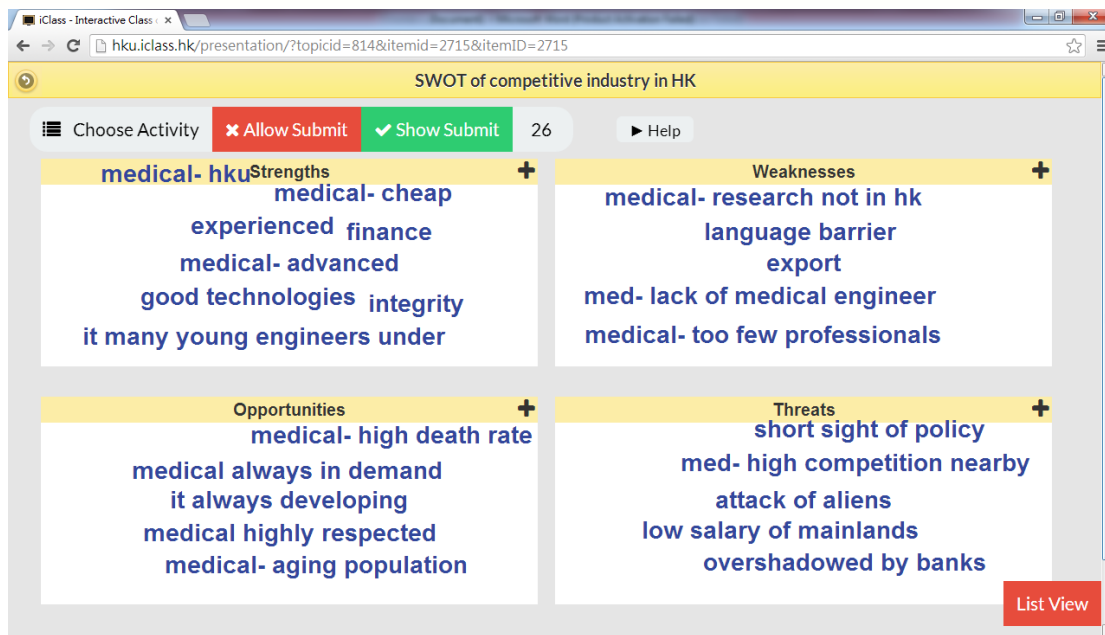
ideas generated. During the debate, students can easily refer to the points on the screen from time to time. It also helps students to construct stronger arguments and formulate convincing rebuttals by considering the opponents' points of view.

#### **4.5.5. SWOT Analysis**

Aside from presenting a two-dimensional view, the system facilitates the four-dimensional SWOT analysis by encouraging students to identify the strength, weakness, opportunities and threats of particular projects or policies. This analytical structure is originally developed by Albert Humphrey in the 1960s in his analysis of business companies, and is later widely adopted for business ventures and all kinds of projects. While SWOT analysis is useful for strategic planning by identifying both the internal and external factors affecting a project, it also proves to be a good analytical framework for discussions beyond the business field.

In fact, the SWOT analysis model is used for an Engineering management class in the university. In discussing the competitive industry in Hong Kong, the professor guided the students to approach the topic from four angles by brainstorming its strengths, weaknesses, opportunities and threats. Keywords for strengths include “advanced technologies”, “experienced engineers”, whereas weaknesses may be “language barriers” or “lack of medical engineer”. In addition to thinking about the pros and cons, students are encouraged to have a long-term vision by considering the opportunities and threats provided by the competitive industries.

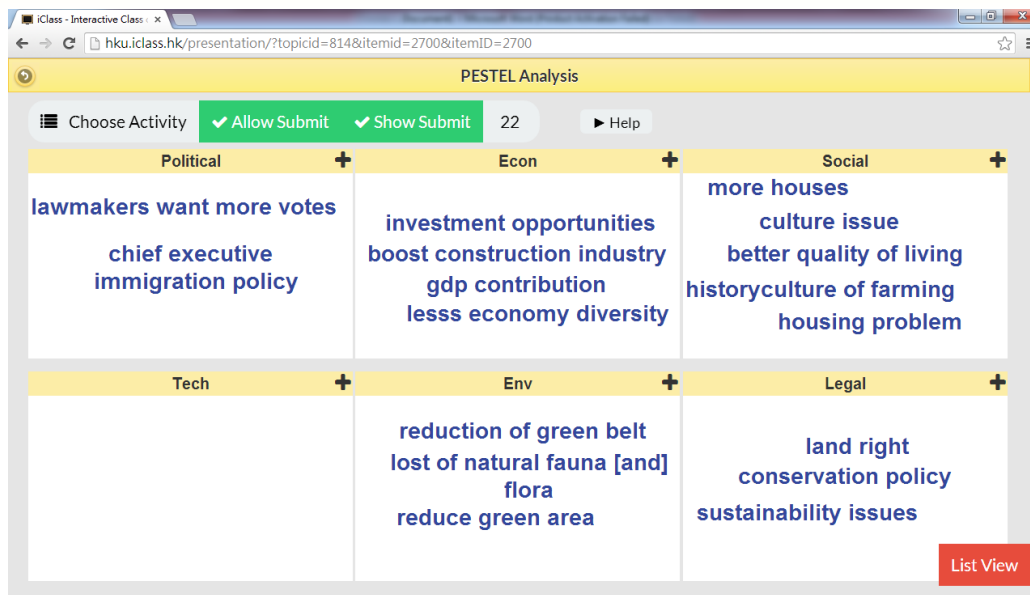
As shown in the diagram below, after submitting their answers to the system, both the professor and students get a clear table view of the ideas immediately. In the past, class discussions are often difficult to carry out when the class is not active or responsive enough. With the support of iClass, the teacher can conduct and coordinate effective class discussions based on the points contributed by students, at the same time making the class more interactive by responding directly to their ideas.



#### 4.5.6. PESTEL Analysis

In addition to facilitating SWOT analysis, iClass supports another similar yet slightly different analytical framework – the PESTEL model. The PEST framework was first created by Harvard professor Francis Aguilar to analyze the business environment with respect to the political, economical, social, technological aspects, and was later expanded to include environmental and legal factors. While the SWOT analysis focuses more generally on the internal and external factors, PESTEL analysis offers a macro view on the issue.

For instance, in analyzing the effectiveness of setting standard working hours, the teacher may want a more in-depth discussion rather than just pointing out the positive and negative impact of the policy. With the PESTEL analysis function in iClass, the teacher can guide the students to think in more diverse ways and consider the political, economic, social, technological, environmental and legal implications of the policy. For example, students may key in “greater social harmony” under social impact and “lower productivity” under economic impact. After the students express their ideas, the system automatically categorizes the answers under different aspects to provide an easy reference for the class.



As illustrated, the system is a useful tool in facilitating multidimensional discussions that accommodate various types of discussion and teaching styles required in different subjects. In today's world, learning no longer stresses on the one-way knowledge transmission from teachers to students, but in enhancing the capacity of the student to develop critical thinking ability to analyze issues from multiple angles in an organized and logical way. Discussions, whether they are between teachers and students, or among students themselves, have hence become an increasingly important part of interactive learning.

The system is also a good and easy way to keep record of the discussion content for each lesson, which can then be used for review during the next lesson, or for the students' future reference when they prepare for essays and examinations.

By stimulating the brainstorming of ideas and providing an easy way to contribute ideas in class, iClass encourages more active participation from students to foster a more interactive class environment that is optimal for effective learning and teaching.



# Chapter 5: Interactive Technology in Science Education





## 5. Interactive Technology in Science Education

The interactive features of iClass, as introduced in the previous session, can be applied in teaching different subjects. Science education, for instance, has capitalized on this advancement of technology in enhancing learning effectiveness. Just as how the world wide web changed the way we communicate a few decades ago, the emergence and popularity of e-textbooks and interactive technology have revolutionized the traditional mode of learning by placing student at the center of the learning process. E-textbook is an effective tool that integrates the use of technology with practical sessions and other in-class activities in helping students build, reinforce and consolidate knowledge. By incorporating new technologies into practice with functions such as simulations, data logging, projected animations and other dynamic digital resources, e-textbooks facilitate students in understanding complex scientific concepts and physical processes.

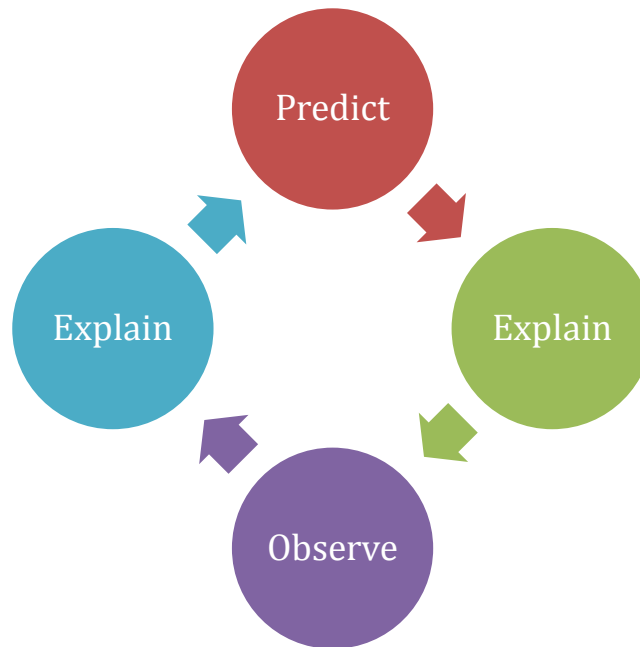
There has been well-established research literature on the benefits of the use of Information and Communication Technologies (ICT) in science education. With the rapid development of educational technology in the past decades, educators and scholars have developed different pedagogical approaches for science education that capitalize on the technological resources available. The following section reviews the different ways in which e-textbook uses technology to enhance the overall effectiveness of learning and teaching science.

### 5.1. The Use and Benefits of Interactive Technology

#### 5.1.1. Increasing In-class Interactivity: the PEOE Model

The “Predict-Explain-Observe-Explain” Model, better known as PEOE, refers to the pedagogical approach of adopting a “Predict-Explain-Observe-Explain” learning process. This model is commonly used in science education which places great emphasis on students’ direct engagement and input in learning. It is particularly useful in science subjects like Physics, as students often hold a lot of misconceptions. In the first phase, students are asked to make predictions on the possible

outcomes of an experiment or scientific process and provide explanations. They then observe the actual processes as demonstrated, followed by the teachers' explanations of the underlying concepts.



As such, E-textbook is an effective tool that supports and reinforces the PEOE learning model by enhancing the level of interactivity and students' involvement in class. Instead of having the teachers deliver the content, students learn more effectively by gaining hands-on experience with the topic materials. They are engaged throughout the entire learning process, from asking “what if” questions to observing and explaining their findings. As such, students participate actively in the knowledge building process, synthesizing and linking new ideas and concepts with existing knowledge. By eliciting, discussing and challenging students' ideas, e-textbooks help to reinforce the PEOE learning process by encouraging students to construct and restructure their own knowledge through providing a series of interactive activities.

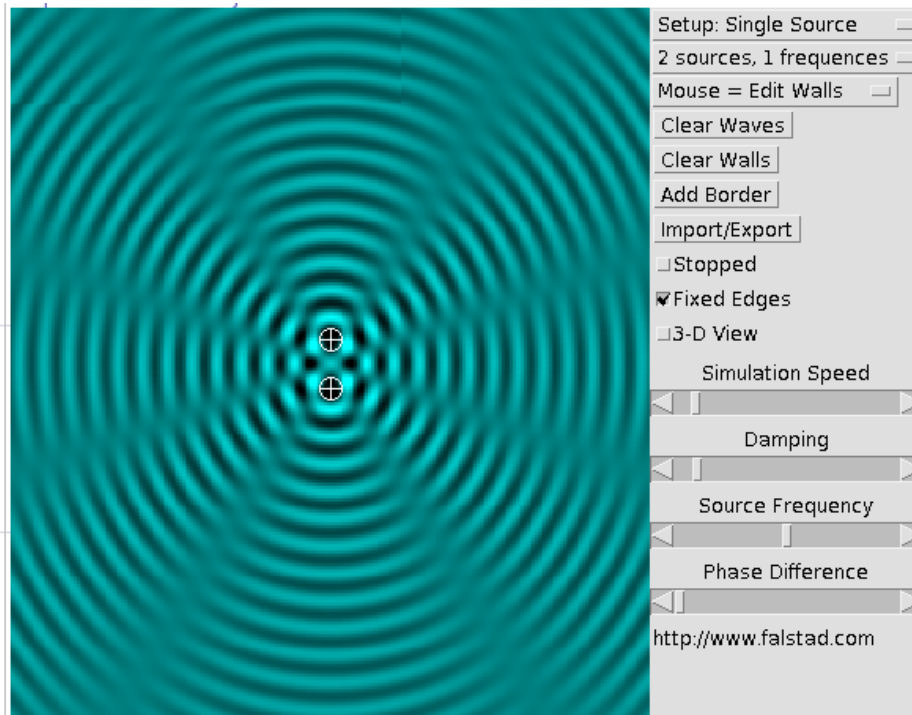
To take an example, instead of directly telling the students factual knowledge about conductors and insulators, the teacher may first ask students to predict what would happen if electricity passes through a type

of material, say, silicon. Students then make predictions on possible results based on their own knowledge of the properties of silicon, and explain their answers. In this initial stage, the interactive features of e-textbook come in useful in collecting the predictions from the entire class. This electronic mode of learning increases accessibility and interaction within a class by allowing many students to participate in the same activity simultaneously. Each of them can submit their guesses to their teacher at the same time, and the teacher can invite students to offer explanations based on the ideas gathered. Students may even draw images on screen to reflect their ideas and share them immediately with the class for discussion. After generating ideas on the possible outcomes, students observe the process as the teacher demonstrates what happens when electricity passes through a piece of silicon. Afterwards, the underpinning concepts will be explained to students to reinforce or rectify their understandings of conductors and insulators. In this case, e-textbooks support collaborative investigation by fostering student participation in what Sutherland (2004) calls a “collaborative community of inquiry”. By eliciting students’ knowledge and challenging them against empirical findings, students keep involved and motivated throughout the entire learning process.

### **5.1.2. Visualizing abstract concepts: simulation/animated images**

In the past, teachers distribute worksheets for students to work in class, asking them to fill in missing components or draw diagrams of electric circuits on papers. Concepts and theories that involve complex processes are also taught and explained by mere descriptions. Nowadays, e-textbooks, by incorporating interactive simulation software and other multimedia resources, facilitate the visualization of abstract knowledge and concepts. With the dynamic visual representations of physical phenomena, e-textbooks come in as especially helpful to slower learners who have difficulty formulating their own mental representations. For instance, instead of imagining the motion of electrons, simulation models and animations embedded in the e-textbook help students visualize the

actual movement and direction of the electronics, as well as the effects they are expected to generate.



Use computer to simulate complex science concepts

For a subject like Chemistry that includes many abstract concepts, electronic technology can be applied to help students get a better grasp of its theories. Chemistry educators have suggested the triplet relationship in the teaching of chemistry, referring to the idea that chemical knowledge can be represented in three ways: macro, micro and symbolic. The macro-structure refers to things that can be visibly seen; the microscopic world includes things that are not physically visible to human eyes, while the symbolic refers to the diagram representations or equations in science subjects. With reference to this triplet model, electronic learning can strengthen the teaching of chemistry by enhancing students' understanding of the abstract microscopic world. As Dr. Alice Wong, education researcher in the University specializing in Science Education suggests, in order to teach knowledge of the micro-structure effectively, diagrams and words have to be matched very well in helping students visualize the concepts. This is challenging with printed textbooks as they only include static images and diagrams. On the other hand, electronic textbooks make things easier by supporting moving images and

animations. With just a click or tab, simulation models and micro-level movements are displayed visually. For instance, in learning crystallography, animations incorporated within the e-textbooks help to demonstrate and explain how various diffraction patterns are produced.

Moreover, the use of simulation greatly enhances the interactive process of learning. As many educators have pointed out, given the complex and counter-intuitive nature of scientific concepts and processes, the opportunities for discussion, reasoning, interpretation and reflection are essential components for knowledge building. In their view, “technological tools and resources which students can use interactively potentially offers further opportunities for expressing, evaluating and revising their developing ideas as they visualize the consequences of their own reasoning” (Hennessy et al. 2007). In other words, through capitalizing the use of electronic technology, e-textbooks enable students to directly engage with the concepts learnt and encourage knowledge exploration by stimulating students to evaluate, reflect and pose questions.

The use of simulation technology in science subjects also directs students’ focus on the key underlying concepts, relationships and processes that the teacher wants to address. In science subjects which involve many practical activities and demonstrations, students may have a different focal point from the teacher and place attention on parts that are irrelevant to the theory concerned. For instance, when studying the workings of a motor on a printed textbook in which images remain static, some students may misplace their focus on the two magnets at the north and south poles instead of the motion of the motor in the middle. By incorporating animated images, e-textbooks help student to focus on the target concepts by highlighting them with motion.

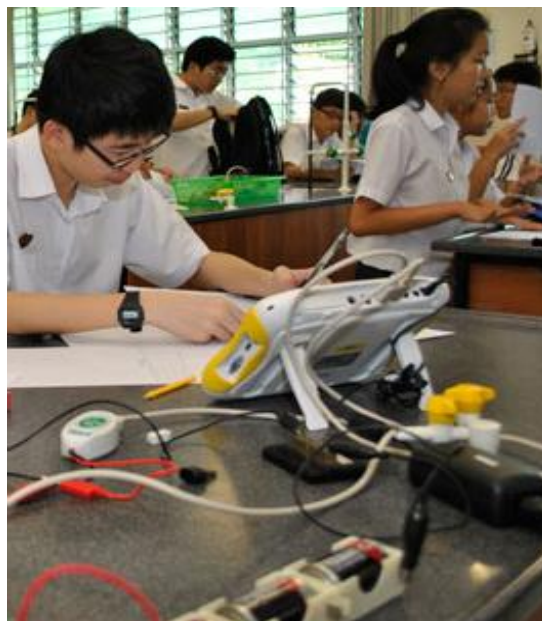
### **5.1.3. Promoting collaborative learning: Data Logging**

In addition to increasing students’ level of involvement in the learning process, electronic technology promotes collaborative knowledge building through data logging. Back then when technology was not as developed as it is today, when students carry out simulation, they have to



perform a collision physically and observe the effects. However, with the use of sensing equipment and other advanced electronic devices, once the collision happens, experimental data can be automatically generated, recorded and displayed (Newton & Rogers 2001). Through real time data plotting, students are encouraged to predict, hypothesize and ask questions based on the data collected. They are also allowed to gather as many data as possible through repeated experiments, which are impossible in the past when experiments still have to be conducted in practical sessions. In this sense, electronic learning revolutionizes the learning process by realizing what could not be done in the past.

More importantly, with the immediate availability of experimental data, the class can carry out dynamic discussion based on their findings. For instance, in examining the relationship between magnetism and electricity, students can conduct the simple experiment of passing a magnet near a coil of wire connected to an ammeter. After collecting the automated readings from the ammeter, the class may discuss the implications of the results by considering the variables affecting the amount of current, such as the magnets' location and speed or the type of coils. This kind of discussion increases the level of interaction and promotes student-centered learning.



*Using data logger to record experiment results***5.1.4. Supporting Self-directed Learning**

E-textbooks not only promote student-centered learning, but more importantly enable self-directed learning by empowering students to learn independently. As many teachers would have known, the science curriculum includes sections on factual knowledge that does not require much explanation or practical experiments. For instance, students can read and understand factual information such as the types of thermometers or radiators, or how different radiation is produced. Given the valuable and limited class time, it is recommended that quality class time should be better spent for higher-order learning such as investigation of theories, leaving other information to students to read on their own. In this case, e-textbooks come in as helpful tools to support independent learning by making multimedia resources readily available and accessible to students at anytime, anywhere.

Moreover, e-textbooks provide an alternative way to train students' ability in reading-to-learn, which is an important skill highlighted in today's science curriculum. In subjects like Physics, students are required to read science-related articles. The ability to read and understand different kind of texts is an essential life-long skill and students are better off acquiring such skill at an earlier age. E-textbooks promote the development of students' reading skills by presenting them with a myriad of up-to-date articles and other reading materials. These kinds of interactive resources are especially useful to the more investigative and independent learners who actively seek extended knowledge to enrich what they learn in class.

**5.2. The Role of Interactive Technology**

It is believed that the most ideal way to implement interactive technology in the classroom is to integrate it well with other learning components. In any case, interactive technology should be regarded as a means but not an

end to education. In other words, electronic technology and e-textbooks are used to facilitate learning and teaching, rather than overtaking the objective of education by taking the center stage in a classroom.


As Dr. Wong suggests, experiments for science subjects should not be separated into a lab session of 4 hours but instead integrated well to daily teaching. In the past, with limited class time and teaching periods, it may be difficult to include lab sessions into daily lessons. In this sense, electronic technology proves to be useful in integrating laboratory demonstration into regular classes by making it affordable and convenient to conduct experiments.

Much more importantly, interactive technology plays a vital role in promoting a positive learning attitude. The aim of education, rather than being knowledge transmission, should be about the cultivation of an inquisitive mind among students such that they have the self-motivation to learn. Well-designed e-textbooks, by incorporating more enlivened resources, enables students to experience the fun of the knowledge seeking process. After all, instilling the drive to learn comes with much more value than implanting hard and fast knowledge.

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- ii. Newton, L. & Rogers, L. (2003) Thinking frameworks for planning ICT in science lessons. *School Science Review*, 84 (309), 113-120.
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# **Chapter 6**

## **Case Studies at the University of Hong Kong**

## 6. Case Studies at the University of Hong Kong

### 6.1. Case study: Faculty of Medicine

Case: Conduct pre-test and post-test

Teacher: Dr. Julia Chen and Dr. Weng Yee Chin

Students: Undergraduates

Subject: Common Core Course – From Health to Well-being

The common core course was first introduced in the University of Hong Kong to accommodate the curriculum reform in Hong Kong. Categorized into four Areas of Inquiry (AoIs) including Scientific and Technological Literacy, Humanities, Global Issues and China: Culture, State and Society, the main objective of common core courses is “to broaden their horizons beyond their chosen disciplinary fields of study” (HKU Common Core website 2013), and every student is required to take six



courses throughout their undergraduate studies. As such, these classes are often subscribed by a large amount of students coming from diverse disciplines and background. In order to enhance the level of interactivity within the classroom, iClass comes in useful as a tool to engage students with the lecture content. The following session reviews the use of iClass in the common core course CCHU9019 (From Health to Well-being) offered by the Faculty of Medicine last year. It was co-taught by Dr.



Chen and Dr. Chin, both of them professors from the Department of Family Medicine and Primary Care.

The class consisted of 120 students coming from different disciplines. iClass was employed quite substantially in the course and was used in 10 out of the 12 lectures. It played a supportive role in the course by increasing the level of students' participation, making the large class more accessible to students who felt comfortable contributing opinions through the use of mobile devices. The real-time nature of the system also allowed the teacher to immediately draw on and respond to the results generated. More importantly, the use of iClass enabled different modality by engaging students in a variety of activities. Instead of only listening to the lectures, the students had something fun in hands to work with. It was the first time that iClass was introduced in the class and students' responses were generally very positive, and some even considered iClass as one of the merits of the course in the end-of-term evaluation. One credited the use of technology by writing "I can see the very good implementation of technology within this course, like the system of iClass, and also the forum stuff (on Moodle)..."

### **The Use of Different Features**

#### **a) Multiple Choice Questions**

Different features of iClass were used to conduct various in-class activities. The Multiple Choice Question feature is used most often to carry out pre-tests and post-tests. For instance, in the lecture on global health, a pre-test was given to students to check their background knowledge prior to the lesson. Simple and short MC questions were posed, such as asking students to choose from the options the country with the highest infant mortality rate. It enabled the lecturer to gain insight of students' baseline level of generic knowledge and at the same time encourage students to stay focused and look out for things they do not know during the lecture. Sometimes, pre-tests were set to ensure students have completed the required readings before coming to class. At

the end of the lecture, a post-test was given to anchor students' knowledge and test their understanding of the lecture content.

**Pre-test**

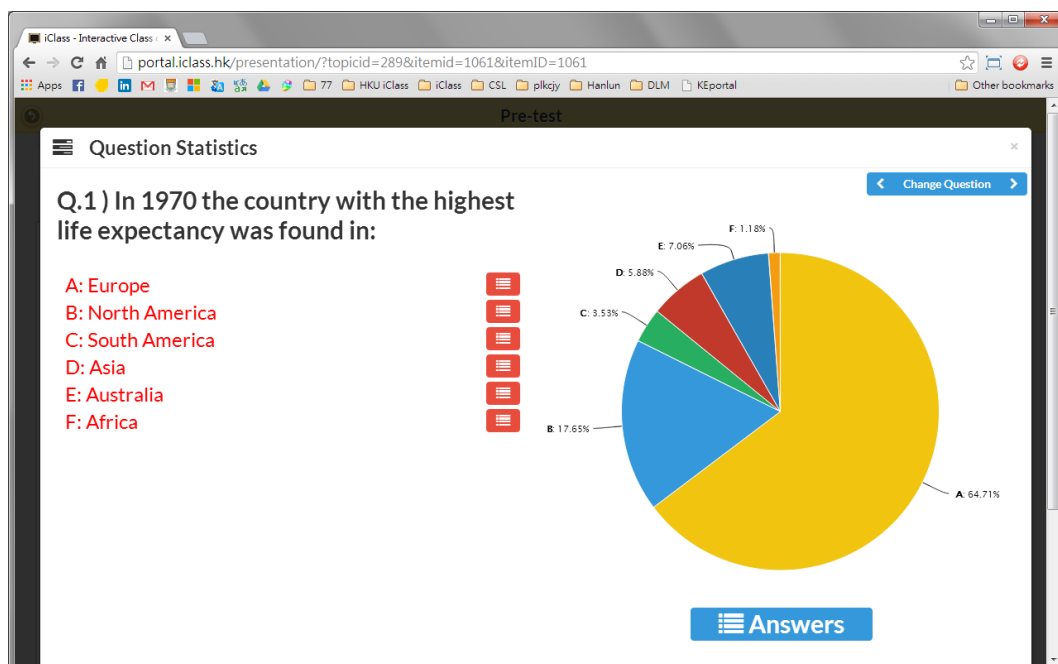
1 In 1970 the country with the highest life expectancy was found in:

- A Europe
- B North America
- C South America
- D Asia
- E Australia
- F Africa

1: Not yet done  
2: Not yet done  
3: Not yet done  
4: Not yet done  
5: Not yet done

A B C D E F

One of the questions in the “Pre-test”



Part of the result for “Pre-test”

**Post-test**

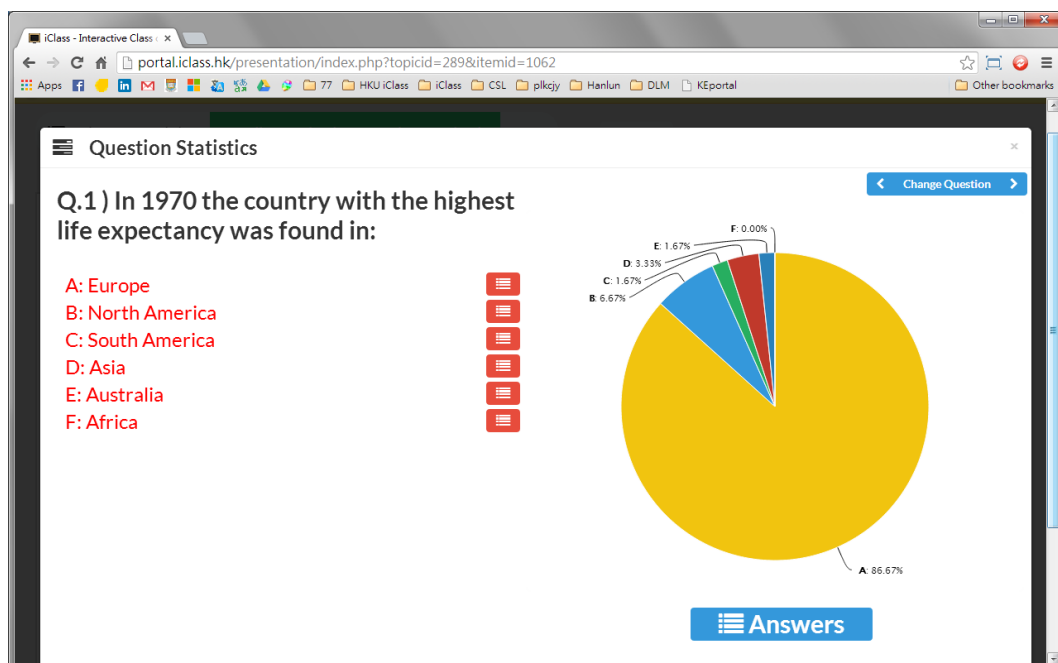
1 In 1970 the country with the highest life expectancy was found in:

- A Europe
- B North America
- C South America
- D Asia
- E Australia
- F Africa

1: Not yet done  
2: Not yet done  
3: Not yet done  
4: Not yet done  
5: Not yet done

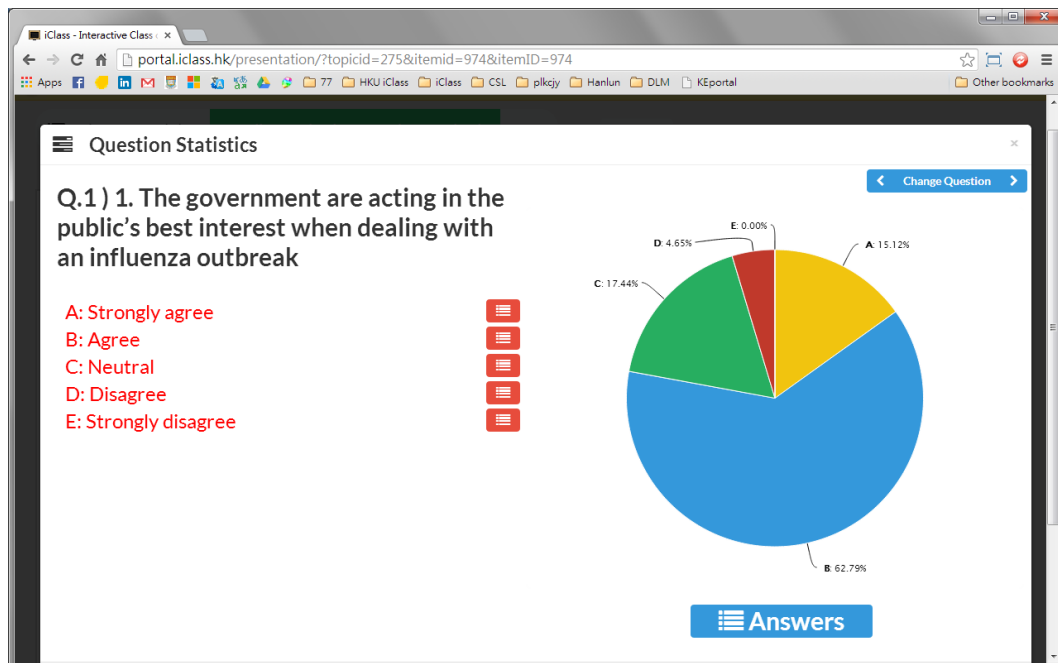
A B C D E F

One of the questions in “Post-test”



Part of the result in “Post-test”

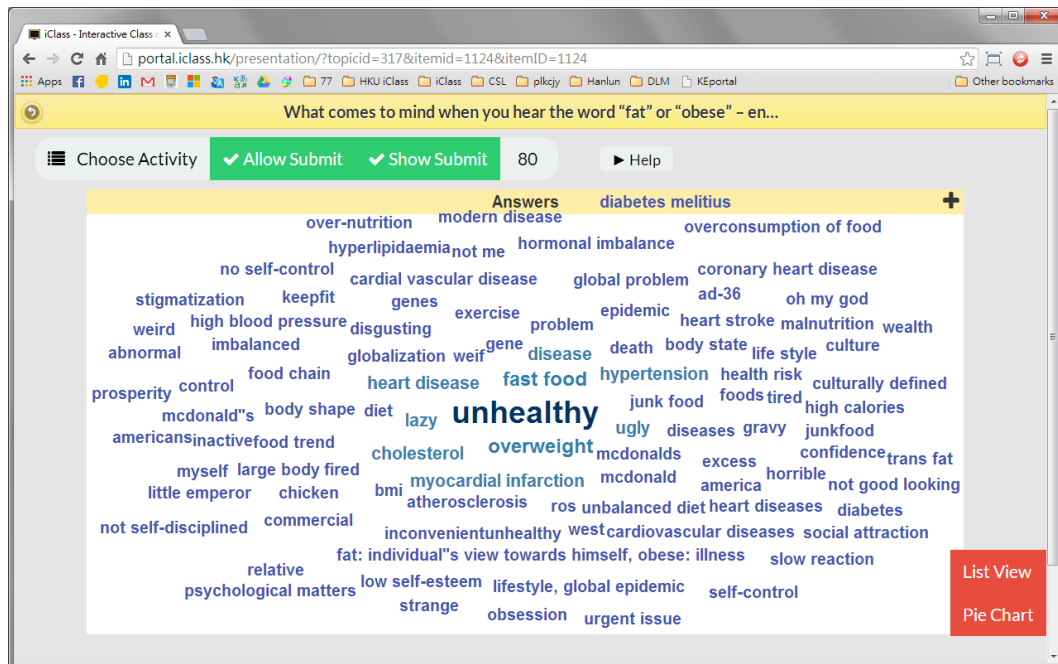
Other than knowledge-based questions, the MCQ feature of iClass was used to carry out surveys containing attitudinal-based questions that focus on students' beliefs and values. In one lesson, a survey was conducted to understand students' attitudes on bird flu before introducing to them the relevant knowledge.



#### b) Tag Cloud

Although iClass was not employed extensively to carry out in-class discussion in the course, it was sometimes used to collect general opinions on a topic before the lecturer delivered the content. In the example below, in teaching health related diseases, students were asked to put down what came to their mind when hearing the word “fat” or “obese”. Students then logged into their accounts, input the keywords and submitted them to the system. The words were immediately projected on the centralized screen with the size of the word directly proportional to its frequency. In this case, the word “unhealthy” was enlarged and highlighted in bold, meaning most students associated unhealthiness with obesity. Alternatively, the data could be presented quantitatively in a pie chart. This gave the lecturer a general idea of the students' perception,

and the teacher could then respond to their views or address any misconceptions during the lecture.



Meanwhile, iClass provided students an easy channel to participate in class. In a study, VanDeGrift et al. (2002) identified several factors inhibiting student-initiated interaction in large classes, such as student apprehension, comment verbalization, feedback lag and single-speaker paradigm. Students often feel intimidated when they are asked to articulate their ideas in front of a large class. As such, iClass, by minimizing the feeling of uneasiness, motivated students to participate by contributing ideas with their mobile devices.

### c) Voting

In some occasions, iClass functioned as a voting system in which students selected the winners of a group project using their mobile phones. This form of peer feedback promoted collaborative learning and encouraged students to not only appreciate but also learn from each other's works.

## Reference



- i. VanDeGrift, T., Wolfman, S. A., Yasuhara, K., & Anderson, R. J. (2002). *Promoting interaction in large classes with computer-mediated feedback system*. Seattle: University of Washington.

## 6.2. Case study: Faculty of Dentistry

Case:	Facilitate submission of assignment and in-class sharing
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Teacher:	Dr. James K.H. Tsoi
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Students:	Undergraduates
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Subject:	Dentistry - Practical Class
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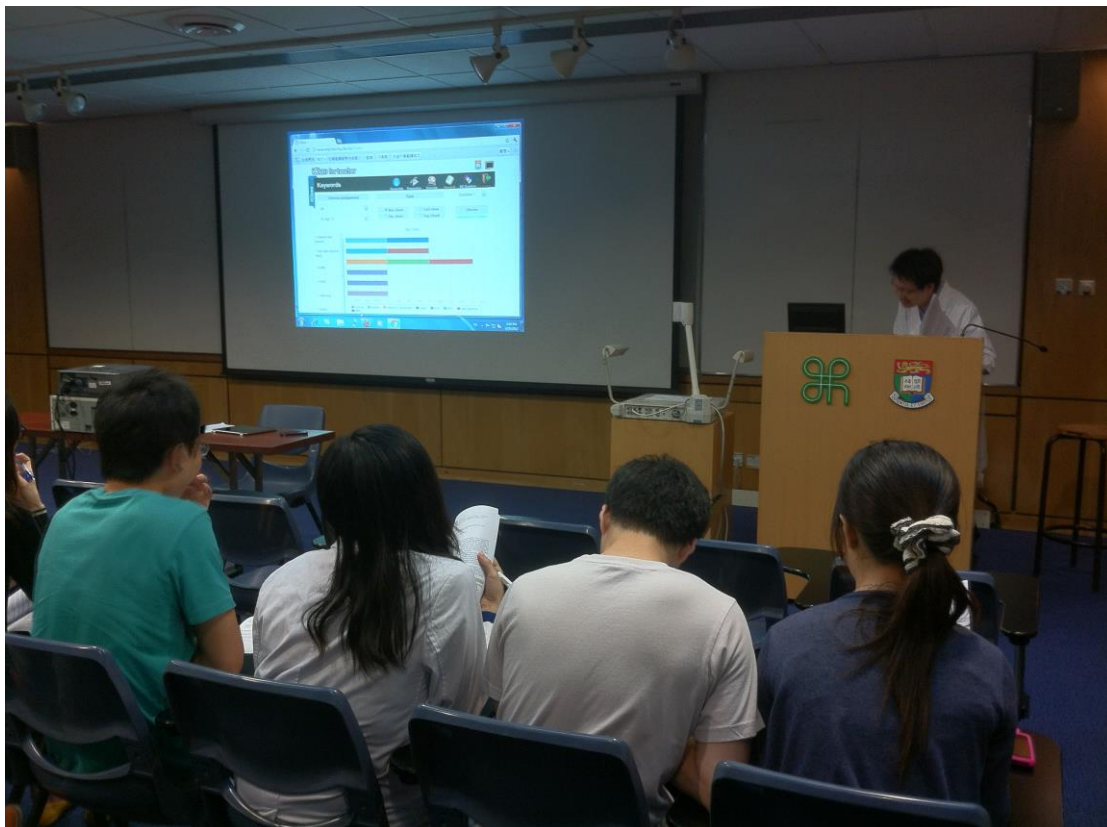
Last year, iClass was introduced in a taught postgraduate course to support Journal-based Learning, a learning mode adopted at MSc level that requires students to study prescribed journal articles and then discuss among themselves on particular topics. As observed by Dr. Tsoi, the use of iClass helped to facilitate interaction among students and between students and the facilitator. This year, iClass was used to teach a practical course at undergraduate level. It was used quite intensively in 7 practical classes, and around 1-1.5 hour was spent on the in-class activities conducted with iClass each time.



### The Use of Different Features

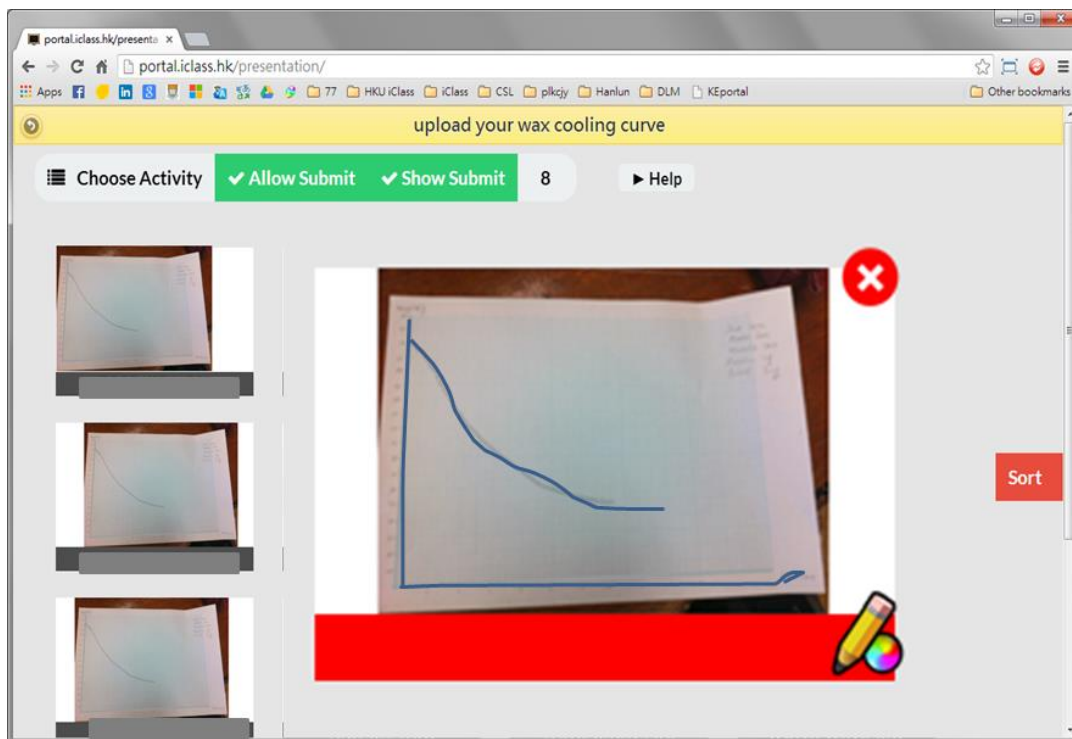
#### a) Drawings

iClass is a user-friendly and effective system for students to upload their classwork or other assignment, which will then be viewed and marked by teachers. As Dr. Tsoi explained, turning in digital copies of assignment was more convenient for both students and teachers, considering the paperwork and administration procedures required for hardcopy submission. With everything being just a click or tab away, students were more motivated to hand in their work right after class, which generated a higher submission rate of assignment. In this kind of course, assignment was not compulsory as long as the students attended the class, and this often resulted in a lower submission rate. As observed by Dr. Tsoi, with the submission function of iClass which enabled students to turn in their work immediately in or after class, students felt more encouraged to hand in the assignment to the teacher, and the attendance rate was also found to have improved.



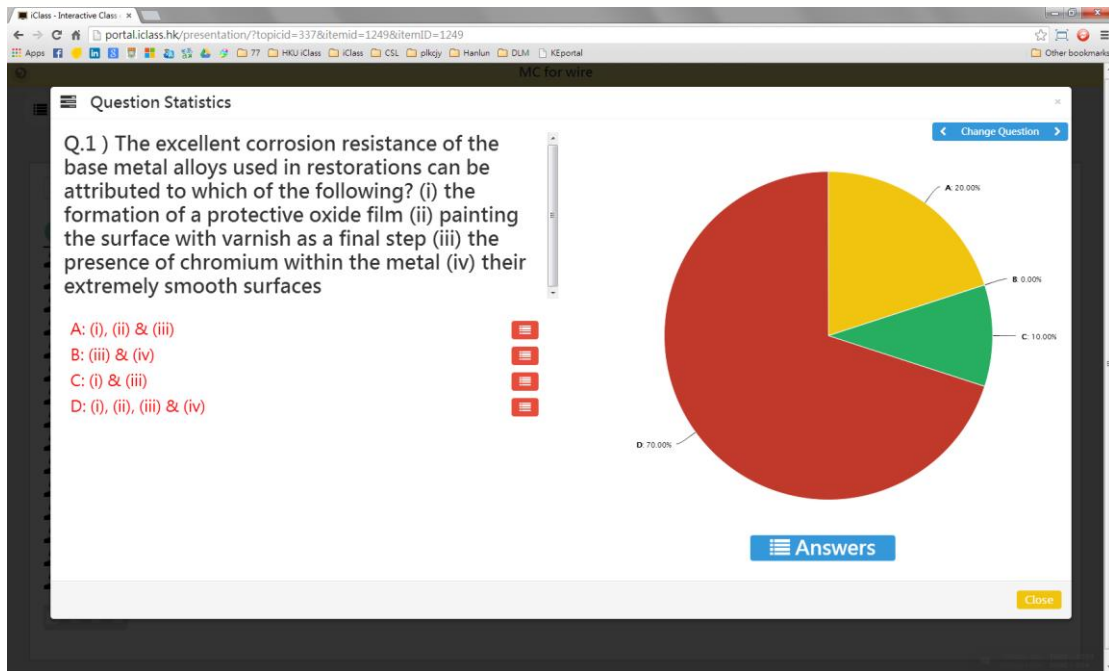
Besides the submission of assignment, iClass was used to facilitate in-class activities and teaching. For example, after conducting an

experiment, students were asked to use the “Drawings” function to sketch a wax cooling curve and upload their work to the system. The teacher then displayed the answers in class using a projector, allowing students to compare and contrast the different curves drawn. Such kind of exercise does not have any model answer and students might come up with different answers depending on the brand of wax they used. The various features of iClass support the follow-up activities of experiments by enabling students to share their work real-time with the class and the teacher to offer explanations based on students’ findings.



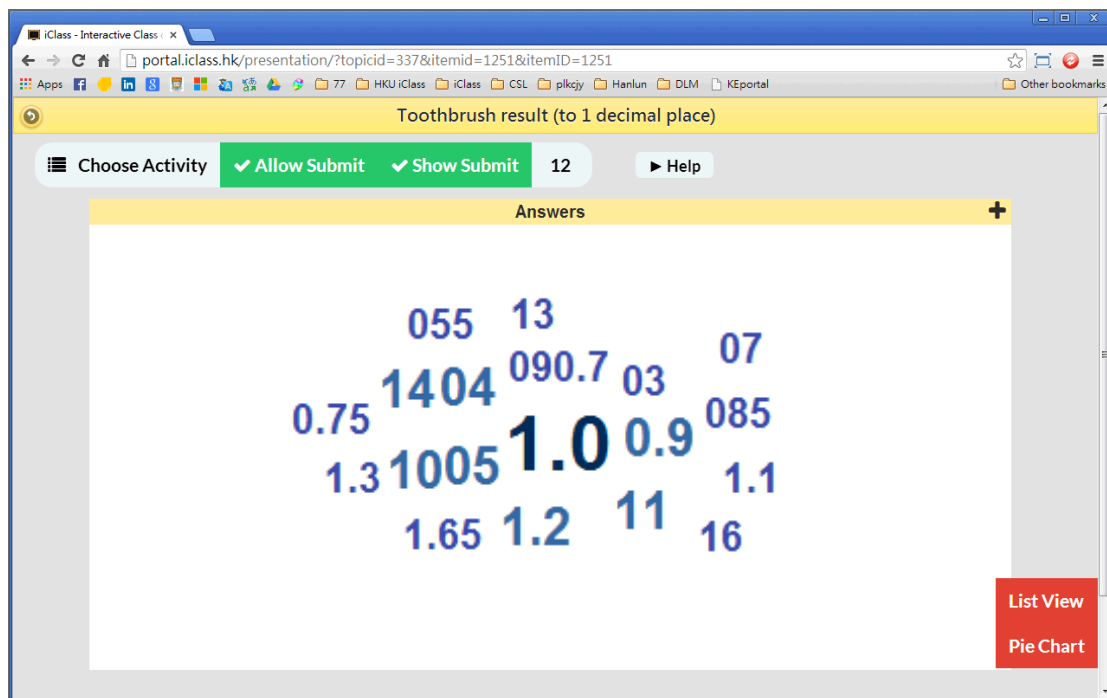
### b) Multiple Choice Questions

In addition to the Drawings function, the MCQ module was used to set questions that are optional for students to complete. The teacher would go through the answers with them later, followed by discussions arising from the exercise. The distribution of answers was shown in a pie chart, while the names of students who answered the questions could be displayed in a list view. Through completing the exercise, students could review and reinforce what they have learnt and the teacher could check students’ understanding of the concepts discussed in class.



### c) Tag Cloud

In another instance, the tag cloud function was used to display students' findings within the class. In the activity below, students were asked to use a formula to do some calculations about wax and wire and then submit their answers to the system. The numbers were immediately shown in a tag cloud format, with the enlarged "1.0" highlighted in bold, indicating that the majority of students had "1.0" as their answers. As Dr. Tsoi explained, there was not a single correct answer for this kind of exercise as long as the number fell within an acceptable range. By effectively displaying the statistical results in experiments or short exercise such as this, the tag cloud format presents the teacher with a clear picture of the majority of opinions in a class in an efficient way. He or she could then use the information generated as reference to address related concepts while teaching.



### 6.3. Case study: Centre of Journalism and Media Studies

Case: Conduct mid-term quiz

Teacher: Professor Ying Chan

Students: Undergraduates

Subject: Common Core Course - Media in the Age of Globalization

Apart from science-related subjects, the application of iClass extended to other fields including Journalism. Last year, iClass was used in a Common Core course titled “Media in the Age of Globalization”. It was offered to approximately 150 students from multiple disciplines across different years. In light of the large class size of common core courses, the system was employed to enhance the level of interaction among students and between the lecturer and students in a classroom setting.

### The Use of Different Features

#### a) Multiple Choice Question



Before the class, students were reminded to bring along with them mobile devices in order to complete a MCQ test that counted towards 5% of the final course grade. On the day of test, most students had with them the electronic devices such as iPads, smartphones or tablets. Out of the 150 students, only 7 were not able to access the system with their own devices, either because they failed to connect with the wireless network or that their gadgets ran out of battery. In the end, these students borrowed the spare devices prepared by the teachers in completing the test.

Prior to the test day, the teacher designed a MCQ test consisting of 10 questions and uploaded it to the system. During the assessment, students first logged into their own accounts and used 5 minutes to finish the test. As answers and comments were preloaded in the system, auto-



correction was performed the moment the students submitted their answers, saving tedious paper marking work. At the same time, the data generated was immediately analyzed and summarized in the forms of graph, chart or list, giving teachers an idea of the distribution of answers and overall performance of the class.

In general, iClass proved effective in administering a MCQ test in a large class, while students exhibited interest and enjoyed the fresh learning experience brought by iClass. Upon the completion of test, the teacher displayed the answer distribution on the projected screen, went through the question one by one and addressed students' common mistakes. The MCQ activity lasted for about 25 minutes, from the administrative procedures at the beginning to the discussion after the test. As observed, the tag cloud diagram seemed to be able to stimulate further thoughts among students.

b) Keyword

Another application of iClass was the use of the Keyword module in conducting class discussion. At the beginning, students were asked to use 2 keywords to describe the news media in China nowadays. After submission, their answers were displayed in tag cloud format, allowing the class to carry out



effective discussion based on the ideas generated. As shown below, the majority of students found the news media “biased”, and this keyword was enlarged and highlighted in bold. As observed, the learning atmosphere was positive and students’ response was generally active.



#### 6.4. Case study: Faculty of Engineering

Case:	Conduct In-class Exercise with MCQ Module
Teacher:	Professor K. W. Chow
Students:	Undergraduates (Year 1, Engineering majors)
Subject:	MATH1851 - Calculus and Ordinary Differential Equations

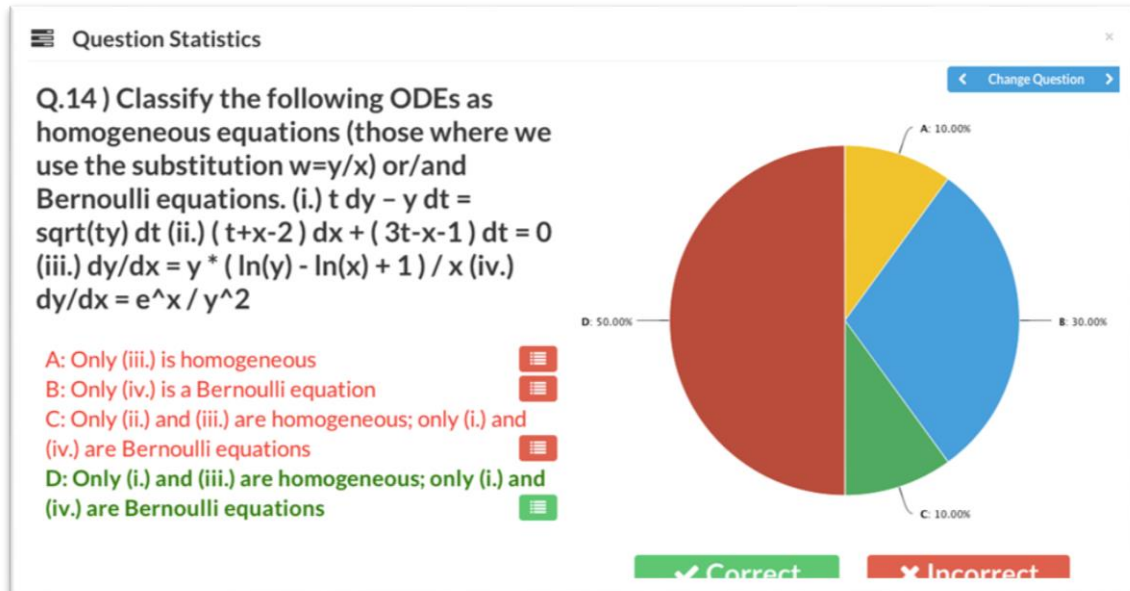
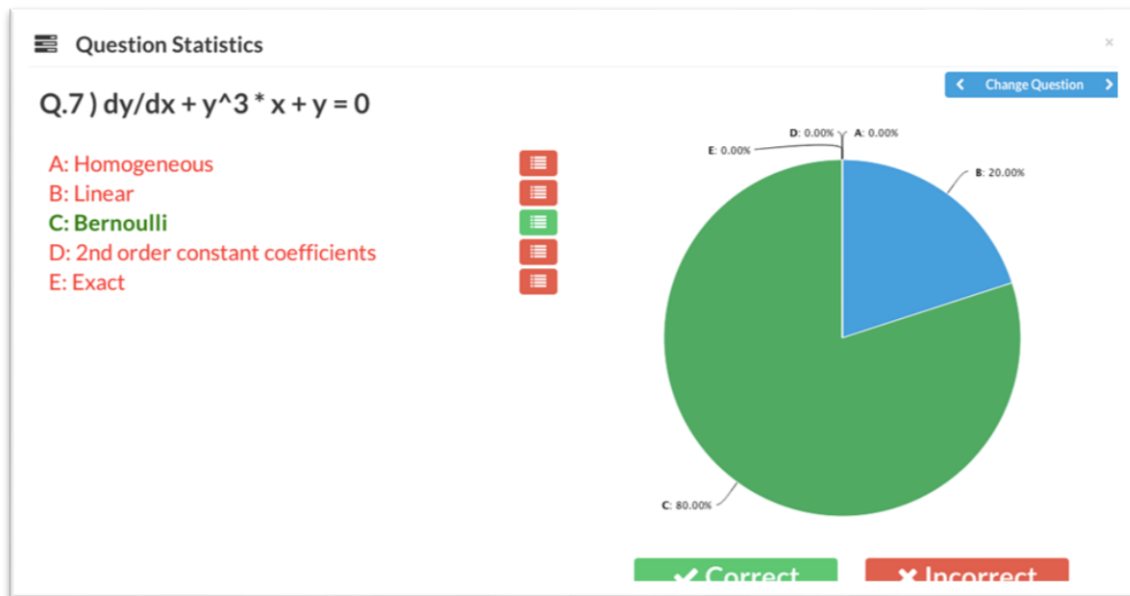
During Semester 1 2013-2014 (09/2013-12/2013), iClass was used for the first time in the engineering mathematics class MATH1851, a compulsory course for all first year Engineering students. The course was offered in both semesters, with about 280 students in the first semester and 200 in the second. In light of the disappointing failure rate last year, carefully planned actions are taken to enhance the teaching and learning environment, such as increasing the number of tutorial sessions and using information technology more actively in the classroom. In November 2013, iClass was employed in a pilot study in the course, during which the Multiple Choice Question module was used in administering in-class exercises.

The MCQ module was used for two sessions in the teaching of differential equations. Before the class, a message was posted on Moodle reminding students to bring their tablets or other devices for connection to the internet to the lectures. During the lesson, the first 25 minutes were allocated for normal teaching, followed by the in-class exercise that consisted of around 10-20 questions on conceptual knowledge. Students were given 10 minutes to complete 10 carefully designed questions, after which the lecturer went through the questions with them and offered explanations when necessary.

On the day of class, most students brought with them their electronic devices. The log-in process was smooth with no students reporting difficulty in accessing their accounts. Due to the large number of students enrolled, classes were conducted in two separate sessions (with about 140 students enrolled in each session). Typically for each session there were about 70-80 students attending the lectures, and the response rate to the in-class exercises was around 60% of those present.

One major benefit of iClass was the almost instant feedback provided to both the teacher and the students. Upon the completion of in-class exercise, the distribution of answers to each question could be displayed in the form of a pie chart, enabling the teacher to identify the common mistakes and problematic areas. In the interest of time, the teacher can

reduce the coverage on those aspects where students mostly get the correct answers, and instead concentrate on the weakest link in conceptual understanding.



Based on the available data gathered from the two in-class trial runs, a correlation study was carried out to study the effectiveness of iClass in enhancing the learning performance. From a preliminary analysis, it was found that those students who responded to the two iClass MCQ

exercises scored better in the quiz afterwards. Yet at the present stage, more data and case studies is still needed before a more definitive conclusion can be drawn. Nevertheless, the relevance and usage of iClass in improving the teaching and learning effectiveness have definitely been firmly established.

In the semester 1 of 2013-2014, iClass was mainly used to run two in-class exercises with the MCQ module. In the future, it is likely that the application of iClass would be extended, such as using the Drawings function to plot graphs. In addition to using the platform in the regular lectures of a big class, the idea of using iClass in small group settings such as tutorials will be examined. It is expected that iClass will play an important role in enhancing the efficiency of these activities too.

### **6.5. Case study: School of Biology**

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Case: Support pre-teaching activities

Teacher: Dr. Karen Yuen

Students: Undergraduates (Year 2)

Subject: Biological Science

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iClass took up a supportive role in the teaching of an introductory course on Biological Science that was taken by second year students. The system was mainly used to facilitate pre-teaching activities which students can participate in at their times of convenience.

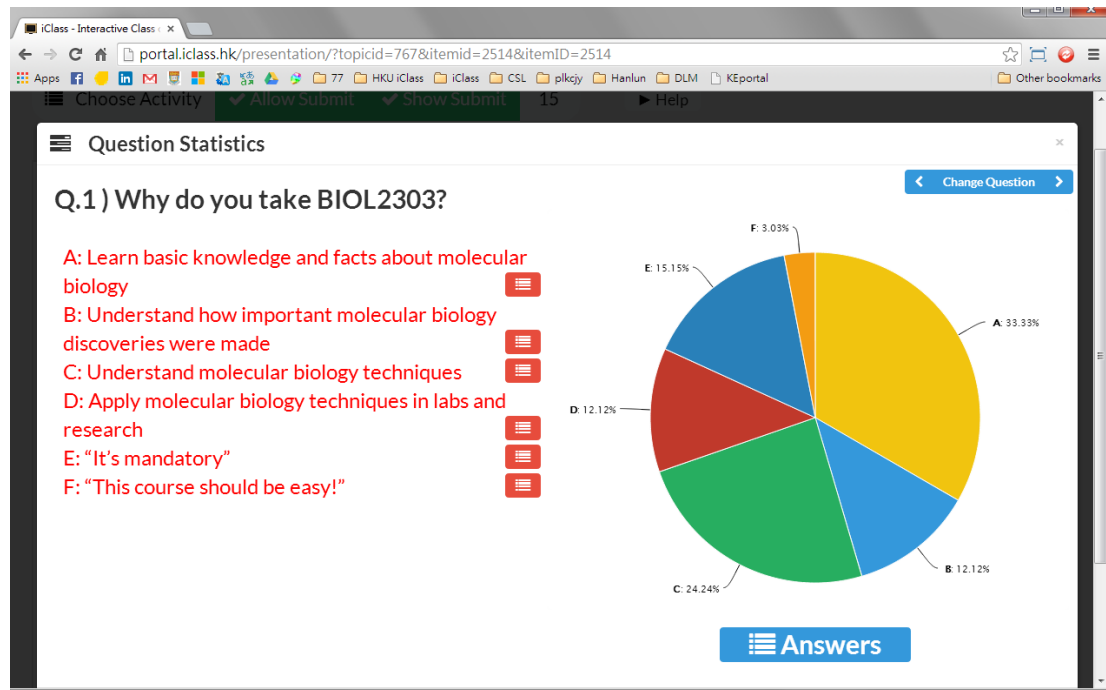
### **The Use of Different Features**

#### **a) Multiple Choice Questions**

The multiple choice question function was used most often in conducting pre-teaching activities. As Dr. Yuen described, she would post a few MC questions based on the lecture content to iClass before the lesson. The URL link to the questions was posted on Moodle (which contains other



course materials such as lecture handouts), and students could try out the questions on a voluntary basis. The purpose was to stimulate students' learning interests prior to the delivery of lecture, while the answers to the questions would be covered in class.

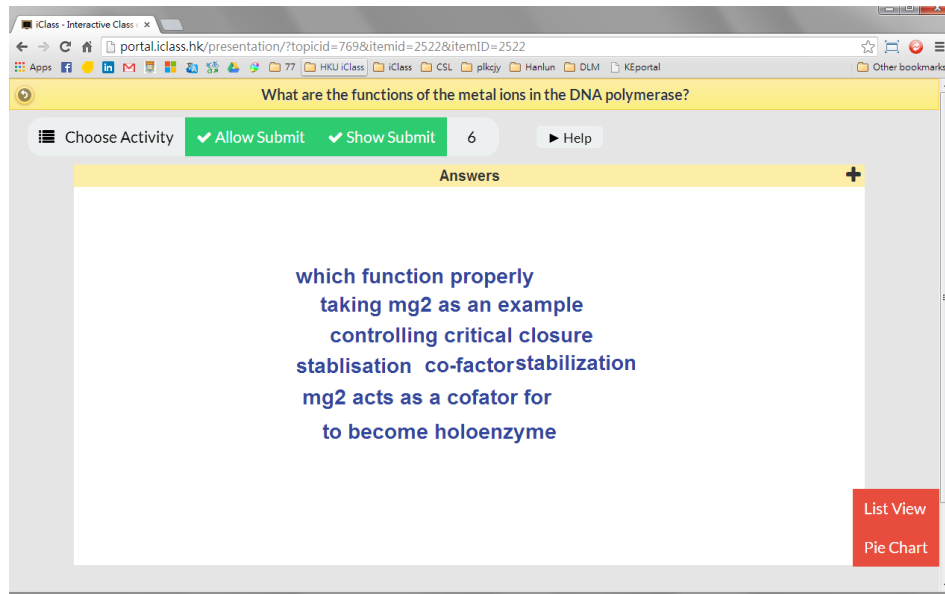


During the lecture, Dr. Yuen would sometimes refer to the points or questions highlighted in the MC question and address the related concepts or common mistakes. In a few instances, the MCQ feature was used to carry out survey among students, such as asking them why they enroll in the course. As the pre-teaching activities was optional for students and did not count towards the course grade, the completion rate was not particularly high. Nonetheless, it was observed that those who took the initiative to do the exercises were generally the active learners who would respond to questions in class.

#### b) Tag Cloud

Besides the MCQ function, Dr. Yuen also used the Tag Cloud feature for other pre-teaching activities. She once posted a question on iClass asking students to brainstorm the functions of metal ions in the DNA polymerase. The primary purpose was to get a picture of students' background

knowledge before teaching the content directly. Moreover, such brainstorming activity encouraged students to conduct some pre-reading to look up for what they do not know prior to the lecture.



Following the local curriculum reform, the class size of many university courses, especially the common core course and introductory courses, was greatly expanded to accommodate the increased student intake. As Dr. Yuen suggested, in the past when class size was relatively small with 30 to 40 students, teachers could still manage in-class activities conveniently, while students also felt more comfortable answering questions in class. However, in a big class with 200 students, in-class activities proved more difficult to be carried out. Students were generally responsive when the teacher asked for a show of hands, but only the active few would actually answer questions raised by the lecturer. Faced with so many students at the same time, it was challenging to maintain direct interaction with each student, collect their opinions or know if they have understood the concepts. The interactive features of iClass, such as the Keyword function, thus comes in timely as a tool to support in-class activities by enabling the teacher to obtain an overview of students' ideas and respond to them.

## 6.6. Case study: Master of Science Electrical and Electronic Engineering

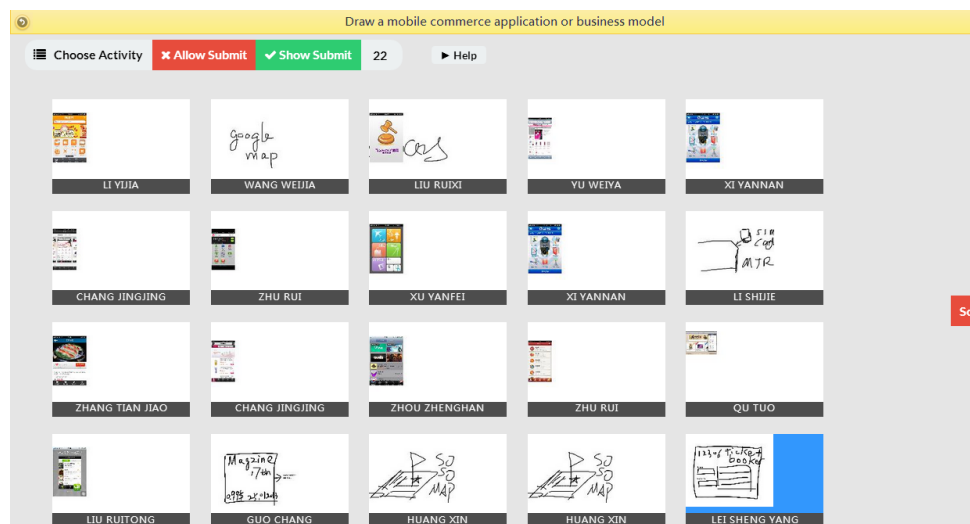
Case: Share ideas and innovations

Teacher: Dr. Wilton Fok

Students: Master degree students

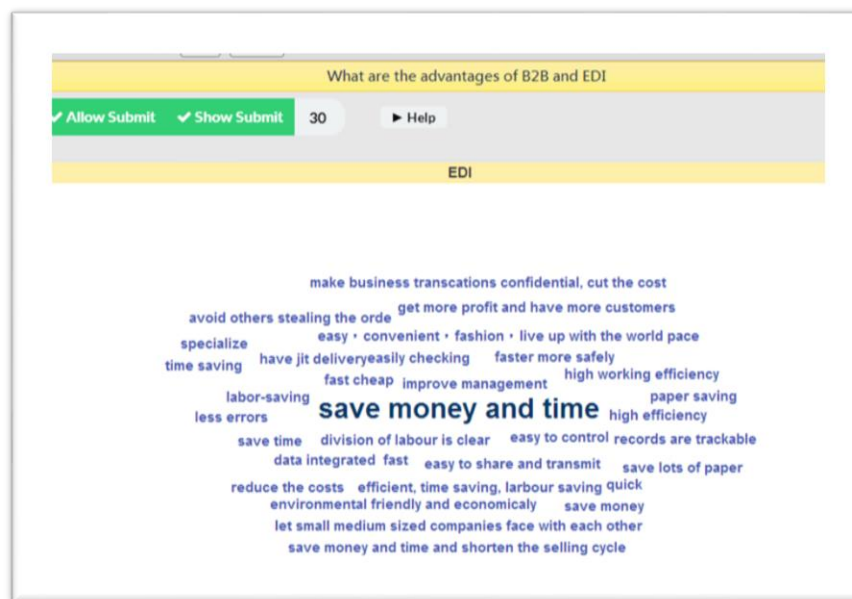
Subject: ELEC6098 E-Commerce and mobile commerce

While iClass supports the teaching of subjects that require more factual knowledge such as Economics, it can also be used for innovative activities that do not presuppose a specific correct answer. In one of the classes of the course ELEC6098 E-Commerce and mobile commerce, students were asked to draw an application or business model of mobile commerce. Some students directly drew on their devices with the drawing function, while some creatively captured and shared the screen of a mobile application using the e-sticker function. This show-and-tell practice encouraged the sharing of ideas among students and fostered an interactive classroom atmosphere.



Other than the drawings and e-sticker features, idea sharing can also be done via the keyword module. In the example below, Dr. Fok asked his students to brainstorm the advantages of a business-to-business model. The results were displayed in tag cloud view, with the central idea

highlighted and enlarged. As shown, the most frequently appeared keywords were “save money and time”, indicating that the majority of students believed time and cost and efficiency was a merit of B2B model. By identifying the core idea, the system enabled the teacher to narrow down the scope of discussion and focus on a main idea. As Dr. Fok elaborated, iClass enabled him to easily locate a focal point for discussion, which was especially helpful in a big class consisting of students with diversified opinions.



## 6.7. Case study: Master of Science – Energy Engineering

Case: Conduct Multi-dimensional discussion

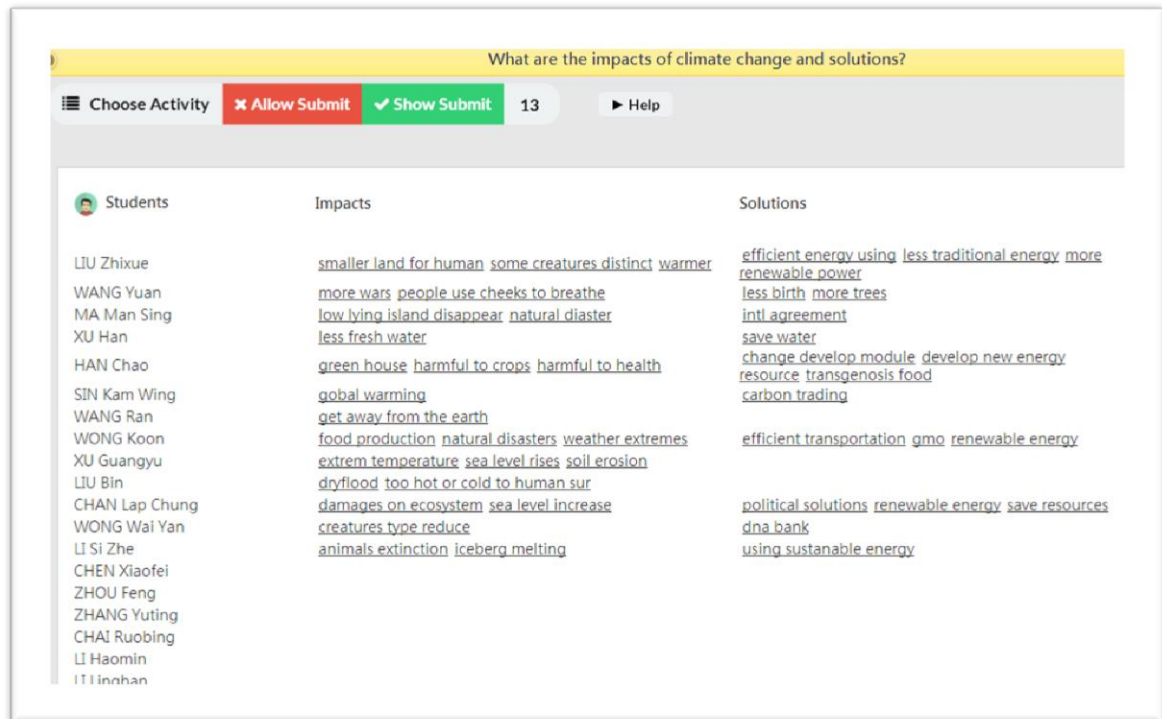
Teacher: Dr. Wilton Fok

Students: Master degree students

Subject: ELEC7047 sustainability and climate change

In addition to one-way discussion like the example above, iClass supported multidimensional discussions by encouraging students to discuss different aspects of an issue. In the course ELEC7047 sustainability and climate change, students were asked to brainstorm the impacts of climate change and the possible solutions. After Dr. Fok

posted the discussion question on the system, students logged into their accounts and input their ideas by typing keywords under the “impacts” and “solutions” column respectively.



While a tag cloud view showed the pool of ideas collected, the list view sorted the ideas according to its contributor, pairing the impact and solution suggested by each student. This highlighted the causal relationship between ideas and helped students link up relevant concepts. More importantly, such collection of students' opinions supported student-centered learning, allowing Dr. Fok to draw on their ideas as the lesson proceeded. With a picture in mind of what students found most important, Dr. Fok could adjust his teaching and direct more time and focus on those specific ideas to make the lecture content more relevant to students. Moreover, all the discussion content was digitalized and shared to all students with the peer review function. This encouraged collaborative learning and knowledge discovery among students in today's classroom, which no longer featured passive, top-down transmission of knowledge from teachers to students but independent, student-directed learning.





### 6.8. Case Study: Faculty of Engineering

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Case: Conduct concept test and mid-term quiz

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Teacher: Dr. Wilton Fok

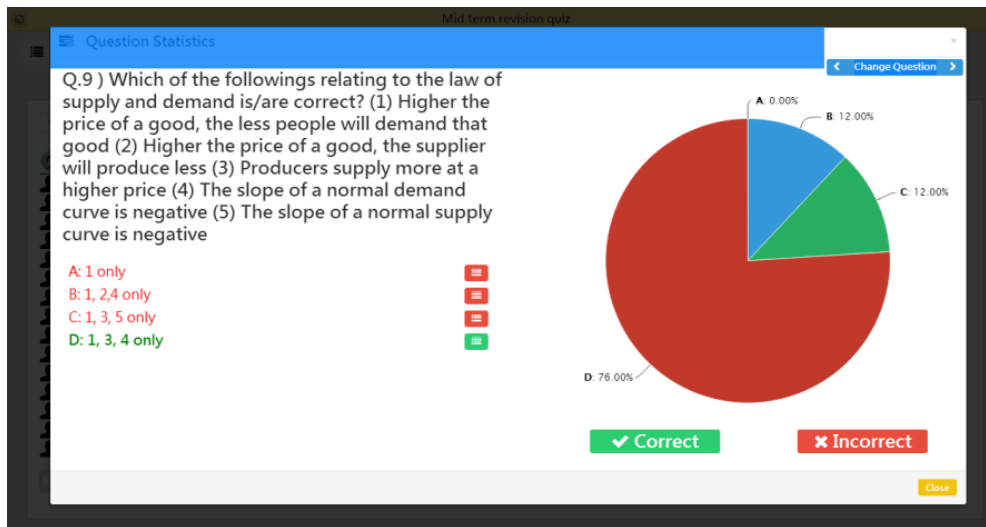
Students: Undergraduates (Year 3)

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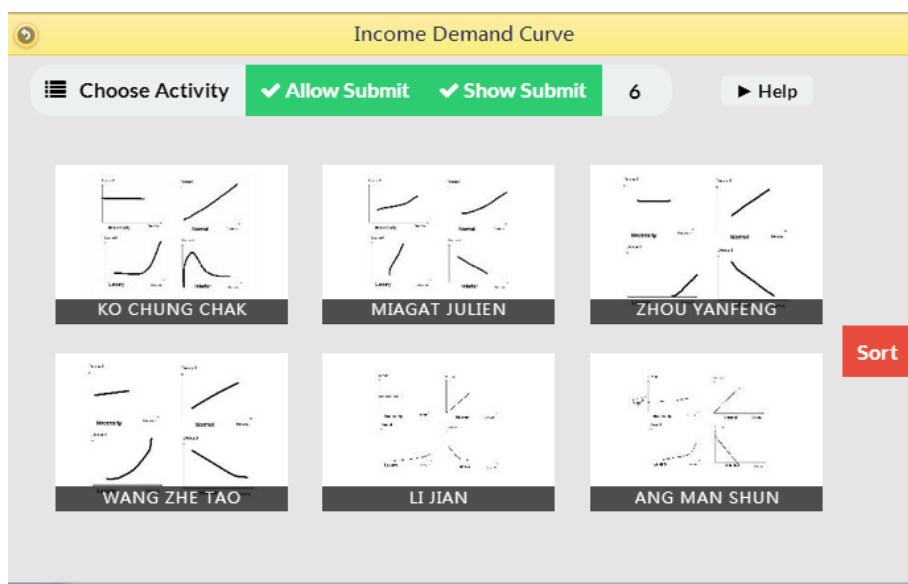
Subject: ELEC2815 Finance, Economics and Marketing for Engineers

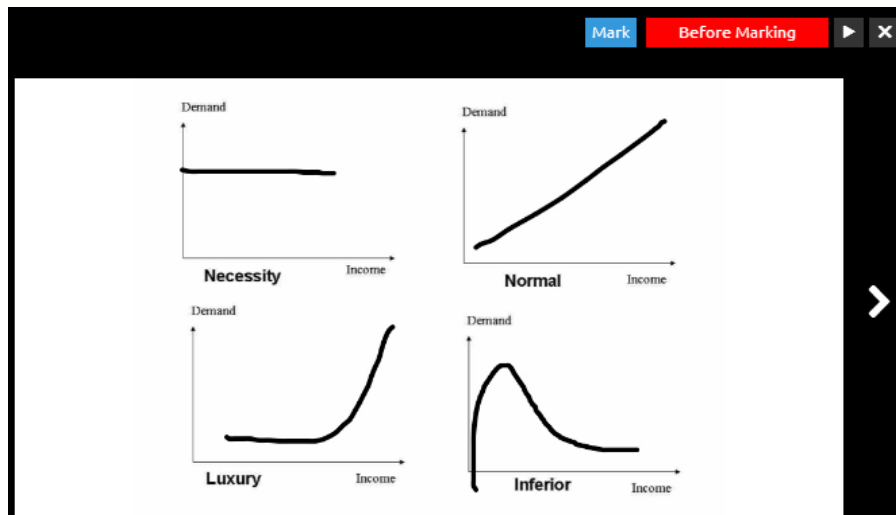
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In this course, the quiz module was used to conduct the mid-term test set in the format of multiple choice questions. After students completed the test, the distribution of answers for each question was displayed in a pie chart view, showing whether the majority of students opted for the correct answer. As illustrated in the example below, the common mistakes were option B and C, which received a similar percentage. Based on the pie chart, Dr. Fok could easily identify students' misconceptions and further explain why statement 5 was incorrect while statement 4 was correct. In addition to rectifying misunderstanding, the list view of the system sorted the scores of students in descending order so that he could reward the high performers to encourage them to keep up with the good effort.



Apart from the mid-term quiz, Dr. Fok used iClass to carry out a concept test with students before the delivery of lecture. Before teaching the relevant concepts, students were first given a few blank graphs, on which they were asked to draw curves indicating the income elasticity of demand for different types of goods. Drawing from their background knowledge and common sense, students drew the curves by judging how a change in income level would affect the demand of different goods. After the students submitted their answers, Dr. Fok could view the curves easily and know if they have any big misconceptions on the topic.





Through the system, he also identified interesting and unconventional ideas within the class and invited those students to elaborate their answers. In the example below, he asked a student to share his thought with the class and explain why he drew a special shape curve for inferior goods. Dr. Fok then followed up on his idea to stimulate more inspiring discussion. With the support of iClass, the teacher could elicit responses from all students more effectively, which is often difficult to do in the past with a whiteboard and pen. As Dr. Fok explained, this exercise was done once each year and students' creative and valid ideas never failed to surprise and impress him. Such kind of exercise is particularly crucial in higher education which emphasizes the importance of cultivating students' critical thinking skills.

# **Chapter 7**

## **Case studies:**

### **Schools in Hong Kong**



## 7. Case study: Schools in Hong Kong

### 7.1. Kwun Tong Government Primary School (Sau Ming Road)

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Case: Provide immediate feedback and identify students' mistakes

Teacher: Mr. Lau Ka Yiu

School: Kwun Tong Government Primary School (Sau Ming Road)

Students: Primary 4

Subject: Mathematics (Shapes & Areas)

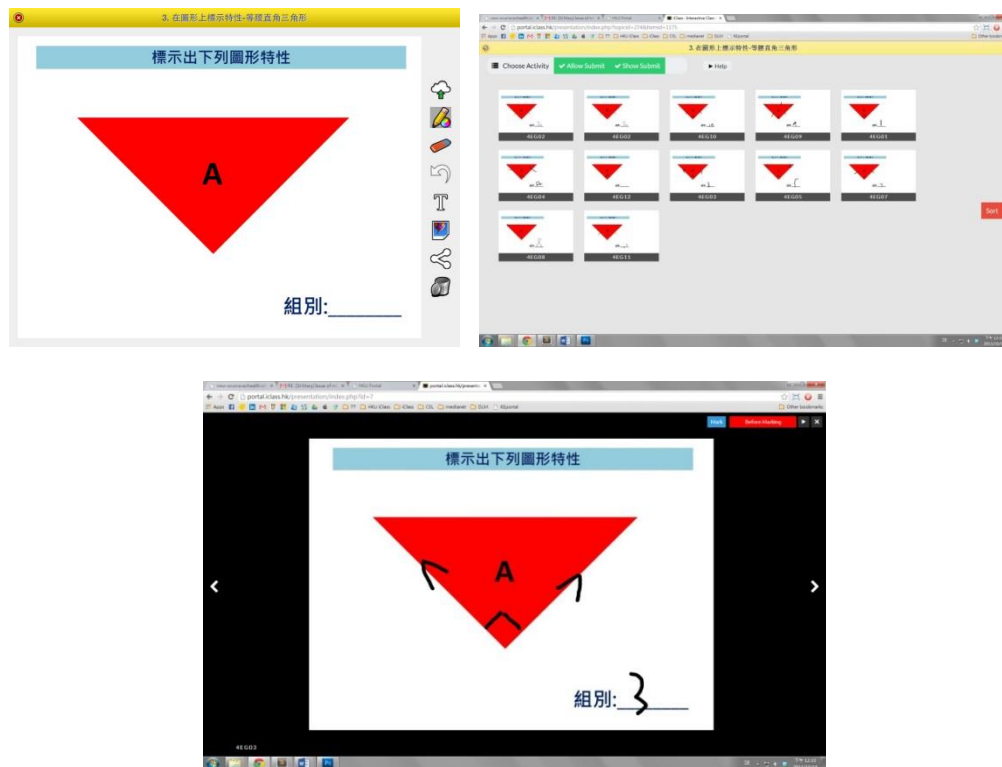
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iClass is not something new to both the teachers and students in Kwun Tong Government Primary School, for they have been an iClass user for several years already. In the past, iClass was used as a tool to facilitate Chinese Language learning and its interactive features have proved effective in arousing the learning interests of students who expressed enthusiasm with this new mode of learning. Last year, Mr. Lau extended the use of iClass and applied it to a Primary 4 Mathematics class that consisted of 27 students with 2 people sharing an iPad. As with previous cases, the results were equally encouraging.

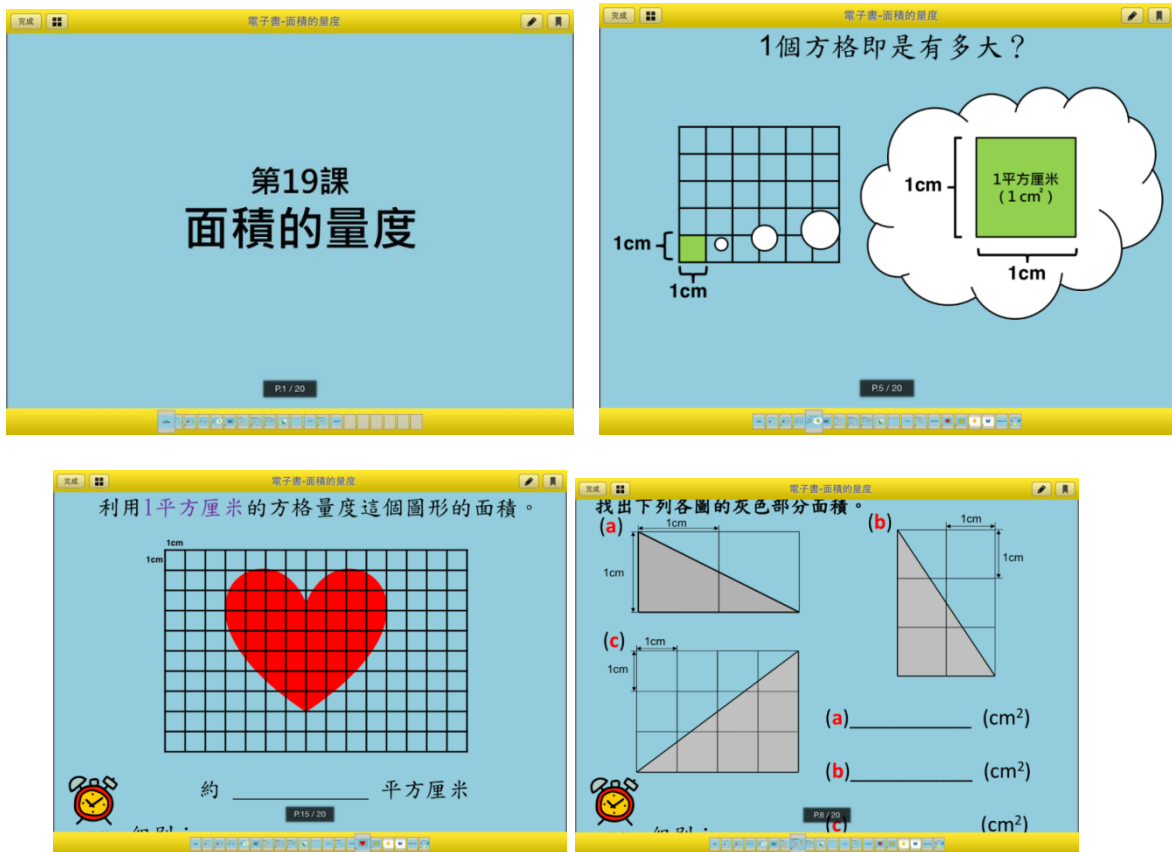


### 7.1.1. Example 1 – Fitting and Dissecting Shapes



Mr. Lau mainly used iClass for the unit on shapes and areas. In the Primary 4 Mathematics curriculum, one core session is to teach students how to fit and dissect various kinds of shapes. During class, students were told to launch an app on Tangram, which they used to learn how to form different shapes by fitting the seven 2D shapes. After arranging the pieces and forming the shape as required by the teacher, the students captured the screen shot and submitted their finished work to Mr. Lau through the iClass system. Once they clicked the submit button, Mr. Lau immediately received the students' answers and got a clear picture of their progress. With the real-time submission function, iClass enabled Mr. Lau to easily identify the slower learners in class who might have a hard time catching up or understanding the concepts. He could then call upon the groups that had difficulty fitting and dissecting the right shapes and provided further assistance.

### 7.1.2. Example 2 – Measuring Areas



Other than using iClass to teach the chapter on shapes, Mr. Lau also found the system particularly useful in teaching how to measure the areas of different shapes. Before the class, Mr. Lau prepared various shapes in a computer file and uploaded it onto iClass. He also prepared some squared paper for students to measure the area of the shapes. During class, students first downloaded the shapes from the system and counted the number of units to measure the areas. Once they finished counting, they submitted the answers to the system.

### 7.1.3. Teaching and Learning Effectiveness

#### a) Provide immediate feedback

To Mr. Lau, one of the major strengths of iClass was that it enabled teachers to provide timely feedback to students during class. In the past, when students learnt the session on area measurement, they counted the units on worksheets and textbooks. Faced with a big class with many students to attend to, the teacher had difficulty ensuring that all the

students had grasped the main concepts, or knowing how well they understood the materials. As the teacher could only check the final answer on the worksheet, he could not know if the students had really mastered the skill on measuring areas. On the other hand, with the support of iClass, Mr. Lau could check students' answers simultaneously, track their learning progress closely and identified mistakes immediately. For instance, sometimes students had difficulty fitting or dissecting certain shapes but they did not understand what went wrong during the process. As Mr. Lau explained, after students submitted the answers, he would invite them to go out in front of the class and report their progress. In particular, he would ask those who got the wrong answers to come to him and try to understand their difficulties. With iClass, Mr. Lau could identify precisely where the students got stuck at, resolve their doubts and explain further so that they get a solid understanding of the concepts before the end of class.

#### b) Increase engagement and interaction

In addition to enhancing learning effectiveness, iClass also fostered a more engaging and interactive learning environment in the classroom. As Mr. Lau observed, students demonstrated greater enthusiasm and enjoyment in learning with the system. Throughout the lesson, they participated actively and displayed a higher degree of concentration. Instead of being easily distracted, every student was focused on the task in hand and was fully engaged with the learning materials. This helped create a better classroom atmosphere which not only helped Mr. Lau deliver his lesson more smoothly but his students to learn more effectively.

## 7.2. Po Leung Kuk Chee Jing Yin Primary School

Case: Support student-centered learning and follow-up actions

Teacher: Mr. Li Chi Shing

School: Po Leung Kuk Chee Jing Yin Primary School

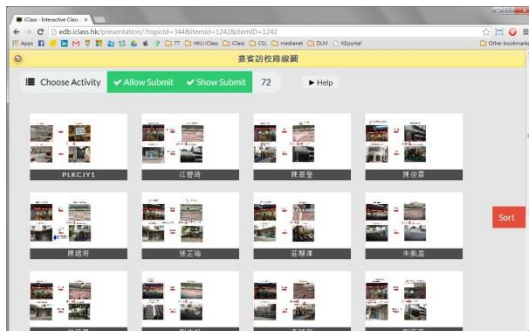
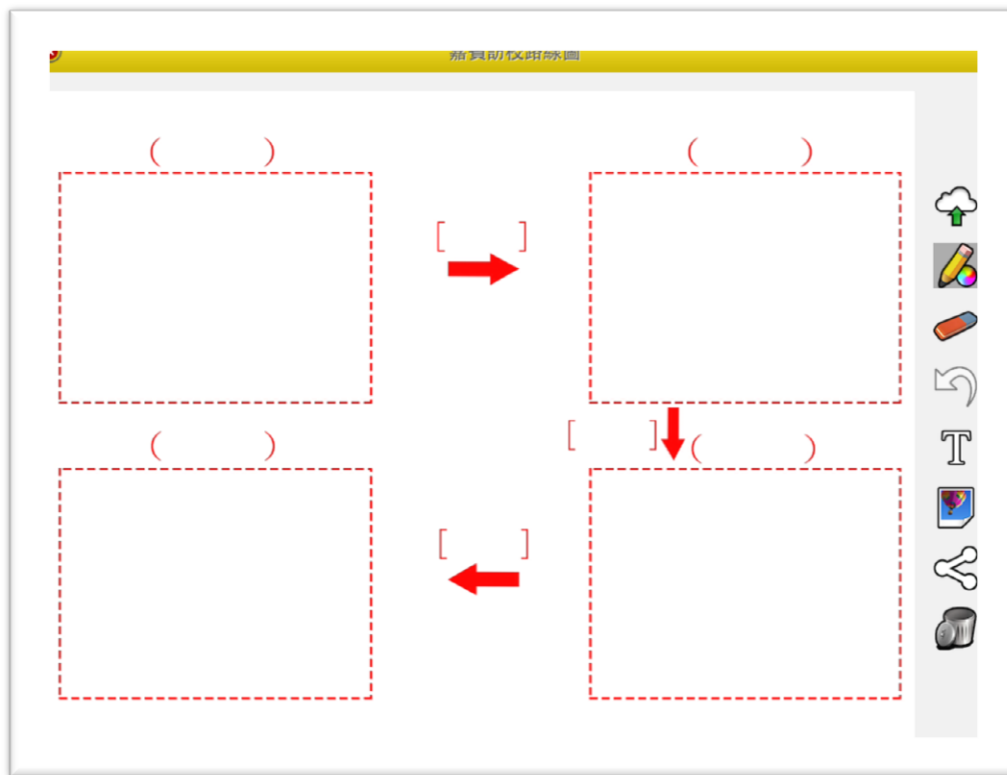
Students: Primary 5

Subject: Mathematics and English

Instead of being a stand-alone system that operates outside the school curriculum, iClass, as Mr. Li explains, is a tool and platform that can be integrated into different subjects for teaching and learning activities. In the school, iClass has been used for core subjects such as Chinese, English and Mathematics, and is more commonly used in the latter two which the school places special emphasis on. When iClass was first introduced in the school, it was used in senior classes as the school wanted to know if the students could manage to operate the system. During the trial period, students demonstrated no difficulty using iClass, which was then later extended to junior classes to support teaching and learning.



### 7.2.1. Example 1 – Space and Directions in Mathematics





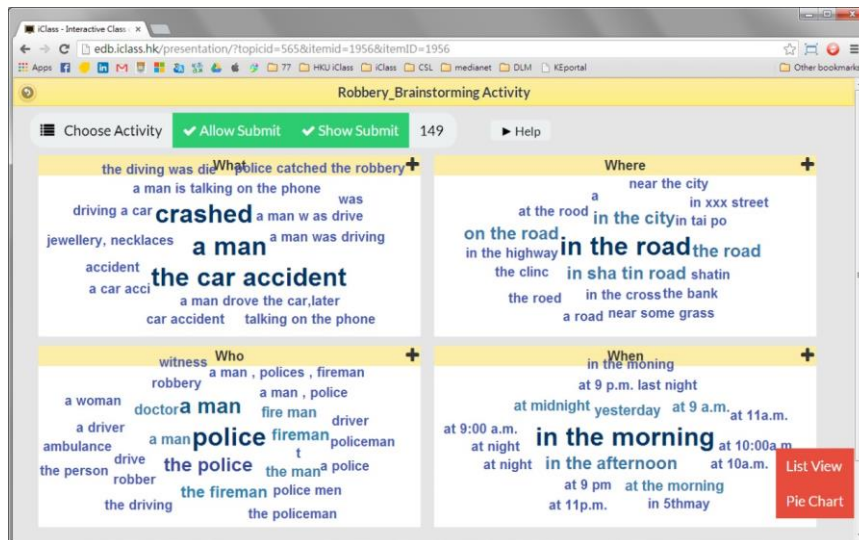
iClass was used in two Primary 5 Mathematics classes, with each pair of student sharing one iPad. In teaching the unit on space and directions, Mr. Li found the drawing function particularly helpful. In the past when students learn about directions, they learned the concepts on paper without having the chance to apply it in real life situations. With the support of iClass, Mr. Li could conduct interactive class activities more effectively. One example he cited was a project on drawing route maps for guests' reference. He first provided general guidelines to students, who then went to the real locations, took photos of the landmarks and marked compass points. Afterwards, they used the drawing functions of iClass, together with other apps such as the compass to combine all their photos, handwritten materials and data to complete the project.

### 7.2.2. Example 2 – Writing Activities in English

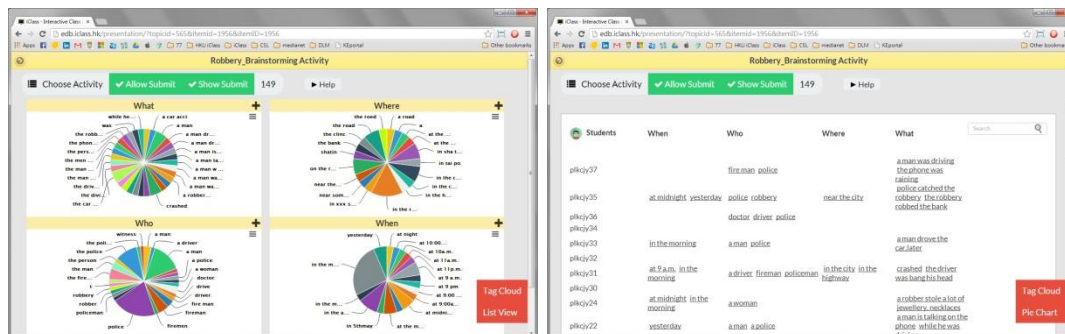
Of the four core aspects in English Language learning, namely reading, writing, listening and speaking, writing is the part in which iClass comes in as particularly helpful as a sharing platform. During writing lessons, teachers would set questions and post them onto the system.

The screenshot shows the iClass interface for a question titled "Robbery\_5A". The question is displayed at the top. Below it, there are four input fields arranged in a 2x2 grid, each with a label and a timer. The labels are "When", "Who", "Where", and "What". Each field has a text input area with a placeholder "每次輸入一個答案" (Enter one answer each time) and a "30" timer. To the right of the input fields, there are icons for a cloud, a trash can, and a speaker. The input fields are yellow with blue horizontal lines.

*Students are required to generate ideas with the “When”, “Who”, “Where” and “What”*



Tag cloud

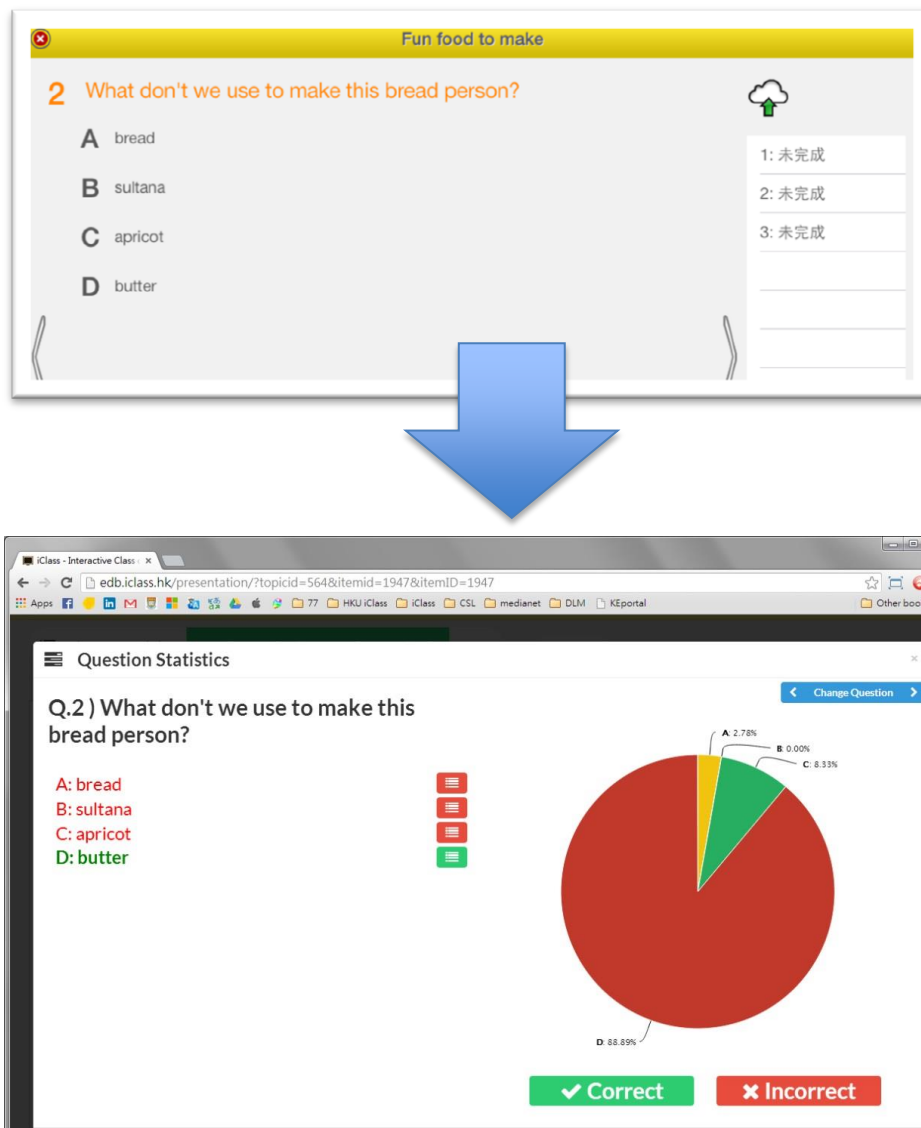


Pie chart

List view

*Pie chart, tag cloud and list view are good statistical tools for teacher to collect the center ideas in the class*

Upon completing the tasks, students could do real-time sharing and peer review to look at the works of fellow classmates. Having all students' works recorded and digitalized, teachers could conduct follow-up actions based on the data provided and retrieve it at anytime in the future. When used it tandem with other supporting softwares, iClass was integrated into the daily English classes and enabled students to share, write and answer questions immediately.



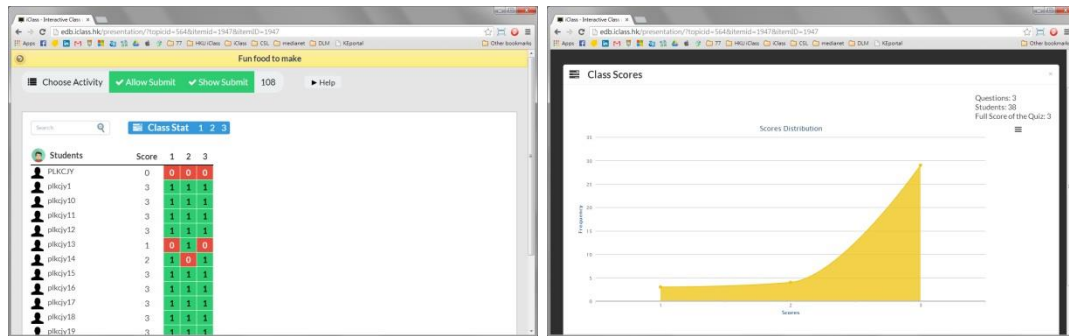
### 7.2.3. Teaching and Learning Effectiveness

#### a) Enhance efficiency for class preparation

In preparing a Mathematics class such as the one mentioned above, teachers always have to draft the content and run pretests for activities before the lesson. To Mr. Li, one of the merits of iClass was that it digitalized the teaching materials, allowing teachers to edit the content conveniently on screen. In the past when they prepared questions for class activities, the information on the documents might no longer be relevant or accurate by the time they conducted the lesson. However with iClass, the teacher could edit the materials immediately with a few clicks and tabs.

b) Increase learning interests and efficiency

With the introduction of iClass in the classroom, the teaching mode has changed from the traditional teacher-centered one to the now student-oriented one. As Mr. Li observed, this shift in focus has increased the level of involvement and engagement of students. In the school, the system was not only implemented in the classes with stronger students. It was also used by the slower and less capable learners, hoping that the technological support would boost their learning efficiency. The students' response was very positive and the learner-centered mode has brought about stronger learning interests. For instance, students could grasp abstract concepts better with a more concrete sense of space and direction. With their active participation and contribution, students also had a more lasting impression of the things learnt in class.



c) Support follow-up activities

As Mr. Li identified, one of the major strengths of iClass was its support for follow-up activities by digitalizing the data simultaneously when class activities were carried out. The instant collection of data was useful for both teachers and students. On the one hand, Mr. Li could post all the findings of the groups in front of the class after the activities. He could then follow-up and double check students' progress to see if they have missed any steps. On the other hand, with all their works recorded and displayed, students could conduct self-evaluation and peer reviews. This form of collaborative learning, which encourages students to learn not only from their own mistakes but also their classmates', makes learning a much more interactive and enjoyable experience.



# Chapter 8

## Case studies in China





## 8. Case Studies in Mainland China

### 8.1. Case 1: Yingxiu Secondary School

Student users in Yingxiu Secondary School represented quite a broad spectrum, ranging from junior secondary one to senior secondary two. The whole class was roughly divided into five groups, with each group of six students sharing an iPad.

The main use of iClass was its Drawings function. Teachers posted questions on the system and students presented their ideas in drawings or simple vocabularies by using the drawing board. Afterwards, students pressed the "send" button and submitted their answers to the central Cloud, which were then displayed and shared in front of the whole class. After collecting all submissions, the teacher asked students to explain their answers and how they came to the conclusion. The teacher could then understand the brainstorming process of the students and rectify any misconceptions when necessary. For instance, for one of the questions, most groups wrote a Chinese character wrongly. With the use of the classroom screen, the teacher could easily identify which groups got the wrong answers and corrected their mistakes on spot.



Despite the broad age range within the class, the classroom atmosphere was extremely good. One of the reasons was that students displayed enthusiasm after knowing that their answers would be displayed on the

classroom screen and shared among the entire class. Students showed positive responses and demonstrated they have put in thorough thoughts when answering the teacher's questions.

Other than that, as students had to share iPads in a group, they had more chances to communicate with one another and exchange ideas. There were heated discussions within groups from time to time, fostering the interactive atmosphere in the class.

As students were instructed to submit answers as accurate and quick as possible, the class was very attentive and remained focused while the teacher delivered and explained the question. Moreover, students exhibited great motivation in learning, probably due to the positive competition among students during various class activities.



The use of iClass as a supportive tool increased the level of classroom interaction and teaching effectiveness. Allowing teacher and students to view all the contributions from the class on a central screen, the system synchronized classroom activities and enabled immediate feedback during class time.

## 8.2. Case 2: Deyang Yuanjia School

In the school, iClass was applied in a Primary Five class consisting of 36 students. Although the majority of students were first time users of iClass, they could easily master its operation after a brief introduction. In the class, students were divided into groups of six. After the teacher posted the questions, the students responded by drawing or writing on the drawing board, and their submissions were displayed before the whole class on the central screen. Each group was then asked to explain their ideas and discussion process to fellow classmates.

As the teacher observed, there were always some quiet and reserved students in class who did not feel comfortable expressing themselves verbally, and teachers often had a difficult time knowing whether these students have grasped the concepts taught in class or understanding their thoughts on a particular topic. iClass, with its multiple in-built functions, encouraged students to express themselves in whatever ways they felt easy with, which in turn enabled teachers to get a clearer picture of students' learning progress. This is especially useful to the quieter or slower learners as the system helped them stay engaged in class by increasing their level of participation.





### 8.3. Case 3: Zhengdong Street Kindergarten

As the students aged six or under, they mainly used the Drawings function which was the easiest to handle. The class was divided into 5 groups, each consisting of 8 to 10 students. The teacher first gave simple instructions on what the students were expected to draw. After finishing their works, students pressed the Cloud button to submit their works to the system. This kind of exercise was designed mainly to cultivate the kids' ability to stay concentrated in class and follow the teacher's instructions closely.

One of the major advantages of using iClass in kindergarten classes is that it helps to increase students' concentration level. Very often, kindergarten kids get distracted by their surroundings and demanded the teacher's attention, which could disrupt the lesson flow and affect the learning efficiency of other students within the class. Using iPad as the main teaching and learning tool, iClass has proved effective in avoiding such situations by keeping students focused on either the iPad screen or the teacher's screen. With the visually stimulating graphics, students paid more attention in class and would not lose their patience or temper easily.



At the same time, the classroom atmosphere was very positive as kindergarten kids always liked to perform and demonstrate their skills in front of other classmates. Having their drawings displayed on the teacher's screen, they were motivated to participate in the classroom activities as they felt their works were recognized and appreciated.

#### **8.4. Case 4: Hangzhou No.14 Secondary School, Hangzhou, Zhejiang**

iClass was new for the teachers and students at Hangzhou #14 Secondary School when they started using it at the beginning of the 2013-2014 school year. Thomas Merchant teaches Pre-Calculus and Calculus at #14, and has been actively exploring the potential of iClass to support his instruction. During the past few months, he has used iClass to teach 22 Senior 1 students, each of whom has an iPad.



#### **The Use of iClass**

##### **a) Posting Responses**

Mr. Merchant found that one of the major advantages of iClass was its ability to assist him in conducting formative evaluations, a particularly useful feature in the Chinese context where learning atmosphere was often passive. It is often the case that Chinese students are too shy to speak up in front of the class or raise their hands to ask questions, leaving the teacher with the sometimes mistaken impression that the understanding of a new topic is better than might actually be the case. As iClass enabled students post individuals responses to the platform and discuss their views, they feel less intimidated and more encouraged to formulate and voice their own opinions. The teacher can more easily track students' progress and identify misconceptions and difficulties.

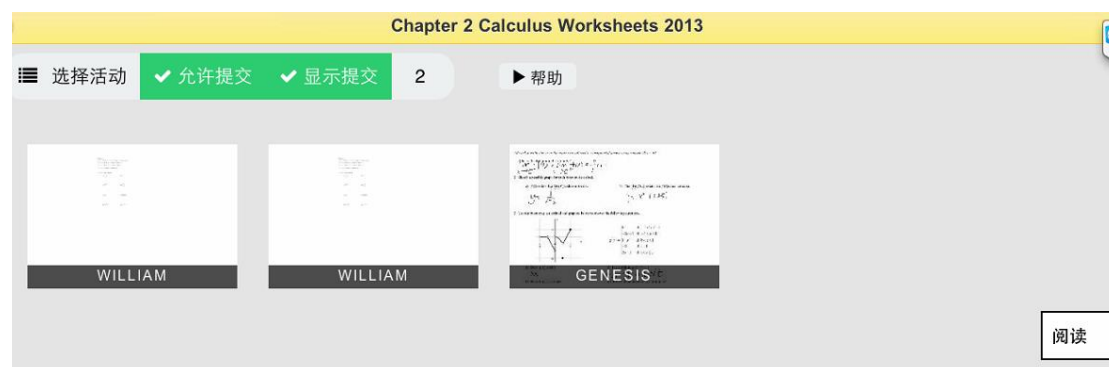




Another feature of iClass is its ability to accommodate brainstorming and keywords activities. The keyword function can be used to ask students to brainstorm the expected objectives of a class, based on introductory information they viewed the previous night. After submitting their ideas to the system, the class can discuss the lesson objectives briefly, helping both the teacher and students to reach the desired learning outcomes by the end of the lesson.

### b) Drawings

Another application of iClass is the use of its Drawings function in plotting graphs, creating problems to solve, or listing steps to solve mathematical questions. As Mr. Merchant explained, in a subject like Calculus, there is often more than one correct answer to the same question. By using the Drawings function to illustrate the possible solutions, students see the different approaches to solving problems.



All work must be shown in this course for full credit. Unsupported answers may receive NO credit.

1. What is the definition of continuity?  

$$\lim_{x \rightarrow c^-} f(x) = \lim_{x \rightarrow c^+} f(x) = f(c)$$

2. Sketch a possible graph for each function described.

a)  $f(5)$  exists, but  $\lim_{x \rightarrow 5} f(x)$  does not exist.  

$$y = \frac{1}{x-5}$$

b) The  $\lim_{x \rightarrow 5} f(x)$  exists, but  $f(5)$  does not exist.  

$$y = x^2 \quad (x \neq 5)$$

3. Use the function  $g(x)$  defined and graphed below to answer the following questions.

a) Does  $g(1)$  exist?  
 No

b) Does  $\lim_{x \rightarrow 1} g(x)$  exist?

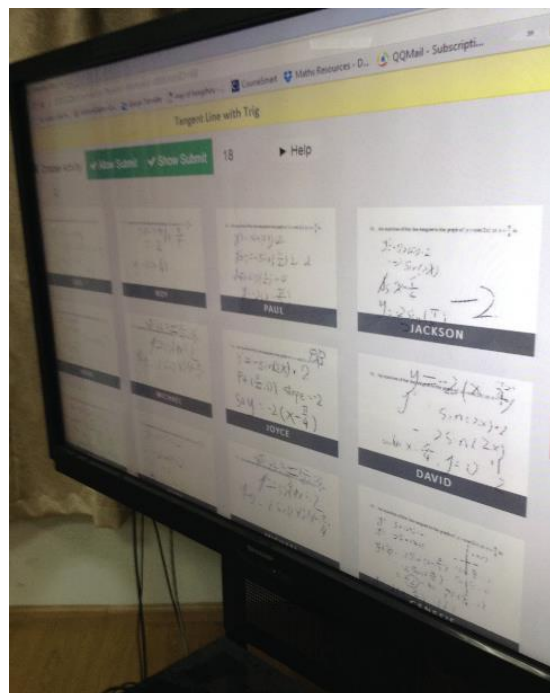
f) Is  $g$  continuous at  $x = -1$ ?  
 No,  $y(1)$  DNE

g) For what values of  $x$  is  $g$  continuous?

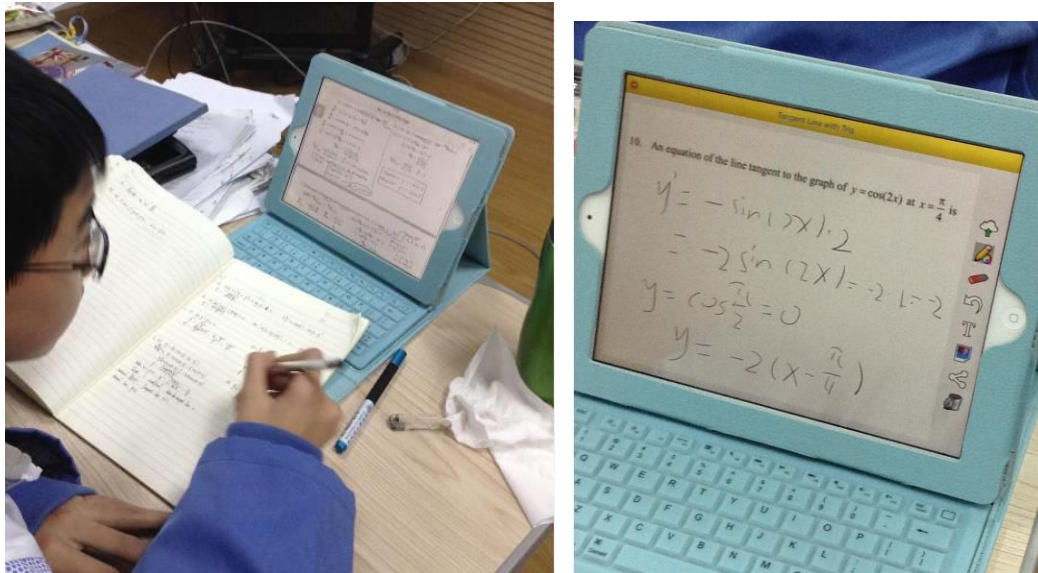
$$g(x) = \begin{cases} 1 & \text{if } -2 < x < -1 \\ -2x - 1 & \text{if } -1 < x < 0 \\ 1 - x^2 & \text{if } 0 < x < 1 \\ -2 & \text{if } x = 1 \\ 2x - 2 & \text{if } 1 < x \leq 2 \end{cases}$$

### c) Integrating iClass with other Apps

On top of using the built-in features of the system, Mr. Merchant uses iClass in conjunction with other Apps in his teaching. For instance, he uses iClass with PDF-Notes to distribute, collect, and mark assignments. Students receive pre-uploaded documents through the iClass platform, then use PDF-Notes to highlight or make notes on the document. Their finished work can then be submitted to the teacher through the system or by email.



iClass can also be used in conjunction with Docrer, an iPad interactive whiteboard that features hand-drawn graphics and remote desktop control. With the support of both applications, Mr. Merchant is able to walk around the classroom holding *his* iPad, which students can use to project their work to the front of the classroom. This feature allows the lesson to proceed smoothly and be continuously interactive.



As Mr. Merchant concludes, iClass gives him an exceptionally effective way to upload and collect documents in a centralized place, where he and his students can share and explore work collaboratively. In addition to being an all-in-one system, iClass is flexible and robust enough to integrate with other Apps and teaching methods to support effective learning.

## 9. The Way Forward

Following the rapid advancement in technology, new pedagogies and learning models have been developed to accommodate the needs of our ever-changing society. From the interactive features introduced in the previous publication to the assessment module in this present work, we have walked through the changing pedagogy, as well as a variety of interactive functions provided by the iClass system, exploring the ways in which technology can be integrated well into daily teaching as effective tools to support and enhance learning.

Gone are the days when students sit passively in a classroom and learn with a pen and textbook in hands. The emergence of the Internet and other novel technology has changed the ways we live, communicate and understand the world. We witness a shift in learning mode that redefines the classroom experience, from traditional classroom teaching to interactive learning with the use of electronic devices.

With the prevalence of electronic gadgets, the next wave of e-Learning will find e-textbook in the spotlight again, but this time with a twist. As observed, one major limitation of the present e-book technology is the lack of interactivity, with limited interaction between students and the machine. Through the iClass platform, dynamic interaction can be fostered not only within a class but also between classes. At the same time, the use of cloud technology enables students' works that are completed in class to be accessed anytime from home.

As things can be done in just a swipe or tab, it will not be long when students no longer have to carry paper textbooks to schools and learn in the traditional pen-and-paper mode. The digitalization of education also generates useful data on students' performance and offers effective



information to move one step closer towards individualized education, turning a once distant dream into a reachable one.

Considering the ever evolving and fast developing technologies, it is still uncertain how things will unfold or where the next step will lead us into. Yet one thing for sure is that more interesting discovery and promising change are awaiting, and that the concerted efforts and devotion from educators, scholars, teachers and students will elevate the learning experience to a whole new level that is exciting and inspiring for all in this new era.

*To be continued...*





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