

# Interaction Design of Digital Teaching Improves Teaching and Learning Effectiveness

Tsung-Chou Chang<sup>1(✉)</sup>, Ya-Fen Tsai<sup>2</sup>, and Fong-Gong Wu<sup>1</sup>

<sup>1</sup> Department of Industrial Design, National Cheng Kung University, Tainan, Taiwan (R.O.C.)  
deadpoet12@gmail.com, fonggong@mail.ncku.edu.tw

<sup>2</sup> Department of Product Design, Ming Chuan University, Taipei, Taiwan (R.O.C.)  
lingocat@gmail.com

**Abstract.** With increasing penetration of mobile device like smart mobile phone, appropriate cloud system can be a good match for powerful teaching aid in classroom. Hu-man Computer Interaction is an important part of visual ergonomics and cognitive ergonomics. It focuses on mental process including perception, memory, inference and motor reaction, etc. The application of teaching is to expect that students can use active learning through interactive design to pay more attention on and complete various tasks instructed by teachers. Therefore, interactive teaching-aided software can not only make teaching activities vivid and variations but also increase students' attention and the willingness of active learning in classroom. The rise of "flipped classroom" in 2007 was also a teaching concept to propose that student should be returned to a learning body and interaction of teacher and student in classroom should be given attention. This study is to explore the relevant literatures for active learning, interactive design, action learning and flipped classroom, etc., supported by interactive design based on the concept of flipped classroom immediate feedback that how teaching media-Zuvio improves teacher's teaching skill through mobile APP and cloud system. The result of this study can be used as improvement of teachers' teaching effectiveness and students' learning outcomes.

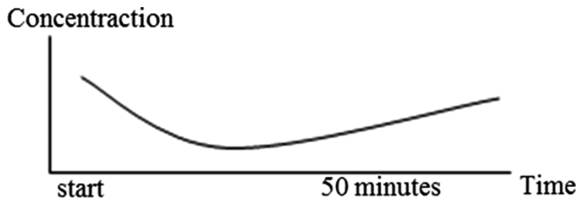
**Keywords:** Human computer interaction · Visual ergonomic · Cognitive ergonomics · Active learning · Flipped classroom · Mobile APP · Interaction design

## 1 Introduction

Teacher's teaching method in Taiwan's education system is mostly one-way transmission of knowledge. Traditional teaching method, i.e. traditional lecture generally exists in the campus. Teachers give lessons with oral interpretation or repeat what books say and students absorb knowledge by listening to lectures, taking note and reading before/after class. Traditional lecture that has long been widely welcome in teachers is because teachers just follow simple and convenient process to interpret according to the textbooks. However, such a "duck-stuffing" type of teaching makes most of Taiwan's

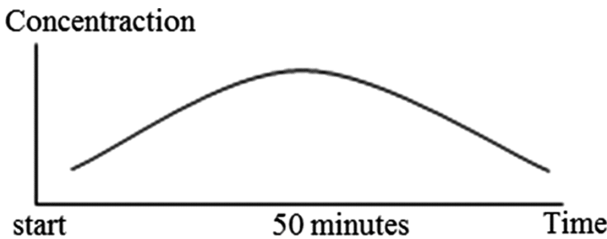
students dare not to express their ideas and lack of initiative. Once students show inattention, it may influence on their learning effectiveness.

Some studies show that few minutes after traditional lecture begins will cause distraction of students. 1094 students were surveyed on campus at Taiwan University for the change of classroom attention. The result is found that learning curve of 47.7 % students is indicated as Fig. 1 for a 50 mins class, meaning students stay focused upon the beginning of the class, showing distraction in the middle and refreshing shortly before class is over.



**Fig. 1.** Learning curve of NTU students (Source: <http://goo.gl/wkXtXm>)

Taiwan University also made 125 teachers self-appraisal for teaching concentration, indicating assessment results for 46.4 % teachers as Fig. 2, meaning teachers may give lessons with less concentration at the beginning, the more the lecture, the better the spirit, but will be exhausted shortly just before class ended.



**Fig. 2.** Teaching curve of NTU teachers (Source: <http://goo.gl/wkXtXm>)

In terms of teachers, improving students' attention, assisting them to be good audiences and actively taking notes in classroom and making them active learners are essential responsibilities of educators. If teachers are able to make good use of inter-active teaching-aided software, students' attention in classroom can be improved other than lively and varied teaching activities. Consequently, this study is mainly to explore how interactive design of immediate feedback teaching media assists teachers in controlling students' learning status for more focus on learning in classroom, and improving more concentration and effectiveness within time limit for better interaction between teachers and students.

## 2 Active Learning

Learning is a kind of knowledge construction progress, in educational field, students enhance their memories or obtain skills and know-how by either passive or active learning. Active learning is an important learning strategy in a classroom. It is generally defined as any instructional methods that engage students in the learning process by meaningful learning activities [1]. The core components of active learning are activity and learners participation. Advantage of active learning is supported by research results of decades showing that active learning is generally better than passive learning in improving learning gain for students [1]. Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing. While this definition could include traditional activities such as homework, in practice active learning refers to activities that are introduced into the classroom. Compare with the traditional lecture which passively receive in-formation from the instructor, Active learning is focused on learning effectiveness for students, such as collaborative learning, cooperative learning, problem based learning, and discovery learning [1].

## 3 Mobile Learning and Mobile App

For more and more penetrations of mobile phone and smart phone, the behavioral of people are changed. Mobile phones have been playing an increasingly significant role in pedagogy system for teaching and learning tests in the last years. The major affordances of mobile phone for learning include user mobility resulting from device portability, easily and movable battery charging, real-time interaction, and on-line connectivity. The smart phone users have more positive beliefs and behavioral intention to use smart phone for learning, and overall users will continue using smart phone for learning that would help educators to promote the use of smart phone for learning [3]. The result of the study by García Laborda et al. was extended prospective research for mobile APP interaction design includes following aspects: 1. task adaptation to mobile phones, smart phones and tablets; 2. user satisfaction; 3. external validity as compared to other delivery systems and other tests including similar pen and paper versions; 4. technical advances in software design for Multi-platform systems supported such as iOS and Android; 5. pedagogical benefits for both educators and students; 6. delivery reliability and 7. Functionality [2].

## 4 Flipped Classroom

“Flipped Classroom” was the first word used by Jonathan Bergmann and Aaron Sams, two chemistry teachers of senior high school to record the teaching video and uploaded online as extra class for students who missed a class, and general students also joined to view online afterwards, so as to generate a teaching mode of flipped classroom [4]. “Flipped Classroom” is a teaching concept to propose that student should be returned

to a learning body. Students may view teaching video at home for preview before class or review after class, and make mutual discussion with teachers and classmates in classroom. “Flipped Classroom” is an interactive learning to adjust the time of teachers’ explanation and students’ homework, allowing teachers to have time for one-to-one instruction. It can enhance students’ learning responsibilities and flexibilities to make classroom teaching become a mutual learning mode between teachers and students, which commands the attention of educational circles. The same concept as “Flipped Classroom” is Zuvio and Moodle platform. Zuvio cloud-based immediate interactive system is a teaching interactive system emerged at the right moment for improving problems among “teaching interaction”, “students’ learning habits” and “hardware limits” and combining students’ learning willingness with digital mobile device and the trend of e-learning. Moodle platform initiated from 2010 has integrated learning contents, homework, quiz and answer sheet into the course website, expecting students to get help for learning with such a teaching video. So that, the entire class originally taken for content interpretation now only takes 15 min to play the video through design and preparation. Some studies pointed out students can get better grades in interactive teaching of “Flipped Classroom” than traditional lecture or the teaching video; however, students’ satisfactions are needed for further improvement [5]. It shows the concept of “Flipped Classroom” is actually helpful for student achievements, but students’ lower satisfactions come from extra tasks for preview before class.

In another study, some of the factors that may have contributed to students’ improved scores included: student mediated contact with the course material prior to classes, benchmark and formative assessment administered during the module, and the interactive class activities. However, implementing a flipped classroom model to teach a renal pharmacotherapy module resulted in improved student performance and favorable student perceptions about the instructional approach [6].

## 5 Zuvio

Zuvio cloud-based immediate interactive system [8] is also an immediate feed-back system developed by Taiwan University educational group, in which students can communicate with teachers for immediate Q&A in classroom through various internet devices (e.g. smart mobile phone, tablet PC, notebook or desk computer), and then feedback real-time statistical information that teachers can adjust their teaching contents anytime depending on students statuses to improve teachers’ teaching quality and increase students’ learning motivation for promoting the popularization of digital education.

Zuvio system structure indicated as Table 1 mainly consists of the four parts: course account management system, multimedia item bank system, peer assessment system and results statistical system [7].

In the case of teachers, the operation of Zuvio system indicated as Fig. 3 Web picture can edit chapters and sections of such a course in the tabs of Chapter list after a new course is added; announced bulletins or topic discussions of such a course in the tabs of Bulletin board; adjusted semester and description of such a course in the tabs of Course

information; management for students list or grouping of such a course in the tabs of Student management. It can also design TA limits of authority and statistical data for various learning statuses including students' attendance, class presentation and class response, etc. For example, teachers can make quizzes for the contents of specific chapters and sections in the course.

**Table 1.** Table captions should be placed below the table

System Items	Contents Description
Course account management system	Teachers can offer several courses each semester setting elective permissions to accept or refuse registration of students' accounts
Multimedia item bank system	Teachers can establish choice questions, question-response and question sets, including pictures that can make up for the lack of words and select grouping answer. Teachers can use it for Q&A process in class, the roll call, opinion survey and even quiz as well as homework and students instant the questions through IOS, Android and computer, etc. devices to achieve rapid interactive effect
Peer assessment system	Teachers can establish a group or individual peer assessment questions, also setting marking standards as well as proportion of each standard, and selecting if marking or discussion is open. Individual or each group's result and ranking should be immediately updated in the process at teacher's end while marking or discussion can be immediately given to others or other groups with IOS, Android and computer, etc. devices from student's end
Results statistical system	Teachers can dynamically view the current answer condition in the process and view detailed data analysis and chart analysis of answer results; it can support Excel file output for teachers' future score statistics while students can view their own answer records for course review

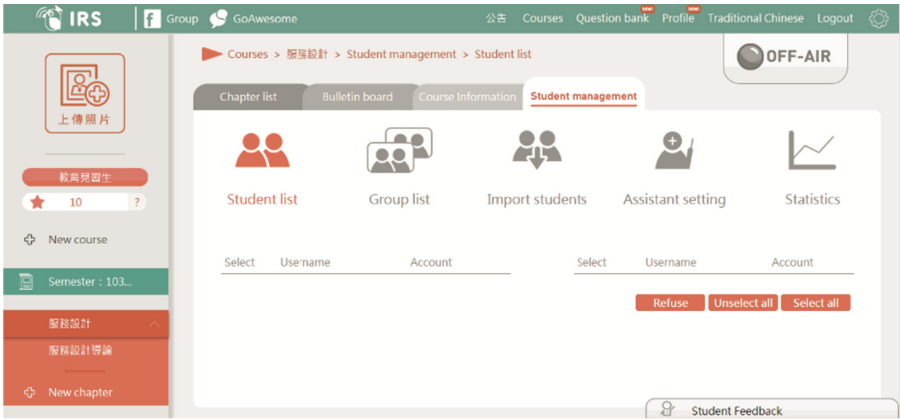


Fig. 3. The operation of zuvio system for teachers

In the case of students, they can login the system through smart mobile phone APP or digital mobile devices indicated as Fig. 4 the main operation picture. Students can answer the questions, send comments or view the relevant bulletins or discuss subjects for the main courses in discussion board after accessing such courses. If teachers have course notes, students also can select the files to download in bulletin board.

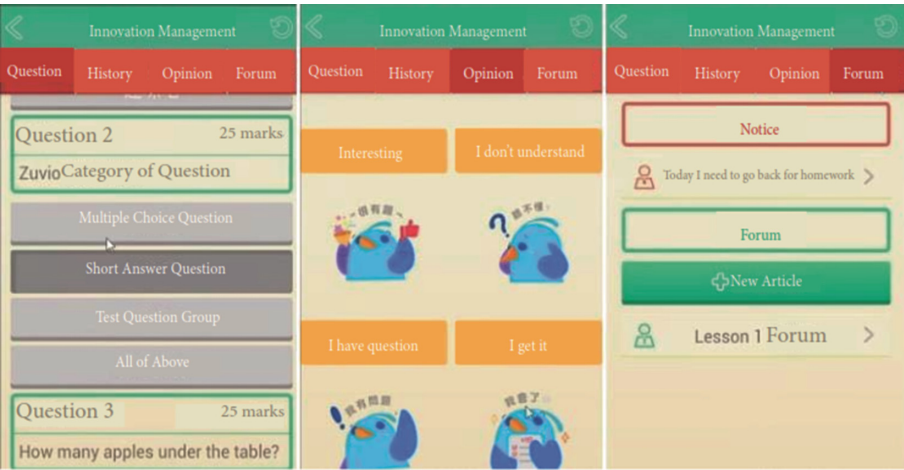


Fig. 4. The operation of zuvio system for students

## 6 Discussion

Zuvio's interactive learning is different from traditional lecture. It complies with emphatic core mentioned in Prince's [1] literature analysis that introducing activities into the traditional lecture and promoting student engagement has extreme significant

effectiveness; meanwhile, Zuvio peer assessment system can facilitate collaborative learning and cooperative learning. Additionally, Zuvio's class presentation or quiz same as problem-based learning for active learning proposed by Prince actually provides a more challengeable, learning motivation and pleasure learning method.

Zuvio's student-end interface design is same as the study of García Laborda [2] et al. for mobile APP PAULEX that mobile APP can realize visual ergonomics with technology. The fundamental criteria for mobile App are accessibility, interaction, and the functionality or usability of the application according to the delivery, visual ergonomics, and content inclusion [2]. According to empirical study of Zek [3] et al., it explained interviewers are glad to use smart mobile phone for course learning and also improve learning effectiveness.

Besides, other relevant studies for flipped classroom [4–6] made further explanation that Zuvio integrates digital technology into classroom to provide teachers with assistive devices for teaching aids, valuing experiences of teachers and students to be helpful for teachers' teaching effectiveness and students' learning effect and to promote good interaction between teachers and students.

## 7 Conclusion

“Flipped Classroom” is an interactive learning to adjust the time of teachers' explanation and students' homework, allowing teachers to have time for one-to-one instruction. It can enhance students' learning responsibilities and flexibilities to make classroom teaching become a mutual learning mode between teachers and students, which commands the attention of educational circles

Based on the concept of flipped classroom for interactive designed teaching media, the way of how Zuvio improve teachers' teaching skill and students also can make good use of teaching software within limited time to pay more attention to classroom learning can be used to improve learning concentration and effectiveness; immediate interactive assessment and learning feedback are more likely to help teachers to control students' learning statuses for not only teaching the right candidates but also promoting good interaction between teachers and students.

To increase the teacher-student interaction and ease of use in the design of man-machine interface, the need to consider the people, the environment, user interface, and mobile multimedia products. In the design process, the need to understand the product itself by professionals (such as teachers) to lead, it must be in-depth analysis of the use of user behavior, so that interactive teaching media interface more consistent with human factors design.

While flipped classroom can improve student's learning outcomes, but there are still some issues to be resolved, such as: how to determine in advance prep students? Teachers how to teach in the classroom? School substitute teacher by the students, the teaching effect is better than the teachers to teach? In addition, learn how to improve the interface design of interactive systems? How to design more ergonomic interactive software to increase the flow of students and teachers in the operating convenience and fluency? Future researchers need to be further explored.

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