Journal of University Teaching & Learning Practice

Volume 9 | Issue 2 Article 5

8-31-2012

Developing Animated Cartoons for Economic Teaching

Yu Aimee Zhang
University of Wollongong, azhang@uow.edu.au

Developing Animated Cartoons for Economic Teaching

Abstract
Purpose – A picture is worth a thousand words. Multimedia teaching materials have been widely adopted by teachers in Physics, Biotechnology, Psychology, Religion, Analytical Science, and Economics nowadays. To assist with engaging students in their economic study, increase learning efficiency and understanding, solve misconception problems, encourage in class discussion, and increase final performance for students (especially for international students and RA students), some animations and cartoons are developed to explain basic economic concepts for both macroeconomic and microeconomic concepts, issues and events. Methodology – Two surveys were first conducted to collect first year and international students' requirement and suggestions. Cartoons and animations were then designed and developed to solve the major misconception and misunderstanding problems facing first year students or international students in their economic studies. Qualitative interviews were conducted to collect feedbacks for the cartoons developed for this project from economic lecturers, tutors, students and other teachers and students without economic backgrounds. Learning efficiencies from animations and text materials are also compared by the length of learning time in this paper. Findings – Surveys in this study support the view that different students have different preferred learning methods. However, practice case studies are the preferred learning method for both first year university students and international students. The animated cartoons developed in this research received strong positive feedbacks from peer colleagues in Economics, teachers from other faculties, tutors in Economics, first year students, international students and RA students with dyslexic problems. Utilisation of these resources can improve learning efficiency, help students in their understanding and long-term memory of the subject, engage students in their studies, and increase interest in undertaking economic studies amongst all other students. Value – The results of this study could be used in any Economics subject, as well as for self-study by Economics students and others. As part of the Teaching and Learning Project, these materials are capable of being further used in mobile applications to assist in engaging students in their learning.

Keywords
Teaching, Animation, Cartoon, Economics

Cover Page Footnote
This work was supported in part by a Teaching and Learning Grant from the University of Wollongong, NSW, Australia.

Introduction

Animated cartoons have been adopted by many teachers as an alternative or supplement to traditional teaching methods (Becker et al. 2006; O'Day 2007). It is commonly said that a picture is worth a thousand words. Animated cartoons are being adopted by an increasing number of teachers in physics (Halpern 2007), biotechnology (Heyden 2004; McClean et al. 2005; O'Day 2006), psychology (Eaton & Uskul 2004; Brown & Logan 2005), religion (Pinsky 2001), analytical science (Larive 2008), and economics (Hall 2005; Becker et al. 2006; Klein & Bauman 2010; Luccasen an&d Thomas 2010). To help engage students in their economic study, animated cartoons are adopted or developed to explain basic economic concepts for both macroeconomic and microeconomic studies (Klein & Bauman 2010; McTaggart et al. 2010). The developed materials can be embedded into any economics lecture to illustrate basic economic concepts or cases. They can also help with the self-study process of any student who is interested in economic study but has no background in economics.

Therefore, supported by a Teaching and Learning Project at the University of Wollongong, this study developed animated cartoons for basic macroeconomic and microeconomic teaching; the project is expected to benefit students of economics, especially those international students who are non-native English speakers and students with dyslexic problems. Quantitative surveys were conducted in the beginning of the project to collect information about these students' requirements and problems. Face-to-face interviews were also used to collect feedback and suggestions from students, teachers in the Economics faculty and teachers in other faculties.

Literature Review

There are numerous theories and much research related to learning studies, including behaviorist research, cognitive research, experiential learning, humanistic research and social learning. Martyn Stewart (2011) has highlighted the major contributors, and has argued that learning is a complex process that includes both mentally cognitive and emotional affective factors from social and individual perspectives. Lewin (1948) and Kolb (1984) have agreed that active experience can help in a cycle-of-learning process. The efficacy of “chalk and talk” learning (Becker et al. 2006) fades a bit more each year in an age of digital media and students raised in an nursery filled with electronics (Lave & Wenger 1991). Teaching, therefore, should be a clear, interactive and supported process with well-prepared and well-structured materials, flexible and multiple teaching methods and relevant, real case studies that can inspire and engage the student in learning, thinking, discussion, group work and feedback. Such a teaching process includes many methods and tools that relate to new technologies.

On the other hand, the increasing number of students traveling to another country for a higher-educational degree have found that culture and language differences have influenced their learning processes (Vygotsky 1962; 1978); these differences have also influenced the design of teaching, which now must take into account the need to help students from very different backgrounds. Misconception is one of the major problems facing students studying in a second language. Cartoons and animations can help students cross language barriers in their first-year studies and learn concepts correctly and consistently (Sweller 1994; Akamca et al. 2009). Connor (2009) found that cartoons help students who have difficulty in quickly processing large tracts of written text or dialogues, and increase both learning efficiency and students' interest in learning. This, in turn, has a positive influence on students’ achievements (Akamca et al. 2009).

Therefore, many teachers have adopted and examined the usage of animations in economic teaching (Hall 2005; Becker et al. 2006; Klein & Bauman 2010; Luccasen & Thomas 2010). However, the use of animation products developed by cartoon or movie companies (e.g, the television show The Simpsons) have required more explanation in the lecture. Different illustrations and explanations by different teachers may vary the quality of the results. Even when explained by the same teacher, a given animation may have different influences on different students (e.g., on students of different genders) (O'Day 2010). The use of such cartoons and animations is also limited by the small amount of scenarios that could be used to express the economic concepts (Luccasen et al. 2011). Furthermore, the suitable length of such animations embedded in a lecture is also under debate (O'Day 2010; McClean et al. 2005); therefore, some theorists have suggested using in-class discussion as a complement to the use of animations. Educational papers have suggested that students' attention declines in the first 10 to 15 minutes of a lecture (Wilson & Korn 2007). Therefore, animations and cartoons should be used to attract students' attention, as well as to engage students in their economic studies. A combination of different methods can help refresh students and attract their attention. More case studies and further development of cartoons related to the field of study are expected to help in this process.

Instead of adopting the cartoons formally produced by movie companies, Klein (2010) developed static cartoons to introduce microeconomic concepts. While they are expected to engage students in their economic studies, the static cartoons are obviously limited in their ability to show changes or scenarios with movement. Moreover, there are too many text messages associated with these cartoons, which may have limited use in helping international students in their learning. Although it may be translated into different languages, the translation itself may be confused (Appendix B).

Developing animations for teaching is not a simple task; it is very time-consuming, partly due to its association with new technologies (Heyden 2004). The authors developed animated cartoons to demonstrate 80 basic economic concepts (Appendix C) for students at the University of Wollongong. The animations illustrate micro- and macroeconomic course material. The process and outcomes will be described in this paper.

Animations for Economic Concepts

The project is designed to help students increase their learning efficiency and understanding. Based on the results of a survey conducted in the 2011 autumn session, first-year students had many difficulties in understanding the basic concepts of the subject (Appendix A). Students' part-time jobs, family commitment and other activities and events also occupied much of their time and attention. More than half (16 out of 30) students who participated in our surveys indicated that their preferred learning method was through practical cases and discussion.

To better understand the real problems facing international students, another survey was conducted online from 8 November, 2011 to 27 February, 2012 (Appendix B). The survey, completed by 63 Chinese students, shows that the primary problem for international students studying in Australia was the language barrier. More than half (59%) of the participating students indicated that the special terms in a subject caused problems in their study, and that the confusing translations in dictionaries were amongst the major barriers to their effective study. Respondents indicated a need for more dedicated study-assistance services for international students. And more than half the participating students preferred practical case studies as their learning method, which accords with the empirical results reported by Lewin (1948) and Kolb (1984) in their surveys on first-year students. The survey also showed that international students were reluctant to participate in class

discussion, which may increase the problems of misconceptions. Cartoons and animations encourage students to participate in class discussions (Ostrom 2004) and help remedy misconceptions (Keogh & Naylor 1999; Kabapinar 2005; Akamca et al. 2009).

To fulfill the requirements of first-year and international economic students, animated cartoons were designed and developed to express the basic concepts of economics teaching. First, hand drawings were developed by the author and scanned into computers. Secondly, Windows Paint software was used to colour these pictures. Lastly, an open-source software (GIMP 2) was used to develop the animation by cutting pieces of the pictures into different layers and setting frames for continuous time slots. The developed materials included both macroeconomic and microeconomic concepts. These animations and cartoons could complement current teaching in the following ways: (1) on their own to explain a complex concept, issue or event; (2) as part of a lecture slide with text information; (3) as a specific example for a general concept; (4) as a stimulus for class or group discussion; and (5) as part of exam questions that help students understand complex materials or processes.

Example of animated cartoon for opportunity cost

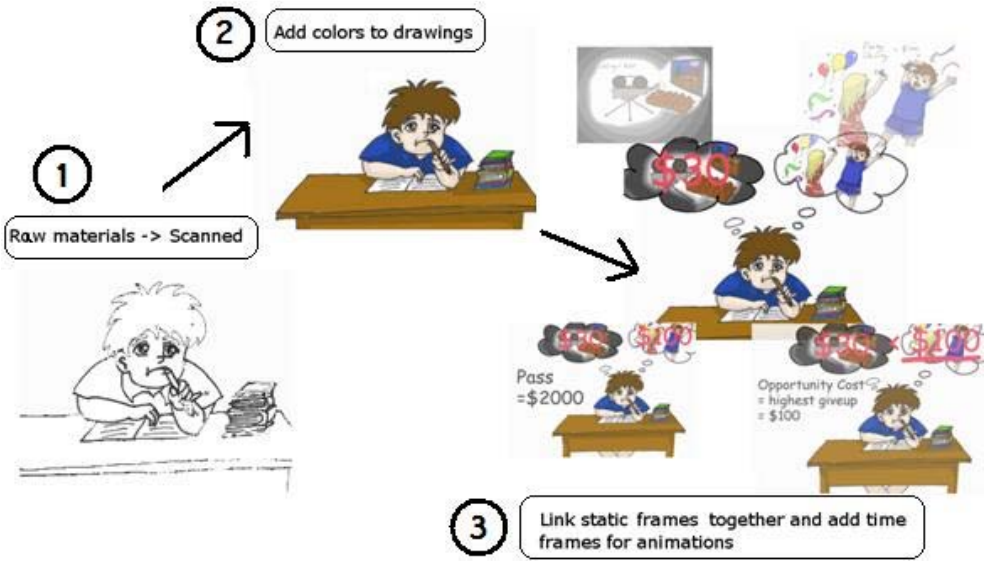
Opportunity cost is introduced in most macroeconomic and microeconomic subjects. The opportunity cost of something is the highest-valued alternative that someone must give up to get that thing. However, different teachers adopt very different methods and cases in explaining this concept:

> For example, you face an opportunity cost of being at university. That opportunity cost is the highest-valued alternative you would have chosen if you were not at university. If you drop out of university and get a job at Coles [a supermarket chain], you'll have lots of leisure time and you'll earn enough to buy some DVDs and go to the movies. If you remain at the university, you can't afford these things. You'll be able to afford them after you graduate. But for now, when you've bought your books, you have nothing left for DVDs and movie tickets, and studying leaves little time for leisure. The opportunity cost of being at university is the highest-valued alternative you would have chosen if you dropped out. (McTaggart et al. 2010, p11)

The normal reading time for such text examples is more than 30 seconds, and it can be expected to be longer for international and some students with disabilities. Alternatively, the information – augmented by a demonstration of how to calculate opportunity cost – could be shown in a simple animation.

Figure 1 shows the process of developing an animated cartoon for opportunity cost. This animation is 20 seconds long and contains 17 slides. The animation illustrates the concepts in a real case study, a format which is familiar to undergraduates and can make them feel more involved and engaged. With the teacher's explanation (perhaps accompanied by a group discussion), the expected teaching time for this complex concept is around two to five minutes, including both the case study and a demonstration of how to calculate opportunity cost.

Figure 1: Opportunity Cost in Economics



Animated cartoons can significantly increase learning efficiency as well as help students in their understanding. This animation can be used on its own in any economic subject, or as a lecture slide with the definition, calculation and example for opportunity cost. Tutors can use this animation in tutorials to engage students in a group discussion. Animations can explain not only a clear case study, but also a complex process (e.g. how to graph data) and a comparison of two different situations (e.g. a tradeoff).

Statistics-based cartoons

In some cases, statistics-based cartoons can also show some concepts clearly. Figures 2, 3 and 4 show the cartoon explanations for consumer price index (CPI), substitutes, complements and not-in-working-age population. The cartoons are expected to help students in their understanding of these basic economic concepts as well as increase their learning efficiency. Compared with the definitions of these concepts, the cartoons give a visual and direct explanation. They also help remedy misconceptions for some students.

CPI is a measure of the average of the prices paid by urban consumers for a fixed basket of consumer goods and services. The CPI is defined as equalling 100 for a period called the reference base period (McTaggart et al. 2010). Figure 2 shows the definition of CPI and how to calculate price level. The formula for calculating CPI is as follows:

CPI = (CPI basket in current prices/CPI basket in base prices) * 100
This concept is also related to the definition of inflation (a continuous rise in the price level) and inflation rate (the annual percentage change in the price level). Therefore, a linkage of teaching techniques, including illustrating these concepts with cartoon animations, explanations by the lecturer or tutor and a group discussion, will help engage the students in learning and in-class discussion. The knowledge conveyed via the use of the cartoon could also be applied to other important economic concepts such as the bias of CPI (new-goods bias, quality-change bias,

commodity-substitution bias and outlet-substitution bias) or consequences of the increase of CPI (e.g. salary and transfer payments).

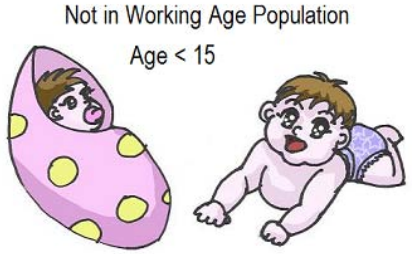
Figure 2: Consumer Price Index

Figure 3 shows the cases for substitutes and complements. A substitute is a good that can be used in place of another good. A complement is a good used in conjunction with another good. When the price of a good (e.g. coffee in Figure 3) increases, the quantity demand for a substitute good (tea in Figure 3) increases, and the quantity demand for a complement good (sugar and milk in Figure 3) decreases (Landsburg 2005). This means that when the price of coffee increases, people consumes more tea and less sugar and milk as a consequence.

Figure 3: Substitutes and Complements

The definition of working-age population is the total number of civilians aged 15 years and over (McTaggart et al. 2010); this figure is used in calculating the labour-force participant rate. Figure 4 shows the definition of not-in-working-age population visually; this can be expected to enhance the students' long-term memory (O'Day 2007).

Figure 4: Not-in-working-age Population



Based on the concept that cartoons and animations assist in engaging students in their studies and lead to greater learning efficiency, 80 cartoons and animations were developed for this project to

convey basic economic concepts and cases (the thumbnails of most of these materials are listed in Appendix C). As these cartoons were developed for the mobile application that will be released in the next stage of the teaching project, their sizes are less than 1 megabyte each, which is easily used in a Word document, PowerPoint slide, and other types of files, and used in lecture slides, case studies and tutorial questions. These cartoons will be further reviewed and examined by teachers and students in economics and other disciplines. As at 27th February, 2012, 10 face-to-face interviews have been conducted to collect feedback and suggestions from teachers and students in different schools, both to improve these cartoons and to develop new ones.

Results and Feedback

All the cartoons created for the project can be embedded in the teaching of any economic subject to illustrate basic concepts. To maintain the quality of this project, the cartoons were sent for review to teachers in economics, tutors teaching economic subjects, teachers without economics backgrounds, first-year students, international students and students with dyslexic problems. A total of 17 interviews were conducted in February 2012, including with undergraduate and postgraduate students, international and local students, a student with dyslexia and teachers in the School of Economics and other faculties. Table 1 shows the interview results.

Table 1: Interview Results for Feedback on Teaching Cartoons and Animations

Interviewee	**No.**	**Feedback**	**Suggestions**
Student with dyslexia (undergraduate)	1	I strongly believe that these cartoons would help, as I learn more from visual examples than reading big words that mean nothing to me.	The disability people could be in labor force.
International students (undergraduate)	4	These cartoons are clear and easy to understand.	Adding a link to the RBA website for the inflation cartoon would be helpful.
International students (postgraduate)	6	It engaged students in class discussion.	
Economics teachers	4	It is really good and I would like to adopt some of them in my lectures. I am sure it will touch a nerve with student's lives. I think it is good for engaging students. It may be used in different subjects and may solve the performance problems of international students.	
Teachers from other faculties	2	It is very impressive. I wish I had the ability to develop such cartoons.	
Total interviews	**17**	**17 comments**	**2 comments**

The feedback and suggestions from both students and teachers were both encouraging and useful. Teaching is a process that always can be improved. We believe that the more effort that is put in to designing better teaching techniques, the better the outcomes and responses. Therefore, knowledge points and course materials will be further improved when more feedback is received during upcoming presentations in economics lectures.

Conclusions

First-year students and international students often struggle in their economic studies due to the many complex concepts and long text examples involved. There is a pressing need for new teaching materials which can assist in helping these students in their learning as well as engaging them more strongly in their studies. Animated cartoons are an effective alternative method for teaching basic economic concepts. However, current studies in adopting cartoons in economics teaching are limited by the quantity and quality of cartoons that could be used to illustrate concepts or linked with case studies.

The new animated cartoons developed in this study for teaching both macroeconomic and microeconomic subjects have received very positive feedback and many favourable comments from teachers and students. Used as an adjunct to teaching, the cartoons are expected to increase both learning efficiency and students' understanding of different economic subjects, to engage students in the study of economics and to remedy misconceptions. These materials may have a positive influence on the final performance of all students, especially international and students with dyslexia.

References

Akamca, G. O., Ellez, A. M. & Hamurcu, H. (2009). Effects of computer aided concept cartoons on learning outcomes, *Procedia Social and Behavioral Sciences*, 1 (2009), 296-301.

Becker, W. E., Watts, M. & Becker, S. (2006). *Teaching Economics: More Alternatives to Chalk and Talk*. Edward Elgar, Northampton, MA.

Brown, A. & Logan, C. (2005). *The Psychology of the Simpsons: D'oh!* Benbella Books, Inc., Dallas, TX.

Connor, D. J. (2009). Creating cartoons as representation: visual narratives of college students with learning disabilities, *Educational Media International*, 46(3), 185-205.

Eaton, J. & Uskul, A. K. (2004). Using The Simpsons to teach social psychology, *Teaching of Psychology*, 31(4), 277-278.

Hall, J. (2005). Homer Economicus: Using Simpsons to Improve Economic Instruction Through Policy Anaysis*, Journal of Private Enterprise,* 20(Spring): 84-92.

Halpern, P. (2007). *What Science Ever Done for Us: What the Simpsons Can Teach Us About Physics, Robots, Life, and the Universe*. John Wiley and Sons, Inc., Hoboken, NJ.

Heyden, R. J. (2004). Approaches to Cell Biology: Developing Educational Multimedia, *Cell Biology Education*, 3, 93-98.

Kabapinar, F. (2005). Effectiveness of Teaching via Concept Cartoons from the Point of View of Constructivist Approach, *Educational Sciences: Theory and Practice*, 5(1), 135-146.

Keogh, B. & Naylor, S. (1999). Concept cartoons, teaching and learning in science: an evaluation, *International Journal of Science Education*, 21, 431-446.

Klein, G. & Bauman, Y. (2010). *The Cartoon Introduction to Economics, Volume One: Microeconomics*. Hill and Wang, New York.

Kolb, D. (1984). *Experiential learning*. Prentice Hall, Englewood Cliffs, NJ.
Landsburg, S. E. (2005). *Price Theory and A*pplications. South-Western Cengage Learning in Mason, Ohio.
Larive, C. K. (2008). A picture is worth a thousand words: animations and simulations in the teaching of analytical science, *Analytical and Bioanalalytical Chemistry* 390, 71-75.
Lave, J. & Wenger, E. (1991). *Situated Learning*. Cambridge University Press, Cambridge, MA.
Lewin, K. (1948). Resolving Social Conflicts: Selected Papers on Group Dynamics. Harper & Row, New York.
Luccasen, R. A., Hammock, M. & Thomas, M. K. (2011). 'Teaching Macroeconomic principles using animated cartoons', *American Economist*, 56(1), 38-47.
Luccasen, R. A. & Thomas, M. K. (2010). Simpsonomics: Teaching Economics Using Episodes of The Simpsons, *Journal of Economic Education*, 41(2), 136-149.
McClean, P., Johnson, C., Rogers, R., Daniels, L., Reber, J., Slator, B. M., Terpstra, J. & White, A. (2005). Molecular and cellular biology animations: Development and impact on student learning, *Cell Biology Education*, 4, 169-179.
McTaggart, D., Findlay, C. & Parkin, M. (2010). *Macroeconomics*. Pearson Australia, Camberwell, Vic.
O'Day, D. H. (2006). Animated Cell biology: A quick & easy method for making effective high-quality teaching animations, *CBE:Life Sciences Education*, 6, 217-233.
O'Day, D. H. (2007). The value of animations in biology teaching: A study of short-term and long-term memory retention, *CBE:Life Sciences Education*, 5, 155-163.
O'Day, D. H. (2010). Animations Are Dynamic, Effective Tools For Science Teaching: If You Just Follow The Rules!, *Journal of College Teaching and Learning*, 7(12), 19-25.
Ostrom, R. (2004). Active Learning Strategies for Using Cartoons and Internet Research Assignment in Social Studies Courses, *Social Studies Review*, 43(2), 61.
Pinsky, M. (2001). *The Gospel According to the Simpsons: The Spiritual Life of the World's Most Animated Family*. Westminister John Knox Press, Louisville, KY.
Stephenson, P. & Warwick, P. (2002). Using Concept Cartoons to Support Progression in Students' Understanding of Light, *Physics Education*, 37(2), 135-140.
Stewart, M. (2011). Learning through Research: An Introduction to the Main Theories of Learning, *JMU Learning and Teaching Press*, (4), 4-13.
Sweller, J. (1994). Cognitive load theory, learning difficulty, and instructional design, *Learning and Instruction*, 4, 247-262.
Vygotsky, L. (1962). *Thought & Language*. MIT Press, Cambridge, MA.
Vygotsky, L. (1978). *Mind in Society*. Harvard University Press, Cambridge, MA.
Wilson, K. & Korn, J. (2007). Attention During Lectures: Beyond Ten Minutes, *Teaching of Psychology*, 34(2), 85-89.

Appendix A – Survey on first year economic students

Survey time: Autumn session 2011 on Econ101 students	Sample: 30	
Proposal: find better teaching methods	Autumn 2010	
Results:		
Question 1: Preferred teaching method	**Sum**	
Presentation in lecture/tutorial - learn by listening and seeing	11	
Question and answers - learn by asking and communicating	8	
Group discussion in tutorials - learn by discussion	5	
Practice in real cases - learn by doing	16	
Others	0	
Question 2: Methods for learning		
Discuss with teachers/students	17	
Change teaching environment (outside)	3	
More practice questions or real cases	16	
Playing and learning - games	4	
Internship in real firms	4	
Distance teaching system - anytime and anywhere	4	
Others	0	
Question 3: suggestions	**Summary:**	
Follow slides hardcopy is easier to take in.	Online slides	2
New examples in class, something make concepts clearer	Real cases	5
No late tutorials.	No late tut	1
Concepts are explained in-depth	Explain more	3
Interaction via videos, slides	Video	2
More real life examples may help to learn better	Student engagement	1
Discuss with teachers/students and practice as possible	Discussion	6
Group discussion, questions and answers	Slower lecture	2
Don't go lectures, can't answer tutorials, all similar	Games	2
Slower lectures, too fast, don't understand properly	Distance teach	2
Practical application of basic concepts in games, exercises, etc.		
Go over homework, work on exercises related to topic.		
Clear explanation, why is this the answer and what does it mean.		
More time to discuss		
No time for discussion		
Lecture slides online is best and distance teaching.		
One way everyone can contribute in discussion.		
Focus on real life, practical topics, not theories for econ terms.		

Provide theory and background then show example - real cases, key

A good mix of theory, practice and discussion

More interactive, video, student engagement

Appendix B – Survey of international students

Surveys Started: 68/ Surveys Completed: 62

1. How long have you been studying in Australia (select the most similar number)?

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	Click to write Choice 1	0.40	5.00	2.02	1.20	63

2. I could understand what percentage of Lectures/tutorials materials at the end of first week, first month, and first session when I came here:

#	Answer	Min Value	Max Value	Average Value	Standard Deviation	Responses
1	First week	2.00	90.00	36.79	22.77	58
2	First month	4.00	100.00	49.78	24.36	59
3	First session	10.00	100.00	66.57	22.82	60

3. What are the difficulties facing your study here? (multiple choice):

#	Answer		Response	%
1	Cannot follow the speed of the teachers		28	44%
2	The subject contents are too difficult for me		17	27%
3	Cannot understand some special words/terms in the subject		37	59%
4	The translation dictionary is not good, which added my confusion		37	59%
5	Limited writing skills, which cannot express what I learned		36	57%
6	Cannot find suitable readings		14	22%
7	Has less communicative skills in group work		20	32%
8	Others, please specify		8	13%

Others:
Some teachers are not good in explanation
English skills, I can achieve 90+ if they are taught in Chinese
Language is still the biggest barrier
Cannot understand some accents of teachers (e.g. India, Malaysia)
Challenging assignments
The accent of some teachers
Did not use enough time on study
No

4. What are the barriers preventing you from achieving a better mark in your study? (multiple choice):

#	Answer		Response	%
1	Cannot understand in the lecture		25	40%
2	Language Barrier		44	70%
3	Part-time job takes a lot of time		4	6%
4	Unreasonable difficulty level in the subject/assignments		21	33%
5	Not enough study service/assistance from the university		17	27%
6	Illness or other affairs		9	14%
7	Others, please specify		4	6%

Others:
Someone did not work in the group work
unclear expectation
Did not use enough time on study

5. Please specify the most suitable learning methods for you (multiple choice) :

#	Answer		Response	%
1	Lecture		31	49%
2	Group discussion		23	37%
3	Essay assignment		24	38%
4	Consultation with lecturer		27	43%
5	Practice question or previous exam papers		35	56%
6	Additional readings		19	30%
7	Real case study or example		32	51%
8	Internships in companies		27	43%
9	Online study		8	13%

6. What improvement would help you in your study?

#	Answer		Response	%
1	Change environment to other place or companies		23	37%
2	New technology such as Facebook, mobiles, twitter		9	14%
3	Remote study from home		17	27%
4	Special service and consulting to International students		49	78%
5	Groups between students		29	46%
6	More video, animation and interactive contents		15	24%
7	Case studies		34	54%
8	Internships		35	56%
9	Others, please specify		2	3%

Others
Special language assistant service to each subject
Make clear each chapter's content and cross supervision, help, and test with other student.

Appendix C – Thumbnails of all developed animations and cartoons