Better Than MOOCs:

Improving Online Learning Environments Based on Cognitive Theories

By

DoHyun Kim

New York University, 2013

Project advisor

Educational Design for Media - Meagan Kathleen Bromley

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"While scientists focus on the problem, on discovering the rule that is operating, designers focus on the solution, on achieving the desired result" (Lawson, 1980), and "successful designers are able to combine reason with imagination and to be simultaneously creative and practical" (Jones 1970).

Abstract

The purpose of this project is to make guidelines for teachers, instructional designers, and even students to create effective online content for teaching and learning. Although there are a number of online lessons, the majority of them contain critical drawbacks preventing students from focusing studying. One of the reasons would be because a majority of online courses are produced with lack of understanding about unique online learning environments and audience. Since having an understanding of how people learn will be the key to creating quality online educational content, we analyze the problems of current online lessons, environments, and target audience based on cognitive theories. Also in order to create exemplar lessons, students' and teachers' feedback, statistical data on Google, and assessment tests scores are taken into consideration. This paper will explain how to create and evaluate the online content and the reasons why they would be better than other existing content.

1. Analysis

Our whole design process follows an ADDIE (Analyze, Design, Develop, Implement, and Evaluation) model (McGriff, 2000). The first step is "Analyze", which is to set the goals and analyze who the learners are going to be. "Design" is the next step to plan what strategies and materials are going to be employed. The third step is "Develop" where instructional designers begin to develop tools and really create content. Once we make our own content, we use our design solution developed in the phase of "Implementation." The last step is "Evaluation," the purpose of which is to revise and refine the content.

A. Background

Currently, we are in a transitional point where online schooling is becoming one of the mainstream methods for learning. The Khan Academy (2012) is one of the most well-known online content providers for K-12 level students and about 40% of the students who access the website are from different countries. The virtual school provides students with more than 3,500 free lectures about mathematics, history, economics, and other subjects. Also, based on data from YouTube (2011), more than one billion viewers visit the website per month and 70% of YouTube traffic comes out of the US. The total number of videos on YouTube is over 120 million and 7.2 million (6%) of them are related to educational topics (2008). In the book, *Disrupting Class: How Disruptive*

Innovation Will Change the Way the World Learns, authors Clayton Christensen and Michael Horn (2008) speculate that by the year 2019, nearly half of all high school courses in the United States will be delivered online. Numerous research results support the idea that taking both online and offline classes is a lot more effective than taking only offline courses.

Given these circumstances, educators, researchers, and instructional designers have been making efforts to improve online learning environments grounded in understanding about the learning process. In addition, many people agree that educators need to figure out what proper teaching methods are for online learning and produce tailored e-learning content with new educational devices. Although educational content developers and educators have been asked to deploy diverse multimedia resources and new teaching approaches, there is very little research to draw from to know about what elements of online lessons influence learning in online education and what teaching methods should be applied to online learning environments.

Clark and Mayer (2004) state, "It is not the delivery medium, but rather the instructional methods that cause learning." When the instructional methods remain essentially the same, no matter what medium is used to deliver the instruction, students and teachers both do not have satisfactory improvements in learning and teaching. Consequently, the goal of our team project is to help teachers design a course that includes effective instructional methods.

B. Problem Description

Although online learning environments are different from traditional offline learning environments, a number of teachers use the same teaching methods in both online and offline classrooms. For instance, MIT and Yale online courses on MOOCs (Massive Open Online Courses) can be good examples to illustrate what problems online lectures have. Forbes (2013) points out that there is an inherent problem with MOOCs in that although enrollment in online college courses of all kinds increased by 29 percent to more than 6.7 million between 2011 and 2012, the completion rate for some courses on MOOCs is under 3%. Hechinger Report (2013) mentions, "Seventy-five percent of students on MOOCs said the main reason they signed up for a MOOC was that it didn't cost them anything, while 29 percent of those who dropped out said they got too busy to continue, and 20 percent said they lost interest."

In addition, current online learning environments cause problems in which students have a hard time finding proper content because there is an overwhelming amount of content on the same website. Plus, some websites do not provide user-friendly interfaces or layout designs. For instance, the Korean English educational website, "gohackers.com," has a menu with 140 sections on the first page, making it hard for students to navigate the website efficiently.

C. Review of Existing & Competing Products and Media Selection

An overwhelming amount of online learning content is accessible for free and educators can use them on various platforms, such as iTunes, iTunes U, MOOCs, EngVid, and Podcasts. People can access these platforms on various types of devices,

such as tablet PCs and smartphones. According to Apple (2010), iTunes U has 350,000

lectures from the top universities around the world such as MIT, Harvard, and Oxford.

In addition, podcasts and iTunes provide video and radio content, such as CNN news,

and they are completely free to download to an iPad or other device. In 2012, Apple

released a new application, iBook author, to assist teachers in publishing e-books. The

new iTunes U 2.0 and iBook 2.0 were also released in January 2012. Teachers are now

in an environment where they can use applications to publish their own teaching

materials and produce online lessons by using advanced and free applications.

1) MIT and Yale University physics and economics courses on MOOCs

Tens of thousands of students have certainly received benefits from taking online

courses on MOOCS: they are free (at least for now), and they offer educators huge

laboratories for the learning process. Some students give very positive feedback and

review comments on the courses provided by MOOCs like the comment below:

I really appreciated the instructors' contributions to the discussion; their support,

patience and feedback.

- C. Engel, Stanford University

As we discuss in the problem description section, Forbes (2013) says that less

than 5% of people on MOOCs complete their courses. Based on students' feedback and

comment on MOOCs, a significant number of students do not finish their courses because

lessons on MOOCs do not give credits like in traditional schools. So one of the main

motivations for adult learners to study hard and complete whole courses does not exist on

MOOCs. Another reason is that students quickly lose their interest in studying with

online content with less than ideal teaching methods and approaches. MIT's physics and

Yale University's economics on MOOCs are good examples to illustrate what problems

they have. For the physics classes of MIT, since the camera set up in the back of

classroom is far from the professor, students online cannot see what the teacher is writing

on the blackboard. In the economics class provided by Yale University, the professor

speaks to the students in the physical classroom and not to the online students so students

may not fully engage in the class since they may feel like they are observers rather than

participants. Moreover, while professors write notes on the blackboard, students should

just be able to watch it. The professor should prepare the lecture notes and add it before

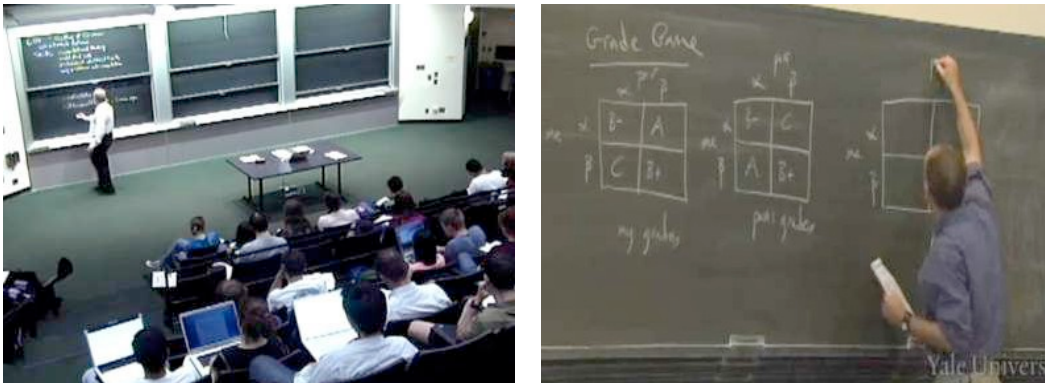they post their lectures (See figure 1.2).

Figure 1.2 From the left: MIT physics and Yale economics on MOOCs (2011).

Jonathan Haber at Stanford University (2013) identified four types of students:
auditors, who watched the videos throughout the course, but took few quizzes or
exams; *completers*, who viewed most lectures and took part in most assessments;
disengaged learners, who quickly dropped the course; and *sampling learners*,
who might only occasionally watch lectures (See Table 1.1)

Table 1.1 Students Demographics Image Courtesy of Jonathan Haber at Stanford University (2013). This table illustrates four different types of students on MOOCs.

Course	Auditing	Completing	Disengaging	Sampling
High school	6%	27%	28%	39%
Undergraduate	6%	8%	12%	74%
Graduate	9%	5%	6%	80%

2) Khan Academy for k-12 students

Khan has posted 3,500 free online video lectures that break down the obstacles of time and geographical limitation. Clear explanations about topics in science, physics, economics, and other subjects related to STEM (Science, Technology, Engineering, Mathematic).

However, the Khan Academy provides limited diversity in teaching methods and materials. First, one educator, Salman Khan, teaches most of the subjects and lessons by himself. Students have no other options in the choice of their teacher on Khan Academy. Second, the Khan Academy does not use various types of multimedia sources. The school offers students pictures to illustrate some concepts, but few other visual and audio aids like video or music. Lastly, the lectures on the Khan Academy barely use vivid colors, but instead use mainly black colored screen boards (See figure 1.3). Which colors instructional materials use is significant because color can give negative or positive emotions linked to cognitive performance relevant to learning, such as engagement and students' attitude for studying (Gorn and Chattopadhyay et al., 1997)
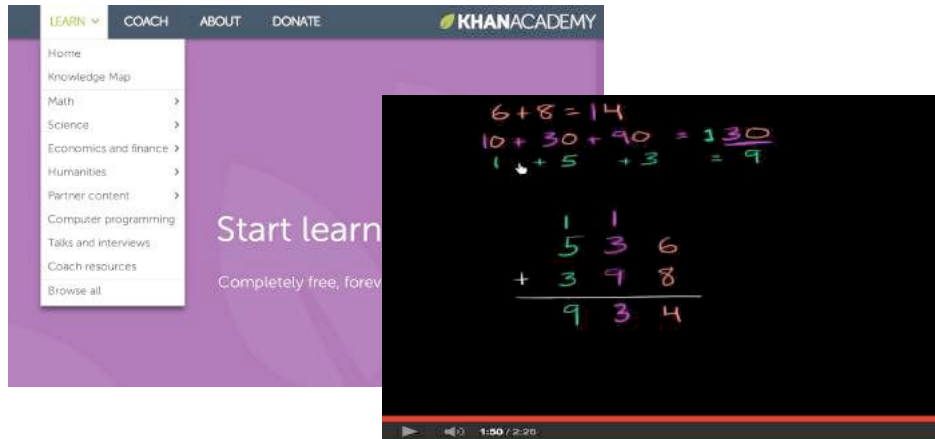
Figure 1.3 Khan Academy (2013) provides various subjects taught mostly by one educator, Salman Khan.

3) YouTube for everyone

YouTube (2011) states that 4 millions video clips are viewed each day and it has over 800 million viewers from 39 countries each month. Furthermore, YouTube is linked to Facebook, which has 900 million users, allowing users to share and interact with others efficiently. However, this strength can also be a weakness of YouTube. This means that too much information can make it hard to find target content in a short period of time. For example, when users type the keyword, "English education," more than hundred million video clips come up. The problem is that users have to check whether the video is what they are looking for. Also, people can see video clips unrelated to their topics in their search results. Since anyone can post a video on YouTube, some video clips may be inappropriate for learners (See Figure 1.4).

Moreover, since YouTube is not a non-profit organization, the website is decorated with advertisements, such as movie trailers or online shopping. It is ideal for

students to have websites where users are free from advertisements and unrelated content so that they can fully concentrate on their learning.

In addition, although strengths of YouTube are to offer people diverse subjects various video lessons, we believe that websites for education should have specific target populations. This will allow students to obtain deeper, more specific information by attracting people who have the same and particular interest.

Figure 1.4. YouTube search results with keyword, "English Education." It provides 242,000,000 results and some of them are video clips unrelated to the keyword (2013).

4) EngVid for ESL/EFL students

One of the most popular ESL (English as a Second Language) educational websites is EngVid. It has more than 162,000 subscribers and 5 teachers provide 550 free lessons (2013). However the layout of the site does not provide a clear way for students to navigate, and it is not clear who their target audience is. This is because the website has many advertisements with a lot of text and information on the same page (See Figure 1.5).

Webpages where students study on should have no distractions such as advertisements. Although teachers can create effective materials and lessons, if there are many images unrelated to topics around them, students may have diminished learning capacities due to high cognitive loads (Mayer, 2005). So designers and teachers should reduce distractions on websites where their content is conveyed.

Figure 1.5 The first page of Eng-Vid website has advertisements and too much text.

D. Exemplary online courses

Although a number of online lessons use traditional teaching methods and outdated materials, some scholars and universities make a lot of effort to make their online classes even more effective than face-to-face classes by tailoring their lessons for online learning. For instance, Harvard University on iTunes U offers PDF versions of syllabi, reading assignments, video lessons, and even assessment tests with feedback via emails (See Figure 1.6). All the content is downloadable on students' smartphones or tablet PCs so that they can study anywhere and anytime they want to.
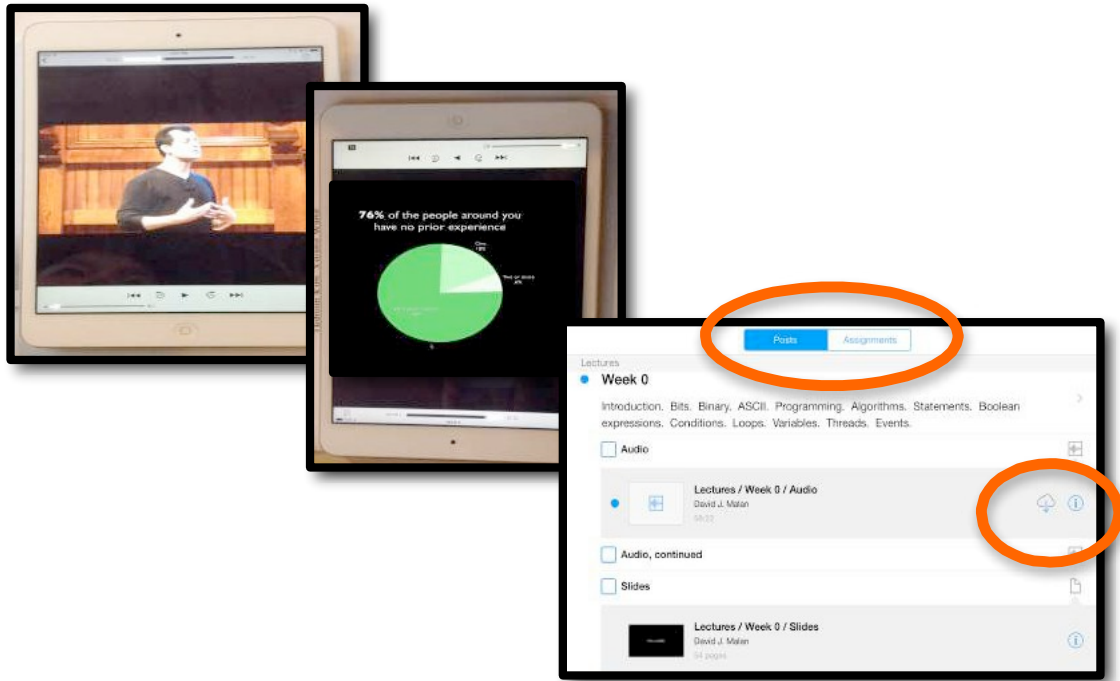
Figure 1.6 Harvard University CS50 on iTunes U (2012). From the top, the video lecture, summary slide, and assignments. All the content associated with the lectures are downloadable.

We believe that online classes can offer their own unique experiences to students, especially in the time when we can afford and deploy advanced technology for educational purposes. Interactive animation can be a good example to illustrate this. Since interactive animations allow students to study at their own pace with interactions and visual and audio aids, they give students strong ownership of studying and increase engagement.

2. Design

A. Learner Characteristics

1.Target Audience

We chose EFL (English as a Foreign Language) adult learners in two Asian countries, Korea and China, as target learners for this project. This is because these two countries are the biggest markets and the fastest growing countries in EFL education. The Educational Test Service, ETS, (2012) said, "Korea has the world's largest number of TOEFL test takers annually." And the English test market is expected to expand further. Robert Di Yanni, Board Director of American University College (2010) said that China has become the largest, most important, and most promising English language education market in the world. According to a survey conducted by Liu 2008 in China, each year about 200,000 people in Beijing attend English training schools, creating a market of 300 million US dollars.

Based on our survey results, we found that the target students for our project are Korean and Chinese adults EFL students, who have plans to study abroad within two years. Through our survey, they expressed interest on the topic about how to order coffee and food at a restaurant. In addition, students want wider selection in teaching methods, and more interactive content. Based on our students' opinions, they believe that 20 to 30 minute video lessons are the proper length for online English lessons.

2. Cognitive Development

Based on the age of our target audience, we will focus on the cognitive development of adults. Research shows that adult cognition has complex levels. For the same cognitive task, an adult will show different kinds of cognitive performance under different situations (Fischer& Yan, 2003). The cognitive performances of adults are more flexible, dynamic and complicated than those of children (Fischer& Yan, 2003). They

can think like children in a simple way or think in more complex ways to solve some abstract and complicated tasks (Fischer &Yan, 2003). The learning goal of our video lesson is to teach learners useful expressions to use at ordering food or coffee. The content is concrete, but there is some grammar knowledge that is abstract. We want to teach both useful expressions and grammar knowledge. Since our target audience is adults, our video lessons will use pictures and situations that are similar to the real world instead of using simple pictures and cartoon style characters. For the learning tests, we can design questions based on situations which may happen in the real world.

Online English training may result in isolated learning because learners may not have opportunities to gain meaningful interactions to people and the English environment (Moore, 2009). The lack of interaction may be a challenge to English learners (Moore, 2009). Therefore, we think it is important to create a community group for online English learners to give our users feedback and answer questions they may have during the learning. So in our website, we provide an email contact form on the Contact page. If they have questions, they can email us immediately. They can also contact us through Facebook or the YouTube Channel by clicking on the links we provide on the homepage.

B. Theory Foundation

1. Situated Cognition Theory

If schools can provide "authentic activities" to students, the learning experience will be more meaningful and will create some great learning outcomes (Brown et.al, 1989). One approach to providing authentic activities is cognitive apprenticeship. The cognitive apprenticeship approach can support learning in a domain by enabling students

to acquire, develop, and use cognitive tools in authentic domain activity (Brown et.al, 1989). In simulations, creating an environment where learners can learn from people who are specialized in that field is something we should consider. Another approach to guiding authentic activities is "legitimate peripheral participation" (Lave & Wenger, 1991). Learning occurs when learners participate in a social community consisting of experts and newcomers and people between the two levels (Lave & Wenger, 1991). Simulation learning environments should provide this kind of social community so that learners can gain knowledge and skills from experts or specialists to develop from a newcomer to a more experienced expert.

From this perspective, the best way to learn English is to be involved in the English culture. However, not everyone who wants to learn English can go study abroad, so we can use videos to create some situations that happen in English speaking countries. In this way, learners can be situated in the American culture and learn English better.

2. Cognitive Load Theory

English learning websites and video lessons as learning environments should follow the principles of cognitive load theory to avoid causing cognitive overload to the learners. There are some principles to foster generative cognitive processing: multiple modalities are better than single modalities (Plass, Moreno, & Bruenken, 2010); let the learner share in the learning experience not observe the learning experience (Plass, Moreno, & Bruenken, 2010); appropriate guidance is needed in order not to let the learner feel lost and frustrated (Plass, Moreno, & Bruenken, 2010); ask learners why and make them think (Plass, Moreno, & Bruenken, 2010).

Based on the cognitive load theory, we designed the website and video lessons by following these five principles. In our website, we provide instructions in every section so that users will not feel confused and they will clearly know where to go next. In the video lessons, we will not give too much information on one screen. The learning content is divided into chunks of steps so that learners will not feel cognitive overload. By giving them a *Pre-Quiz* and *Post-Quiz*, they can think about what they have learned and apply them in real-life situations.

3. Dual Channel Theories

Based on the *Dual channel* principle, Mayer (2011) explains that people have separate channels for processing visual or pictorial material and auditory or verbal materials (See figure 2.1). Since working memory is limited in capacity, two different forms of visual information will prevent students from effective and meaningful learning.
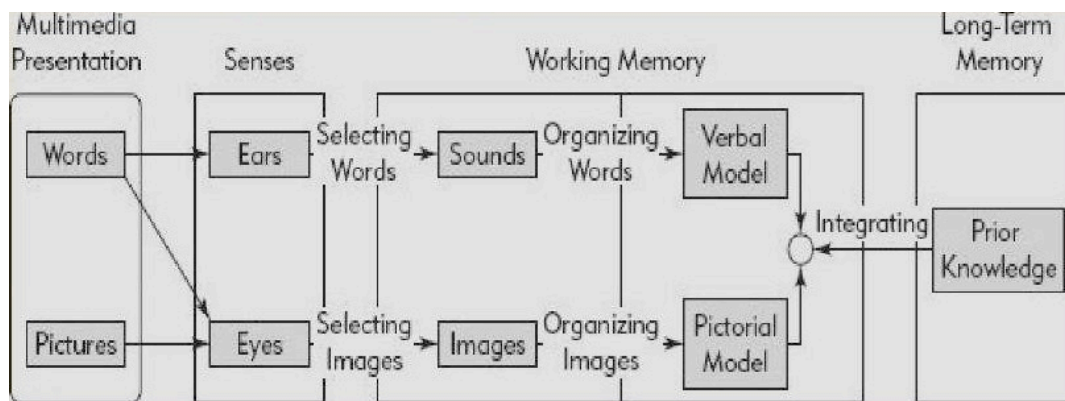
Figure 2.1. The principle of *dual channel introduced by* Mayer at the University of California (2011): a model of how people learn from multimedia lessons.

As we can see figure 2.1, in the left column, a lesson may contain graphics and words (in printed or spoken form). In the second column, the graphics and printed words

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enter the learner's cognitive processing system through the eyes, and spoken words enter through the ears. If the learner pays attention, some of the material is selected for further processing in the learner's working memory—where you can hold and manipulate just a few pieces of information at a time in each channel. In working memory, the learner can mentally organize some of the selected images into a pictorial model and some of the selected words into a verbal model. Finally, as indicated by the "integrating arrow," the learner can connect the incoming material with existing knowledge from long-term memory—the learner's storehouse of knowledge. Mayer (2011) insists, "Meaningful learning occurs when the learner appropriately engages in all of these processes."

4. Color-Coding Theory

Instructors should consider the importance of choosing colors used in lectures. Using different colors will give different emotional experiences, positive or negative. This can affect cognitive processes related to academic performance. Erez (2002) states, "Positive emotions have a crucial effect on cognitive processes that are relevant for learning, such as information processing, communication processing, negotiation processing, decision-making processing, category sorting tasks and even then creative problem-solving process." Isen (1987) also supports the idea that a positive emotional state improves recall and positive emotions serve as effective retrieval cues for long-term memory. Based on color-coding theory, we designed our lesson more frequently using vivid and certain warm colors such as orange, yellow, pink, and green. This will give more positive emotions to student and they may have more positive attitude while viewing our lessons. Tractinsky et al. (2000) state, "Users' positive perceptions about

learning in multimedia environments suggest that positive emotions were produced by the design of various multimedia elements, such as the visual design, design layout color, and sound."

5. Learner Control–Pacing Theory

Although our animation lesson only provides simple interactions, like buttons for going forward and backward, it may have a positive effect on students' learning. Niemiec et al. (1996) states that learning is improved when learners are given control over the pacing of information through features such as start/pause/stop buttons. Also, Meiji (2006) addresses, "Learning is facilitated best when multiple representations in interactive visualizations are dynamically linked and integrated with one another," and according to research conducted by Mayer (2001), students with control outperformed those who did not have any control over the pacing of the animations in learning and long-term memory. This is because controls allow learners to skip over easier parts and focus on more difficult parts of the video, which can be interpreted as avoiding the processing of redundant information by reducing cognitive load (Mayer, 2001). Also it is because learners need enough time to integrate new information into existing knowledge at a rate that reflects the capabilities and needs of the learner (Betrancourt 2005; Hasler et al. 2007; Mayer and Chandler 2001; Swaak and de Jong 2001; Tabbers et al. 2004). Furthermore, we design interactive animation since it is not content that teachers can normally implement in a physical classroom. The virtual world can give unique experiences to students and increase academic performance.

6. Split-Attention Principle

The split-attention principle states that comprehension of multimedia materials is hindered when learners are required to split their attention between and mentally integrate several sources of physically or temporally disparate information, where each source of information is essential for understanding the material (Ayres and Sweller 2005). Plass (2009) says that, "Examples for this effect are materials where a video is presented with subtitles, where a video and an animation are presented next to one another." Nevertheless, many online video lectures provide subtitles while they are watching them (See figure 2.2). In order to avoid split attention, our video lessons do not give subtitles while students are watching them, but instructors will explain the dialogues used in video lessons before or after watching.

Figure 2.2. This video lesson on YouTube provides subtitles on the same frame.

C. Content Analysis

Based on the learning objectives of our video lessons. We divide our learning content into two levels: knowledge and application.

Knowledge:

1) Terms and expressions which will be used in situations of ordering food and coffee: grande, cappuccino, latte, take-out menu, non-fat, the same for me, etc;

2) How to make a request: May I have… Can I get… I'd like…; I want…

3) Asking questions: What do you mean by… What would you recommend; Can I do a takeout order.

4) Basic sequence of ordering coffee: size-milk-flavor-drink type

   Basic sequence of ordering food: starter-main dish-drink-desert

Application:

We want to let learners apply what they have learned in the video lesson to order coffee or foods in real-life situations, but it is hard to assess because we cannot see how they order in a coffee shop or at a restaurant. In order to know if they can apply what they use in real life, we designed a quiz to test if they can make a good choice in some described situations. The questions in the quiz are based on the knowledge above (See figure 2.3).

6. Please fill out the blank below from one of the answer choices below.

Server: May I take your order?
Customer A: Yes, I will have shrimp pasta.
Customer B: That sounds great, (_____)
Server: Sure, I will you have shrimp pasta, too.

○ I'm fine.
○ Same for me.
○ Can you give me a minute?
○ How much is it?
○ None of the above is correct

Figure 2.3. A question in *Pre-Quiz*

Learning Goal and Objectives:

For this project, our goal is to conduct research on the effectiveness of online video English lessons.

The learning objectives of our video lessons are as follows:

1) To understand the terms which will be used in situations of ordering food and coffee: grande, cappuccino, latte, take-out menu, non-fat and etc.

2) To memorize the expressions used in those situations: how to make a request (may I have, I'd like); the same for me; what do you mean by…; what would you recommend…

3) To understand the sequence of ordering food or coffee: food (starter-main dish-drink-desert); coffee (size-milk-flavor-drink type).

4) To apply what has been learned in the video lesson to order coffee or foods in situations (the situations are described in the quiz, the learner will decide which choice is right based on what they learned).

3. Project Description

There are three main parts for the project description: conducting a survey, producing and publishing three video lessons and our homepage, and content evaluation. Before we designed our online lessons, a survey was conducted to analyze our target students so that we can confirm that what topics they are interested in. Finding out our target audience needs are important because we can make students more engaged in our lessons. Clark (2010) says, "The key point of e-learning is that it has the potential to customize learning to the unique needs of each learner and offer asynchronous learning, as well as it should provide 'on-demand' and 'in-time' learning for those who need the lessons."

Once our target students and topic became clear based on the survey results, the next step was to choose teaching methods and to create video lessons. There are three teaching approaches to online lessons considered as effective methods currently. The first one is online tutoring which is the same teaching method as what the Khan Academy uses. The second type is animation, and the third is a conversational teaching method.

Although the lecturing type of lesson is the most commonly used for distance education online, it was not produced. This is because students strongly insist that lecturing is not an effective way for them, and a lot of research has shown that lecturing is not recommended because it is a teacher-centered method (Kember & Gow, 1994; Samuelowicz & Bain, 2001). Instead, the focal point was to compare the teaching methods considered the three most popular and effective online and then figure out which one was a better teaching method for a specific topic and our target students.

The last step in our process is data analysis, according to the collected data: how long students watch video lessons, how many students watch the lessons, and students' scores on *Pre* and *Post-Quiz* before and after watching the videos on our webpage. Based on all these data, we evaluated our content. This will explain which video lessons and teaching methods are more popular and helpful than others to our students and why.

Part 1. Survey implementation

From the beginning of this project, we encouraged our potential audience to get involved by asking for responses to our survey via Facebook and Twitter for one week. The survey was provided in three different languages, English, Korean, and Chinese, so that people could respond in their L1 (mother language). Out of our survey respondents, 33 people (44%) were Korean, 32 people (42%) were Chinese, and 10 people (13%) were from other countries (See figure 3.1).

Figure 3.1. From the top: English, Chinese, and Korean versions of survey questionnaires were offered to students based on their L1.

The survey respondents totaled 75 people. About 56% (N = 45) of them are adult learners. 21 and 24 people (64%) among the 45 adult learners said that 43 (95%) have a plan to study abroad within two years to English speaking countries, such as the U.S. or England. In questions where up to three out of six answer choices can be selected, 23 respondents (51%) of 45 adults choose these two topics as the most interesting: the first one is about how to rent a house or find a place to stay in the States, and the second is about how to order food and coffee at the coffee shop or the restaurant and what the proper mannerisms are in the restaurant. So, "*How to order coffee and food at Starbucks and the restaurant*" is selected as the topic for our project (See figure 3.2).
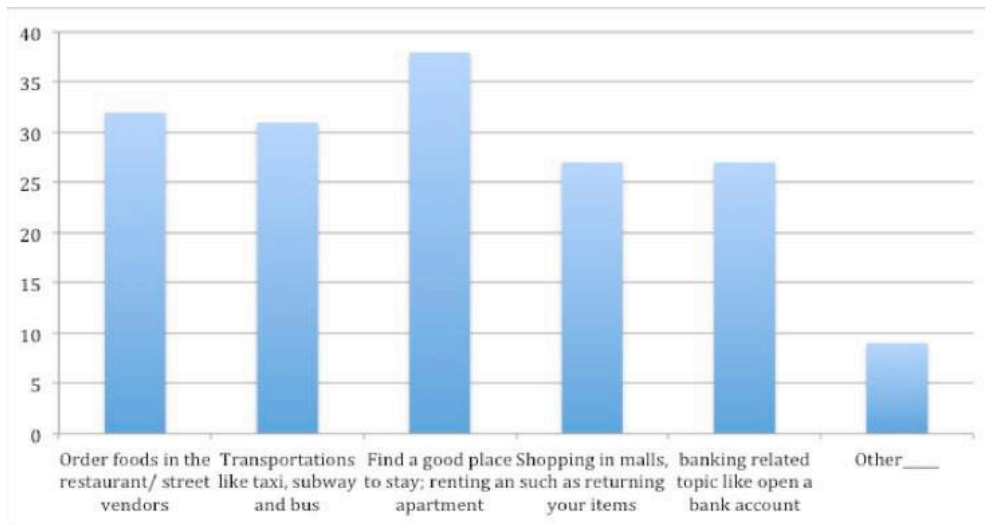
Figure 3.2 This graph represents what topics our target audience want to learn the most.

Other questions ask about online English learning experiences related to what online English content they have used and which are not helpful. Most people believe that face-to-face conversation is the most preferred way to learn English, but only 8 people (11%) say that they prefer to take online lessons to learn English. When all

respondents (N = 75) were asked a question about '*What features should be available to make you prefer to taking online lessons*,' 34 people (45%) say that wide selection in content, topic, and teaching methods should be provided. Also, the second ranked answer is that more interactions and collaboration between students and teachers are necessary for online learners (See Figure 3.3).

Lastly, for the question, "If you have to take 20 online lessons every month for English acquisition, how long do you think the video lessons should be?", the majority of Korean and Chinese respondents (65%) answered that online lessons should be longer than 20 to 30 minutes and other people chose 10 minutes as the proper length for them. So our team made all three lessons longer than 20 minutes and less than 30 minutes.
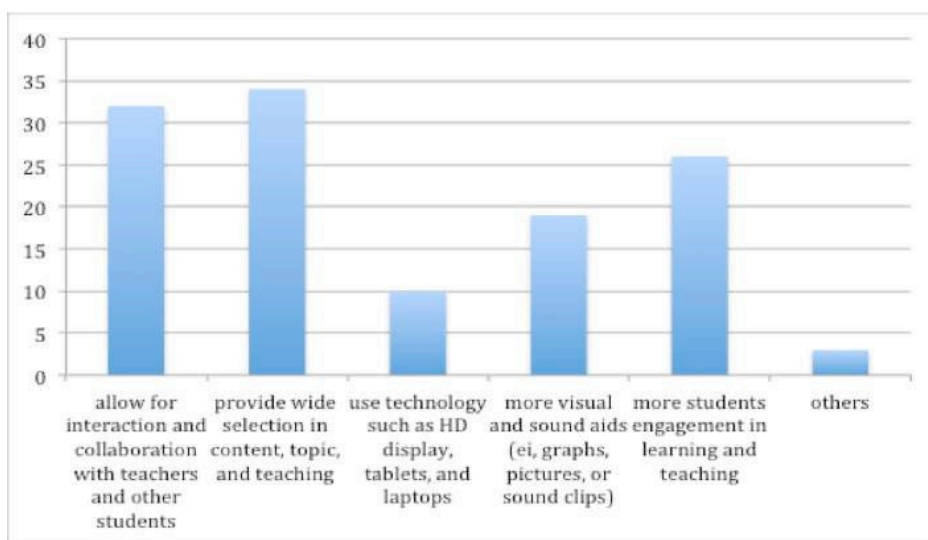
Figure 3.3 This graph represents what features our target audience want to enhance their learning experience in English online lessons.

Part 2. Homepage and Video Lessons Creation

Optimized educational learning environments both on the website and mobile devices should be given as traffic from mobile devices has been increasing. This is

because mobile device's display size and layout is different from one on the web for PCs. Providing enhanced user interfaces and layouts will make learning more effective, which allows students to access educational content anytime and anywhere with their preferred devices.

A. Homepage Creation

We use a webpage creation tool provided by Wix.com, and video lessons are posted on YouTube and then linked to the homepage from there (See figure 3.4).
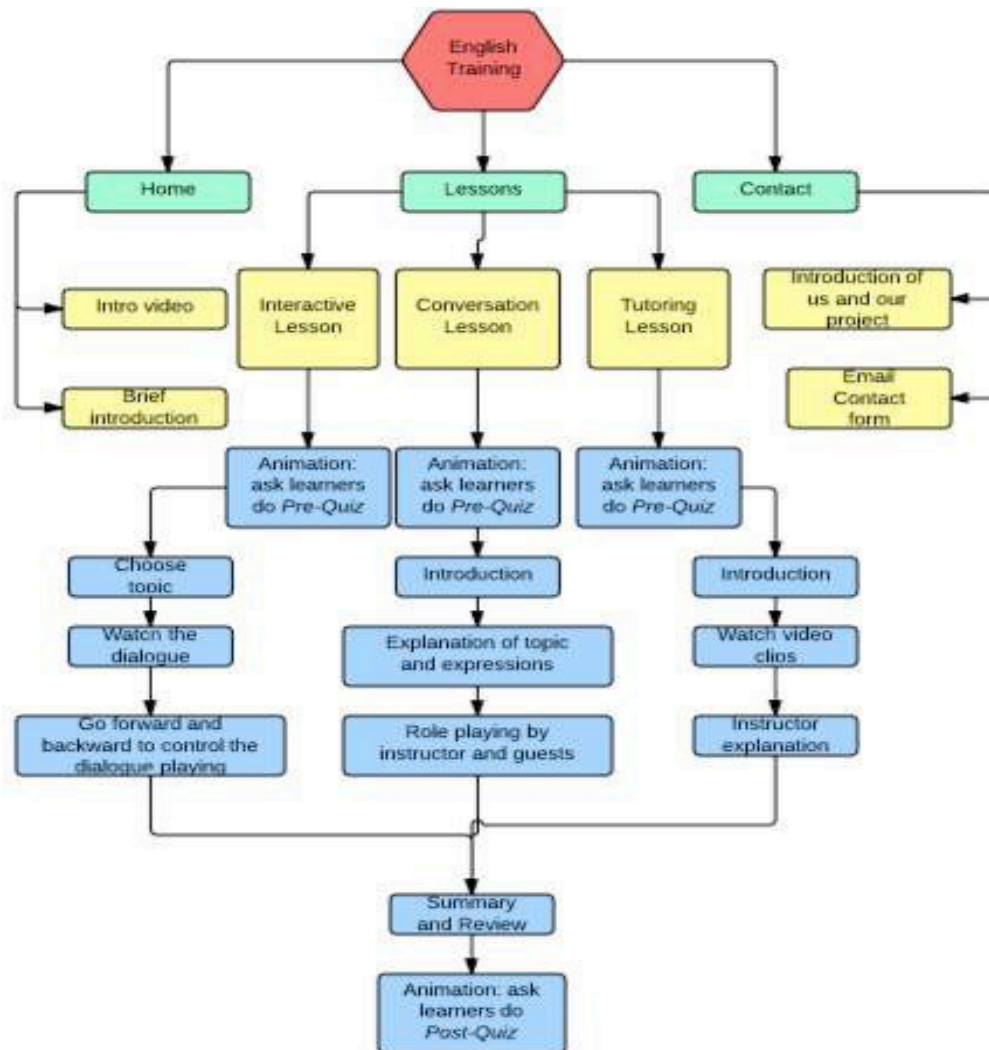
Figure 3.4. The homepage flow chart

1. The website should not have advertisements.

2. The website should explain clearly who the target audience is and what it is for on the first page so that students can navigate and use the content effectively.

3. Screen layouts should be optimized for both the Web and mobile pages so that students can see all the content like video clips and small texts appropriately (See figure 3.5).

4. Students should communicate with teachers anytime via email, Twitter, or other methods. (In this project, YouTube Channel, Twitter, and Facebook page are provided on the homepage and there is a section to send us email anytime (See figure 3.6)).

5. Students should be able to find proper content in a shorter amount of time than YouTube or other competitors. (See figure 3.7).
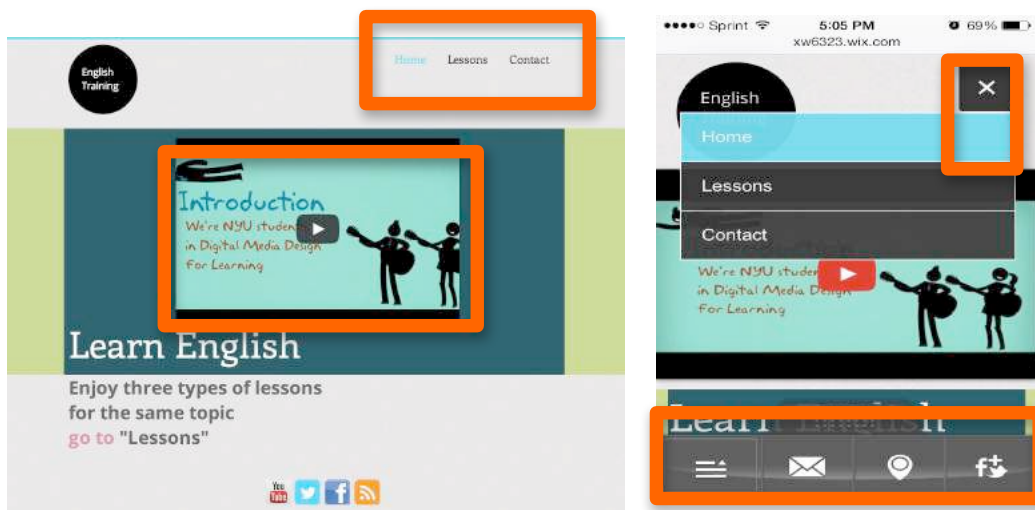
Figure 3.5. From the left, homepage on the Web for PCs and on the right, optimized page for mobile devices without advertisements. The homepage offers a simple menu with three sections: home, lessons, and contact. The introduction video tells who the target audience is and what the homepage is for to visitors. On the mobile page, there is a navigation bar on the bottom and the top right side.
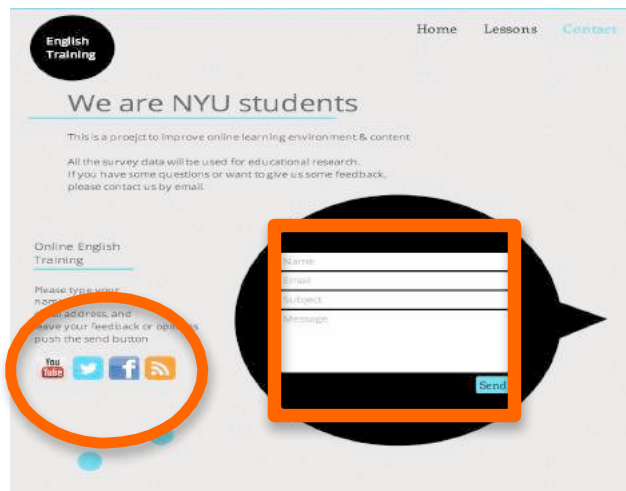
Figure 3.6. The homepage provides diverse ways to contact the instructors and designers anytime via SNSs and email.
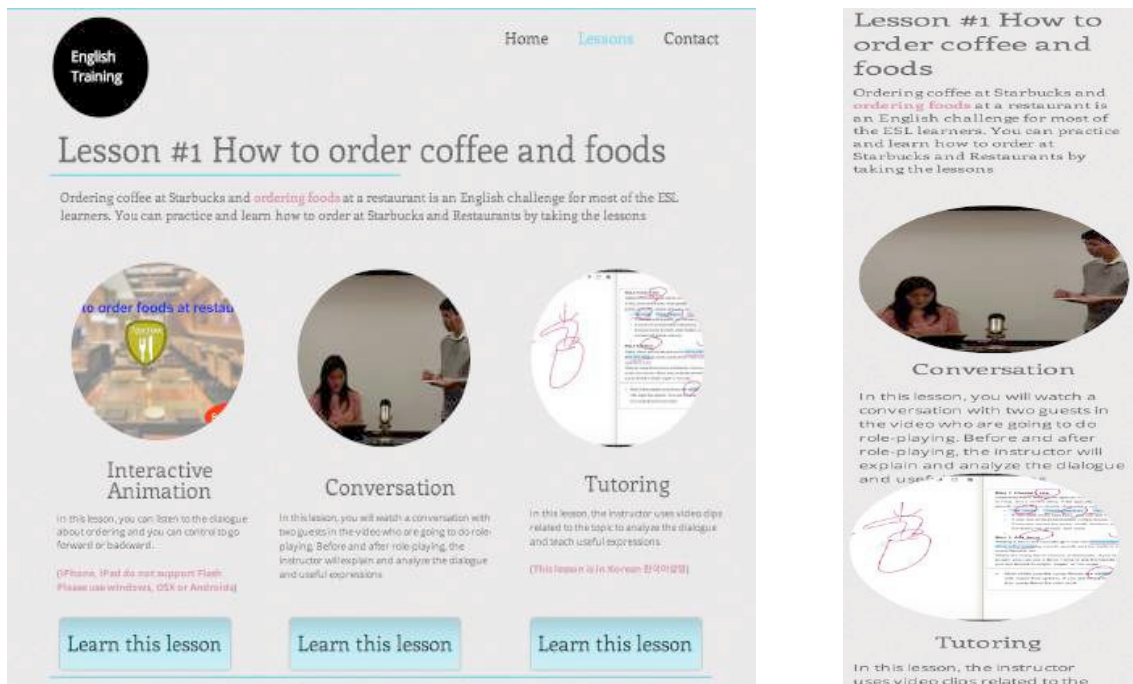
Figure 3.7. On the left, it is a layout for PCs and the right is one for Mobile devices. Students can find specific topics and online lessons quickly on the lesson section. All the lessons come with only related content.

B. Video Lesson Creation

According to all the data from survey and cognitive theories, the video lessons should have some elements like these listed below:

1. More interaction should be embedded into the lessons (Betrancourt 2005; Hasler et al. 2007; Mayer and Chandler 2001; Swaak and de Jong 2001; Tabbers et al. 2004).

2. The instructor should avoid providing unrelated images to their topics and his face should be not exposed to students in lessons (Mayer, 2005).

3. Text, visual, and audio aids properly provided to student without conflicting input types, such as video with subtitles on the same frame (Clark and Paivio 1991; Mayer 1989; Mayer and Moreno 1998; Plass et al. 1998, 2003).

4. Use proper colors, especially orange, yellow, pink, to give positive emotion and decrease cognitive load (Kalyuga et al. 1999; Keller et al. 2006).

5. Based on students' responses, the video lessons should be longer than 20,but less than 30 minutes long.

6. Based on students' responses, there should be a wide selection of teaching methods. In this project, three different types of lessons for the same topic are available: tutoring, interactive animation, and conversational.

In addiiton, the components and sequence to design the first video lesson are:

1. The lesson starts with animation to ask students to take a *Pre-Quiz* before watching the video lesson (See figure 3.8).

2. Introduce today's topic

3. Watch three video clips related to the topic: ordering coffee at Starbucks and food at the restaurant. The first video is about ordering coffee at Starbucks and the second one is a scene in an American sitcom, *Friends*, ordering food at the restaurant. In the third one, President Obama is ordering hamburgers in Five Guys (See figure 3.9).

4. Immediately before and after the video segments, the instructor explains and points out key expressions that students may frequently use by using a tablet to handwrite or draw something in the computer screen like Khan uses (See figure 3.10).

5. The lesson is ending with watching animation to ask students to take *Post-Quiz* (See figure 3.8).

Figure 3.8. On the left side, the short animation is to encourage students to take the *Pre-Quiz* before they watch the video lessons. On the right side is an animation to notice that students should not skip taking *Post-Quiz*. All three lessons have the same animation at the same timeline.

Figure 3.9. From the top: YouTube video, ordering coffee at the Starbucks; a sitcom, *Friends*, about how to order food at the restaurant; and President Obama ordering hamburgers at Five Guys.
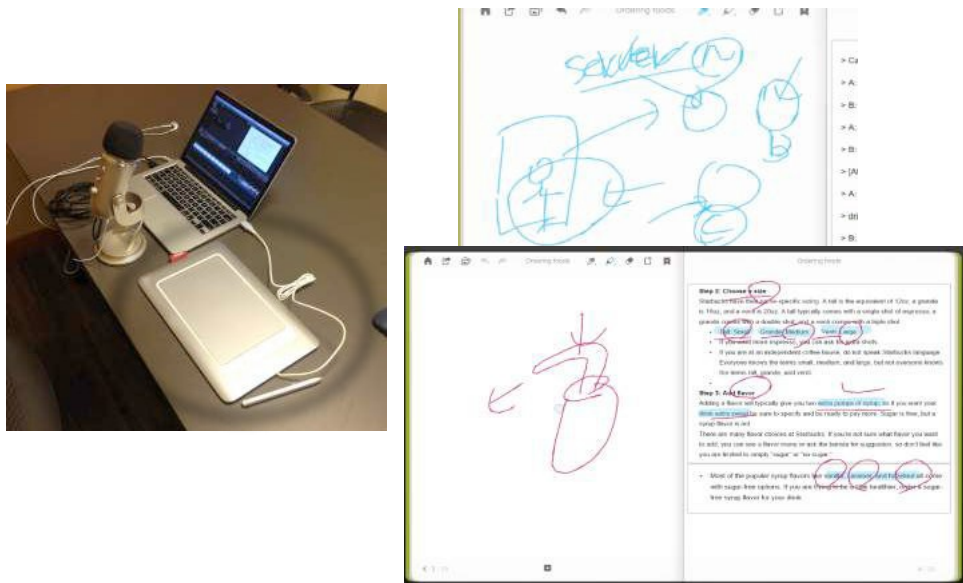
Figure 3.10. A tablet and microphone are used to record voice and handwriting on computer screen like Khan Academy lessons.

In the second type of lesson, the instructor is having a conversation about the same topic as the other lessons, but what it different is there are two guests: one is Chinese and the other is American and they role play in the video. The sequence and the elements in the lesson are:

1. Introduction of the today's topic and the guests and instructor (See figure 3.11).

2. Immediately before and after explaining today's topic and English expression, the instructors and two guests role-play (See figure 3.12).

3. The instructor explains English dialogue and points out useful expressions

Figure 3.11. With two guests, the instructor explains not only teaching English, but also an introduction of their cultural differences and diverse experiences related to the topic they had in New York as international students.

Figure 3.12. Two guests role play as students are recommended to do on their own. By watching what others who are not teachers do, students will be encouraged to believe that they can do so too.

The last type of lesson is interactive animation. Although there is no instructor in the animated lesson, it has male and female voiceover with various images and instructions. An important element is that students can interact with the content and use the control bar to go forward or backward so that they can play it at their own learning pace (Niemiec et al, 1996). The sequence and elements in the lesson are:

1. Students can choose specific subtopics: ordering coffee at the Starbucks or ordering food at a restaurant. (See figure 3.13).

2. The animation automatically stops after each segment, and students are required to click the arrow buttons to continue the animation as well as rewind or go to main page to start over. By clicking the arrow buttons, students can learn the content at their own pace (See figure 3.14).

3. Immediately before and after watching each subtopic, students will learn the key points again with summary sections at the end of each section by interacting with the content (See figure 3.15).
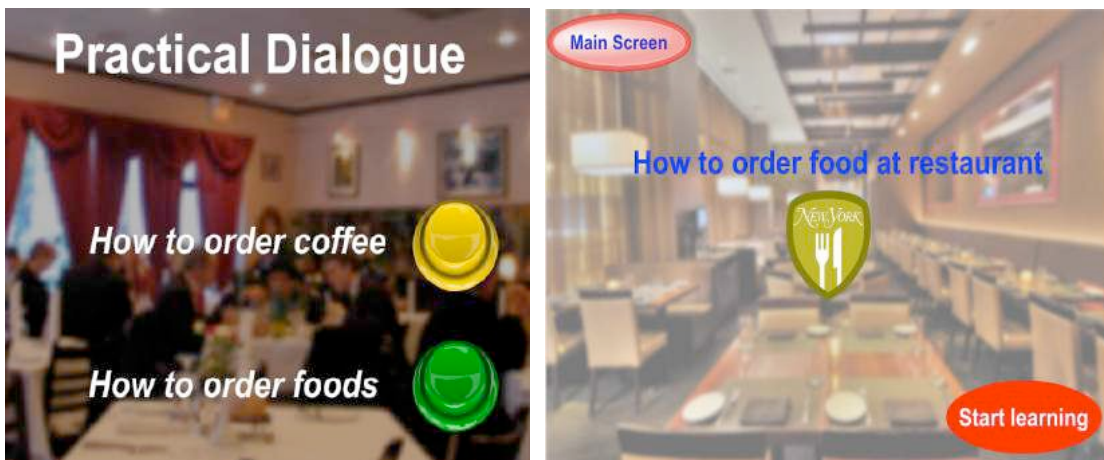
Figure 3.13. On the main page of the interactive animation, there are options for students to choose their subtopics. Learners can choose the part that they want to learn by clicking on the buttons beside the title. While the video plays, learners can go back to main screen at any time.

Figure 3.14. This picture shows how the dialogue is presented in this video lesson. Learners can go forward or backward while playing by clicking on the control buttons provides at the bottom of the screen. This makes students more engaged in their activities and provides more options so that they can decide what to do.
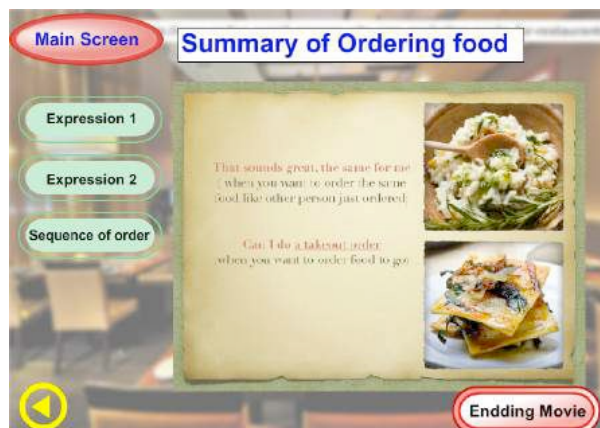
Figure 3.15 This is the summary screen of each part of the lesson. Learners can choose to see the specific summary by clicking on the buttons on the left.

Part 3. Content Evaluation

A common issue in education is bridging the gap between what learners actually know and what they think they know. Since we want to know about not only whether students enjoy watching our video lessons, but also how much they learn from them, conducting content evaluation was a significant part of this project.

A. Content evaluation methods

In order to have reliable evaluation, except for teaching methods, other points of our content were controlled. For instance, all the main points and content knowledge were identical in all lessons. Plus, only one instructor designed and taught in all three lessons to avoid affecting students' improvement in learning due to the different instructors' personal ability rather than teaching methods. All lessons were posted on the same page of our homepage at the same time, and then data was gathered for two weeks.

There are three main factors in evaluating our online lessons. The first factor is popularity (how many people access each lesson) and another one is duration time (how long people watch each video). The third is improvement between both scores *on Pre* and *Post-Quiz*. These data can help to interpret and find valid reasons why certain video lessons are popular while others are not. Popularity figures of each video were provided by YouTube (See figure 3. 16), and students' progress in English was measured through SurveyMonkey with *Pre* and *Post-Quiz* questions. This is to confirm whether they actually learned anything from watching the lessons. By analyzing and comparing both scores on *Pre* and *Post-Quiz*, we can see how much improvement they had after watching the video lessons (See figure 3.17).
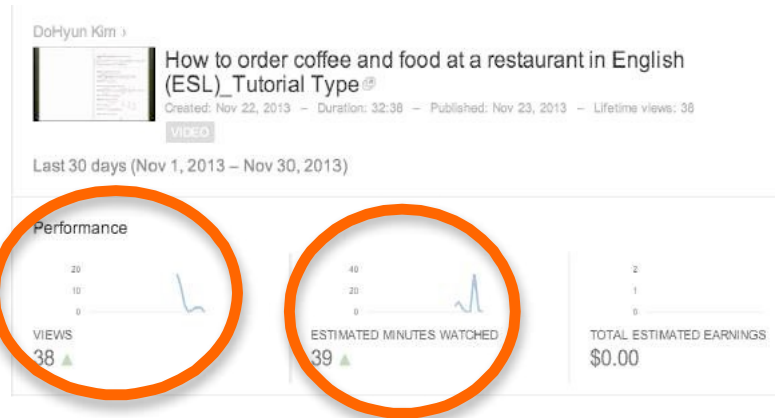
Figure 3.16. Data collected for one week on YouTube (2013). The data indicate that tutorial type video lesson has been seen by 38 people and 39 minutes.

Figure 3.17. On each lesson, it has the emphasized bottoms *for* Pre and *Post-Quiz* and they link to the quizzes on the website. All the quiz's results are compared so that students' progress before and after watching video lessons can be provided to evaluate the content.

B. Evaluation on lessons

According to feedbacks from students, analytic data, and quiz results, we conclude that interactive animation is the most popular among our students, but the tutorial type of lesson, second most popular, is more effective lesson than others, and conversation lesson are ranked at the last in popularity and effectiveness. Specifically, for tutorial lesson, total number of viewers who watch the lesson is 52 people and the total amount of time they watch the video is about 82 minutes. So, the average duration time is about 1minute and 57 seconds (See figure 3.18). On the other hand, conversation type of lesson has less popularity and duration time than tutorial lesson. Conversation type of lesson has 31 viewers and the total amount of duration time is about 45 minutes so, the average duration time is about 1minute and 45 seconds (See figure 3.19). Since tutorial lesson has more popularity and longer duration time, we conclude that tutorial lesson would be more effective than conversation lesson.

For interactive animation, we cannot measure its' popularity and duration time since YouTube do not support Flash video. However, it has more quizzes takers than other two types of lessons. Also, in our interview, leaners gave feedback that they preferred to watch interactive animation because they expected that animation would be more fun than other lectures. So, we interpret that the term, animation, could decrease giving negative emotion and increase positive attitude to the lessons than others. However, the results could be different because each student has their own preferences in learning and different prior knowledge.
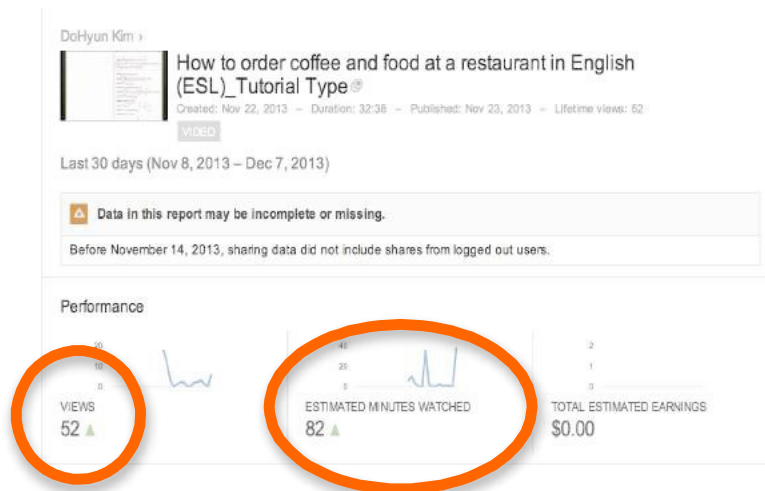
Figure 3.18. This figure represents the popularity and duration time of the tutorial lesson on YouTube (2013).
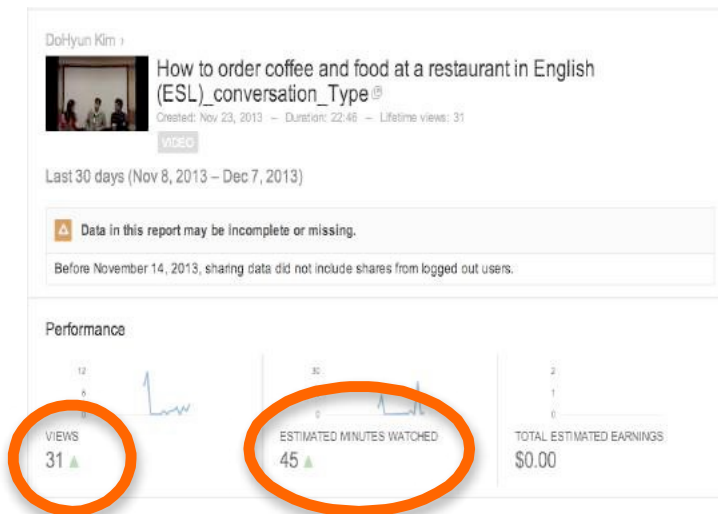

Figure 3.19. This figure represents the popularity and duration time of the conversational lesson on YouTube (2013).

4. **User experience walkthrough**

Linda is a senior college student from Korea. She got an offer to study at New York University. She has never been abroad before, so she doesn't know how to communicate with people in English in everyday situations. She starts to learn English from the website *English Training* which aims to prepare people who want to study in an English speaking country. She can learn many topics for practical dialogue in English. She decides to learn how to order coffee and food first because she thinks that this is the most basic skill for living in New York.

She goes to the homepage first and she clicks on the introduction video. After the introduction video, she knows what she can learn from this website.
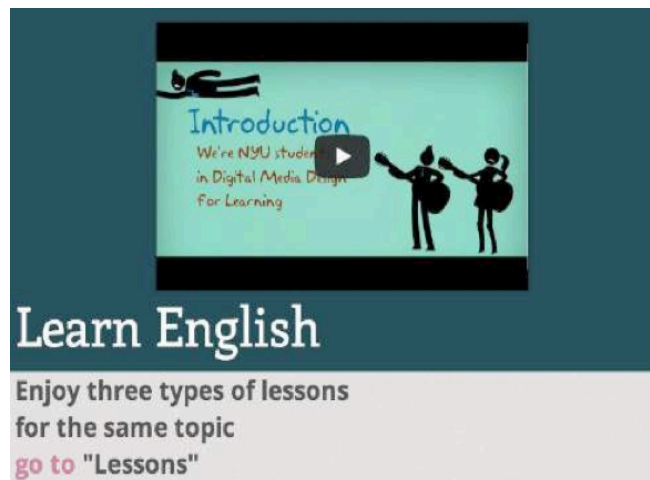
Figure 4.1. The first page of the homepage

Next, she clicks on the Lessons button. She finds that she can learn three types of lessons on one topic. By reading the description of each type of video lesson, she knows what each type of lesson is about and the characteristics of each type of lesson.
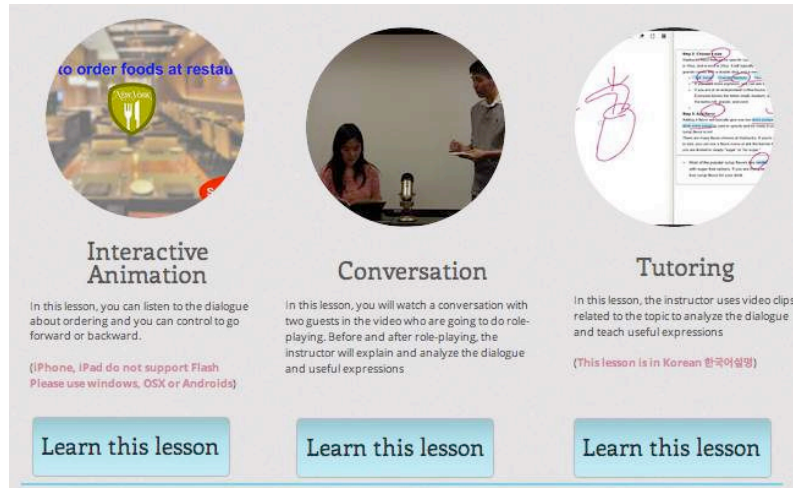
Figure 4.2 Lessons page

She wants to learn through a conversational lesson, so she clicks on the *"Learn this lesson"* button and goes to the learning page of this video lesson.

Figure 1.3 Conversation lesson page

By following the instructions on this page, she clicks on the *Pre-Quiz* button to do a *Pre-Quiz* (See figure 4.4).

Figure 4.4 Pre-Quiz

After she took the *Pre-Quiz*, she starts watching the video lesson. She sees three speakers talking about some cultural things about ordering coffee and food. One of them is from Korea, one is from China and one is from the US. Then she learns how to order coffee and food through the role-playing exercise in the video lesson. And last, she can see the summary of what she has learned through this conversation video lesson. By following the instruction, she takes the *Post-Quiz* after she finishes learning (See figure 4.5).

Figure 4.5 Post-Quiz

After she completes the *Post-Quiz*, she goes to the Contact Page. She knows more about our project and she emails us because she has some questions about the topic. Once she fills out the contact form and clicks on the send button, an email has been sent to us.

Figure 4.6 Contact information and form

Linda completes learning the conversation lesson under the topic about ordering coffee and food. She feels that she learned a lot and she decides to learn the other two types of video lessons to review what she has learned.

5. Conclusion

A. Implications for Future Design

We realized that in order to optimize online lessons, surveys and assessment tests also have to be optimized. Since we used a traditional test method, which is similar to paper-and-pencil tests, there were only about 10 people who took the *Pre* or *Post-Quiz* on our homepage. Although we have more than 100 respondents who watched our video lessons and students know that taking tests is important, they do not take tests because it is not mandatory. Students do not want to take tests or quizzes, which might be stressful or a nuisance, especially if they take free online classes. This is a distinctively different atmosphere from offline classrooms.

A number of students may expect that online classes should be fun and they think online learning environments are more likely to be informal settings rather than formal. So, if students have to take tests or quizzes, they quickly lose their interest in the classes and may get stressed from the fact that someone is evaluating them. So we realized that the *Pre* and *Post-Quiz* should be redesigned as a type of game or simulation so that students are willing to take them. Students may not even notice whether they are taking tests and may feel like they are playing fun games or simulations.

B. Conclusion

We cannot hope to find a perfect solution or model to solve all the problems of online education with a single research project. However, our research findings could give us a framework for instructional designers and teachers by allowing them to use workable prototypes on our homepage. We believe our design solutions could encourage instructors to incorporate their instructional methods for online courses with a wide range of research findings and cognitive theories to provide students with a meaningful learning experience.

Also, we believe that teachers and designers have to be active teachers and developers to solve many problems in education. Without making enough efforts, even after generations we will face the same problems as we see the same problems that we saw ten years ago in education online and offline. We hope instructors can create more quality educational materials and lectures online so that they can give positive influences on students' learning performance. Hopefully, our vision and perspective will stimulate people to rethink whether they are so mesmerized with a huge number of online resources without spending enough time on considering if the content is qualified and properly used to provide meaningful learning experiences for students.

C. Limitations

Due to the time limitation for this project, it was hard to have statistically valid numbers of respondents for our quizzes and views for our video content. We have 100

viewers and 10 test takers. Usually to reach enough number of students, it takes longer than 6 months based on previous experience on the YouTube channel.

Another limitation is the technical problems we encountered. We made the website using Wix, the free website-built tool which limited our capabilities in website design. We think that a learning community is an important part of an English learning website. With the help of learning community, learners will not feel isolated and they can be motivated by other learners on this website. However, we couldn't design a community using Wix. We used Flash to make the interactive lesson, but due to some technical problems, we did not realize some of our design ideas of interactive lesson. For now, the interactive feature of the interactive lesson is that users can navigate the lesson by clicking on the buttons on the screen. There should be more interactive features in an interactive video lesson. For instance, users should be able to drag and drop actions rather than just clicking them. If we had access to professional people in creating animation and graphic design, we can make some animations with high quality pictures to create the related situations.

Also, we designed our lessons longer than 25 minutes based on students' opinions. In the survey, we asked students "If you have to take 20 lessons per month, how long should they be for you?" The respondents answered that they believe the lessons should be longer than 30 minutes, some people said they should be longer than an hour. However, the data of actual usage showed that none of students watched the lesson for more than 20 minutes. With the result, we learned that what people think they want and what they actually do may be a lot different. This project gave us a valuable lesson that audience analysis and content evaluation are important because we can find

significant information about what people do not tell us and how people behave, which

may be different from what they are saying. Therefore, instructional designers and

teachers have to search for these hidden nuances by monitoring and evaluating their

students and their usage of the content.

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