![SDU logo](University of Southern Denmark)

University of Southern Denmark

Quiz-R-us

Re-conceptualizing quizzes to enrich blended learning in occupational therapy study lines

Marchetti, Emanuela; Valente, Andrea

Quiz-R-Us. Playful Support for Blended Learning

Emanuela Marchetti[1], Andrea Valente[2],
[1]Department for the Study of Culture, Media Studies, University of Southern Denmark (SDU), Odense, Denmark,
[2]Maersk Mc-Kinney Moller Institute, Section for Embodied Systems for Robotics and Learning, University of Southern Denmark (SDU), Odense, Denmark
e.manum@gmail.com anva@mmmi.sdu.dk

Abstract: In the latest years, the Danish school system has experienced an increase in digitization and experimentation with blended learning. Research in the field has shown that this approach enables students to be more engaged with the teaching material and classroom activities, giving them the opportunity of being more independent than in traditional lecturing settings (Graham et al 2012). In this scenario, online quizzes have become a popular tool for students' self and peer assessment.

This paper discusses results from a design study on the creation of new digital technologies to support the digitization of blended learning practice. Our study shows that the use of quizzes poses complex questions in relation to the participation of teachers and students in creating quizzes and in managing assessment. At the same time students can experience quizzes as "boring", unless these are contextualized within playful learning settings in groups.

Based on these findings, our study focused on two main issues: the need for making online quizzes more playful, and the need to support the workflow that takes place in the authoring and use of quizzes.

Keywords: Blended learning, gamification, playful learning, quiz, assessment

1. Introduction

In the past years, the Danish school system has experienced an increasing digitization of learning practice, with the goal of activating students in their learning. An approach that has started to be widely spread in Denmark is blended learning, which is "*the thoughtful integration of classroom face-to-face learning experiences with online learning experiences*" (Garrison and Kanuka 2003). Research on blended learning has shown that this approach brings positive results in relation to how students' engage with their teaching material and classroom activities become more dialogic and interactive than it is observed in traditional lecturing settings.

This study is the result of a collaboration between the bachelor programme in Web Development at the Lillebaelt Academy[1] (EAL for short) and the Occupational Therapy education from the University College Lillebaelt (UCL), in the area of Odense (Southern Denmark). The collaboration involved the authors and students from EAL as designers and developers, together with teachers and students from UCL as "clients", experts and users. Since students are involved on both sides, this collaboration has a two-fold learning goal: to explore how to support blended learning at UCL and at the same time to provide a real case for the EAL students.

From a broader perspective, this work aims at continuing the line of research discussed in Marchetti and Valente (2016), which investigated the creation of a learning platform to support the different needs expressed by teachers, students and developers. Building on Marchetti and Valente (2016), we will complement EAL students findings about their UCL clients, by taking into account the different attitudes and needs that the UCL teachers might express regarding the use of digital tools for learning. We are particularly interested in the different tasks and perspectives of the three actors: UCL teachers, their students, and the developers (i.e. EAL students).

Through our collaboration with UCL, we found that blended learning typically involves the use of online quizzes, with the goal of facilitating practices of self-assessment and peer-assessment among the students. However, UCL students and teachers described quizzes as "useful but challenging", mainly in relation to how online quizzes are experienced and how they affect the practice of assessment. Based on initial insights and literature review, in this study we investigate how a digital system could contribute to support blended learning within higher education. We devised a scenario called *Quiz-R-Us* in which all three actors are involved in the construction of a website for creating, sharing and taking quizzes. In Quiz-R-Us developers would implement quiz templates, to be used by quiz creators for generating and publishing specific quizzes (customized in the contents and visual style); the quiz players would then login and solve the quizzes, send feedback to quiz creators, show results to other players, with the goal of practicing to learn or memorize.

---

[1] Where one of the authors worked at the time of the study.

The rest of the paper presents related work (section 2), the empirical study (section 3), and the design and prototype testing (section 4). Section 5 presents a discussion of our findings, followed by conclusions (section 6).

2.   Related work

Blended learning has the potential of *"[…] integrating the strengths of synchronous (face-to-face) and asynchronous (text-based Internet) learning activities."* (Garrison and Kanuka 2003). Garrison and Kanuka discuss the complexity of implementing blended learning, especially given the large design space it creates and the abundance of different contexts in which it can be applied. In this paper we are interested in online quizzes, their development by us and EAL students, the authoring done by UCL teachers and their students, and the use of quizzes in the blended learning classroom.

Authoring of online quizzes in the learning context has been investigated for a long time, and very many tools have been proposed, implemented and tested, for different subjects: For example, White and Hammer (2000), discusses a web-based tool to support teachers' creation of self-grading quizzes within the area of psychology education. In Freasier et al. (2003) we find a web-based quiz system to support learning for undergraduate chemistry students, where quizzes are considered homework. Krajka (2003) offers an example of a tool for the rapid creation of web quizzes, targeted at quiz authoring for English teachers. However, teachers' problems were not all solved, since a few years later, even after the spreading of learning management systems (or LMS, special kinds of CMS dedicated to learning resources), we find that easy and rapid creation of quizzes was still investigated: "*In most LMS/CMS it is not so quick and easy to create auto-graded quizzes in effective various formats. We have made a prototype tool enabling rapid creation of quiz data importable to Moodle, a popular open source LMS"* (Yuuichi et al 2006). Contemporary teachers have more choice of tools, often free and of good quality. Self-grading quizzes can be created directly with Google Forms (Wolber 2012) in a very intuitive way, and without any coding; the data is automatically collected in spreadsheets for further analysis. The system is integrated in Google Docs and is considered user-friendly enough that even primary school students can work with it.

An interesting survey of authoring tools (not only for online quizzes) can be found in Haghshenas et al (2012); one of the tools mentioned is the "Quiz Maker tool" (part of the "Articulate" authoring tool) which allows for *branch quizzes*, where the answer to a question changes which question is presented next. We have encountered a similar idea in our study (in section 4).

Despite the progress in supporting online quiz creation, in settings where teachers have low computer proficiency creating online quizzes remains complex: *"[...] in three Indian peri-urban schools. We identify key issues impeding digital content creation by low computer proficiency teachers [...]"* (in Hutchful et al. 2010). We believe that this can be maintained in general, whenever IT competences are not part of the teachers' background, for instance in many primary and secondary schools in Denmark.

Many of the papers we surveyed focus on supporting teachers; another factor in the successful use of online quizzes is students' motivation and engagement. Online quizzes can be made mobile-friendly, and one of the main advantages of mobile tests is motivation: *"students were highly motivated and enjoyed using mobile application for testing"* (Romero et al 2009). Online quizzes can be made more engaging by:

1.   Mixing quizzes with games (as in Game-Based Learning), or

2.   Gamifying the experience of taking the quiz.

An example of mixing quiz and games can be found in Hamshire et al (2012), where a game is developed to support students starting a higher education. In that study quizzes are used in two ways: for self-assessment in relation with the learning game, but also in the design process. The developed game was in fact accompanied by a website: *"After playing the game, students can access the companion website that includes FAQs, quizzes, videos and student case studies"*. Quizzes were also used in the design of the game: *"[...] three broad themes used to scaffold the game design [...]. The most frequently occurring problems and concerns from these three themes were developed into quiz questions and dilemmas that became three sets of cards for use within the game, using verbatim quotes from students wherever possible"*. In other cases a quiz can be cast in a game setting, like in Dudzinski et al (2013) where a multiple choice test for pharmacy students provided the basis to build a multiplayer serious game.

Alternatively, the experience of creating and taking quizzes can be gamified. For example, Cheong et al (2013) describes a *"gamified multiple choice quiz implemented as a software tool and was trialled in three undergraduate IT-related courses"*. Gamification can also be done without implementing complex digital games,

as discussed in Boskic and Hu (2016), *where "the instructional designers at the University of British Columbia ventured into the "unknown" and transformed a "traditional" online course on adult education into a role-playing game"*. Successful gamification according to Boskic and Hu (2016) requires to take *"into consideration and combining four major aspects: good pedagogical principles, the suitable course, the instructor who was ready to take risks and a platform that was accessible and user-friendly"*. We discuss our approach in relation to similar aspects in section 3.

Another dimension of online and mobile quizzes that is related to students' engagement is the possibility to incorporate resources other than text. The study in Schön et al (2012) discusses *"a lightweight, media-supporting quiz application for mobile devices. [...] The quiz is implemented as a web application, also providing the use of media content such as pictures and videos"*. A problem in systems like this is how to establish links among the participants' devices; the solution in Schön et al (2012) is to use *"dynamically generated Quick Response (QR) codes"*. A modern platform that adopts a similar approach is Kahoot[2]. We find Kahoot interesting because it is free and widely adopted by Danish schools. Kahoot has built in competitive and cooperative modes; however, teachers often adopt another collaborative strategy: they divide students in groups and let them create parts of the same quiz. The resulting quiz can later be used by all students to prepare for an exam.

3.   Learning goals and user study

3.1   Methods and learning goals for the Web Development students

Methodologically the empirical work the authors conducted together with EAL students builds on User Centred Design (Preece et al 2015), UCD for short, and Lean UX (Gothelf and Seiden 2013), as required by the learning goals of the Web Development education. The class of EAL students included 17 first semester students, divided into four groups of 4-5 students, as typical in Danish higher education.

As explained by Gothelf and Seiden (2013), the Lean UX methodology combines user experience design with the lean start-up philosophy, which deals with how nowadays entrepreneurs engage in continuing innovation in order to build successful businesses. In this respect Lean UX is similar to and integrates well with UCD and to agile methods for software development, requiring the developers to involve users since the beginning of the design process in user studies and iterative formative and summative testing sessions, showing to the users low and high-fidelity prototypes, as in UCD (Preece et al 2015). The EAL students were also required to video record user sessions, in order to analyse the input gained, and use clips and screenshots as documentation for the project (Preece et al 2015).

Following Lean UX, the EAL students had to start their design inquiry from a research phase about UCL and their needs as users and stakeholders. Moreover, since the EAL students are also supposed to acquire graphic design skills, they had to conduct a visual research (Dabner et al 2010), looking at the current systems used by their clients and competitors, to take inspiration and also match with the branding strategy adopted by the clients. This blending of methods did not create particular issues, since the research stage of the lean UX method also requires developers to investigate existing systems, and to explore possible changes to the current systems and business outcomes.

3.2   User study, early findings and requirements

Few months before the spring semester started, the authors had two meetings at UCL, in which we were able to arrange three further sessions. First a user study, planned for early February, to enable the EAL students to be introduced to the methods and to have completed their visual research. To prepare for the user study each group of EAL students made a set of 5-6 questions to ask the UCL's students and teachers, about their experience with blended learning and assessment questionnaires. The second session, scheduled for late March, was a formative evaluation during which the EAL students had to show initial low-fidelity prototypes at UCL. Around one month later our students had to present at UCL more refined high-fidelity prototypes, with key functions implemented, to give a better impression on the final application and its scenario of use.

The analysis of the video material gathered during the interview clearly suggested that there is a strong agreement between UCL students and teachers that blended learning is more engaging and motivating than traditional learning. With respect to the use of quizzes, the teachers used Fronter[3], an LMS system that also

---

[2] Kahoot's webstie: https://getkahoot.com/ Last visited May 18th 2017

[3] Fronter's official webpage: http://www.itslearning.eu/fronter Last visited on May 18, 2017

includes modules for the making of multiple-choice quizzes. Kahoot and Study Quiz[4] are also used at UCL; Kahoot is a popular tool and it is used especially in relation to social events, during which the UCL students make quizzes for other classes and engage in group-based competitions.

Through the interviews and analysis of video recordings, we identified two categories of requirements:

- *Usability* – requirements on clarity and technical issues;

- *Experience* – the wishes expressed by UCL students and teachers for new user experiences.

Both UCL students and teachers said that quizzes contribute to blended learning, enabling students to check upon their own results and become more aware of their preparation. However, with respect to the first category, usability, we found that the use of quizzes poses challenges in relation to the participation of the teachers and the students in creating quizzes and in managing assessment, as the teachers see in quizzes an opportunity for reducing their burden in assessment. The UCL students were more active than their teachers in providing requirements about usability. They like how quizzes enable them to quickly see their results, especially when the results are shown after each answer, instead of at the end of the entire quiz. The UCL students complained that, especially on Fronter, they lack an overview of how many quizzes are available, the quizzes topics and how long quizzes are. Moreover, Fronter is considered slow in loading, and especially when using it on the mobile phone they have to login more than once, which was described as "demotivating" with respect to taking more quizzes.

Looking at the *experience* category, we found that UCL students and teachers agree that although social competitions through quizzes can be engaging and motivating, the experience of taking quizzes could be also "boring" and "dry" when quizzes are too long and only focus on memorizing terms. Both teachers and students argued that quizzes would be more valuable for learning if they supported playful experiences and deeper reflections on subjects. The UCL teachers were interested in making quizzes that contain a story, involving also a component of role play "in which the student can imagine to be in that situation, handling a patient". Quizzes might also have questions that "are not only right or wrong", hence enabling students and teachers to discuss ethical dilemmas. Use of videos and images was mentioned several times during the interviews as a desired feature, especially in relation to the storytelling approach. Therefore, building on our data we find a need for challenging the typical concept of multiple-choice questionnaire, to transform it into an engaging experience of reflection and peer learning.

4. Design and Prototypes

The EAL students worked in four groups and developed four different prototypes. In general we noticed a convergence of the prototypes to turn traditional multiple-choice quizzes and individual questions into small multimedia puzzle games. One group simply proposed to introduce images and clips to illustrate the content of multiple-choice questions and their possible answers. A more innovative concept was proposed by another group, who envisioned a questionnaire in which the UCL teachers could create a story by taking a video representing a specific case and dividing it into smaller clips. Moreover, clips could be used to display the possible answers that the students have to choose from; this represents a departure from the typical use of other systems like Kahoot, where videos represent questions and answers are in a textual form. Similarly, another group proposed a multiple-choice questionnaire in which a series of short clips, displaying for instance different stages of a therapy have to be placed in the right order (Figure 1). After the UCL students have placed the clips in the right sequence, the whole video will be played showing how the therapy should be performed. If the completed sequence is not correct, a different video will be played showing the consequences of the wrong therapy on the patients, eventually introducing some humour, like showing catastrophic scenarios for the poorly treated patients.

---

[4] Webpage: https://studyquiz.dk/ Last visited on May 18, 2017

Figure 1: Quiz where clips have to be placed in the right order.

The remaining group wanted instead to create quizzes in the form of multi-linear narrative, in which questions are represented by videos (Figure 2), and the choice made by the UCL students might trigger different story lines. Haghshenas et al (2012) discusses the textual version of a similar approach, called *branch quizzes*. The EAL students found challenges in figuring out how to handle the logical sequences of the questions, without having to involve too many storylines, so that the editing of the questionnaire would not become too complex and time consuming to manage for the teachers. The proposed solution was to allow two or three multiple storylines, and permit questions to converge on the same successive question, to contain the branching factor; for example different storylines could share the same ending.
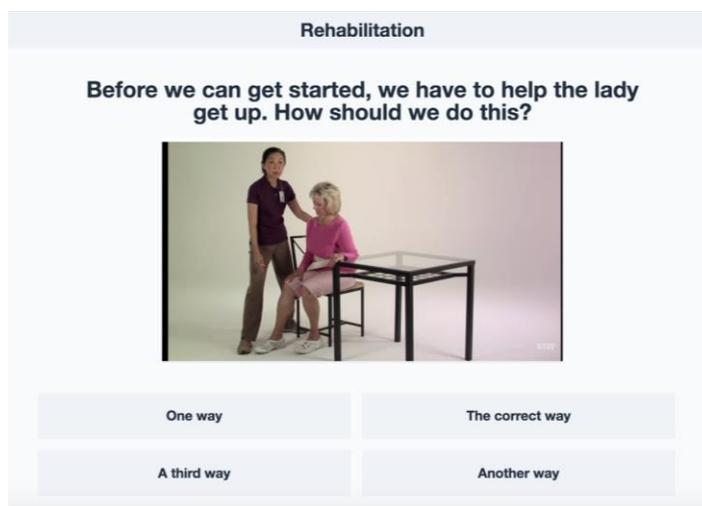

Figure 2: Quiz in which answers lead to see the consequences related to the chosen answer.

In conclusion the EAL students tried to re-conceptualize multiple-choice quizzes based on the data that they gathered during the user study at UCL. At the same time they strived to match the branding identity of UCL, so that the layout of the prototypes, typographic fonts and colors had clear reference to UCL main website.

5.   Testing and discussion

The EAL students presented their final prototypes at the summative evaluation (the second session) and received positive feedback by the UCL teachers for the prototypes' conceptual and visual qualities. These prototypes enabled the UCL teachers to see in which direction they would like to enrich their current practice of blended learning.

The UCL teachers liked the idea of having small puzzles embodied in the questionnaires, and the adoption of video clips. In particular they appreciated how both solutions could enable UCL students to see the consequence of their choices "so that they can understand why that answer was wrong!". This particular scenario was seen as opening the possibility for the students to have in depth reflections and group discussions on the given cases. Following up on this, the teachers asked if it would be possible to have "questions where there is no correct answer?". According to the UCL teachers, occupational therapists often deal with ethical dilemmas, in which there is not a straightforward solution, yet different actions could directly affect the well-being of the patients and on their relation with their therapists. They said that it could be interesting to have questions like: "When we come home to an old lady, we have to act like her guests, but we also have to make her practice. How do we react if she is yelling at us, spitting at us?". Possible answers could be: "Yell, give her a hug or walk away". The UCL students would then have to try and see which consequences their actions have on the old lady. This kind of questions could be easily implemented, however, it would not make sense to consider an answer as *right* or *wrong*, instead the UCL teachers suggested that there could be a space for writing a reflection on the choice made. The UCL students could collect points from the system, the teachers or from each other, for having written meaningful reflections. Moreover, this scenario opens the possibility to compile a list of the reflections written by all the students taking the quiz, providing a kind of collective *learning diary* for the UCL teachers and the students, enabling them to see how their critical insights on the subject matured through time.

This scenario involving videos also opened an interesting discussion, both on a practical and moral level. For instance, the creation of videos could be quite time consuming for UCL teachers and students, who do not have professional skills in video editing. Moreover, a moral dilemma might arise, in having to film and use images of sick individuals, eventually children and elderly, during their daily therapy. Hence, we discussed the opportunity to leverage on the abundance of materials already available on the Internet and on social media, also from the Internet channel of the Danish UCL institutions.

All together, the proposed scenarios were also appreciated from a practical perspective as they all enable the UCL students to see their scores while taking the quizzes, and this would foster more discussion when blended with other activities in the classroom. The UCL student who was present at the summative evaluation added that this could also help her in getting an overview of the questionnaire and of how she was doing.

5.1   Discussion

We faced various challenges during this project. The first was the fact that UCL students did not participate actively in the cooperation. During the user study we were able to involve five students from UCL, plus the two teachers who were our contact, but unfortunately during the evaluations we only had one UCL student participating; in this respect the testing was mostly based on the teachers' perspective, with only one student being present. This situation was generated by an issue of coordinating the cooperation between large groups of two different institutions, as both EAL and UCL students were intensively booked with teaching activities from their schools.

A second challenge was to support the EAL students in framing the project correctly. Designing and developing a system like Quiz-R-Us is different from developing a learning game, here the EAL students found themselves more in the position of designers developing digital design tools for others, who work in areas that are alien to the developers (i.e. the UCL teachers). Therefore, we find that this case enabled us to better grasp how the three roles (developers, UCL teachers and their students), are in a relation of co-dependence where each of them affects the other two, making it difficult to set clear boundaries on how authorship is allotted and shared.

Finally, despite the challenges in coordinating the project, interesting insights were gained through the design process. We found that both UCL teachers and students desired a more playful experience and that online quizzes can better support blended learning:

- If they do not require technical skills to be created, and take into account the roles and needs of all groups of users;

- If they provide partial results (instead of summative scores) because that allows discussion in the classroom and potentially deeper as well as peer learning;

- If they can use a larger palette of media contents, to engage quiz takers and to give more expressivity to the authors;

- If they have questions that follow multiple storylines, showing consequences of decisions, instead of just providing scores;

- If they can be stretched towards simulations or games, to provide more narrative and visual elements, and some form of interaction.

Especially with respect to the last point, during this project we realized that authoring quizzes is a familiar activity for teachers, as solving them is a typical activity for students. Quizzes are usually textual, linear and not very interactive, and are typically much less complex than digital games; however, by trying to imagine all the alternative ways in which a student could "navigate" a similar quiz, the teachers were actually talking about the gameplay of a simple simulation game. So starting from a known activity, we were able to involve teachers in a discussion that resembles game design, in a much more natural way than we expected.

6.   Conclusions

Through this study, we found that blended learning often involves quizzes, and that quizzes can pose complex questions in relation to how teachers and students experience assessment. At UCL they also shared similar desires for having a more playful experience with quizzes, yet neither of them could point at precise design requirements. This offered an opportunity to creatively explore innovative concepts, challenging the notion of multiple-choice questionnaires. Moreover, quizzes served as a concrete base to start a productive dialogue about a future playful scenario.

One of our most difficult tasks required balancing the learning goals of our EAL students with the development of good solutions for the UCL teachers and students. The EAL students for instance experienced the initial phases of project as confusing, as they feared that the project was too complex for their expertise in web development and in occupational therapy. We interpreted this as a problem in re-casting their role from developers of a system like a learning game to developers of a tool supporting the two groups of users. The EAL students eventually appropriated this new role and realized that they were in fact required to define both a prototype and to envision future scenarios for the users. In this sense through this project we (and our EAL students) could see more clearly how the three roles are in a relation of co-dependence with each other, and these discussions provided important insights about how to look at quizzes in novel ways, to make them more informative and engaging for the students.

We have planned to conduct a new iteration with UCL, in order to continue the development of Quiz-R-Us, focusing on a better involvement of their students and testing of more complete prototypes; we are also currently looking at companies working on digital platforms for blended learning as possible partners.

References

Boskic, N., & Hu, S. (2015). "Gamification in Higher Education: How we Changed Roles." In *European Conference on Games Based Learning* (p. 741). Academic Conferences International Limited.

Cheong, C., Cheong, F., & Filippou, J. (2013). "Quick Quiz: A Gamified Approach for Enhancing Learning." In *PACIS proceedings* (p. 206).

Dabner, D., Stewart, S. and Zempol, E. (2010) *Graphic Design School. The Principle and Practice of Graphic Design*, Wiley, Hoboken, USA.

Dudzinski, M., Greenhill, D., Kayyali, R., Nabhani, S., Philip, N., Caton, H., Ishtiaq, S., & Gatsinzi, F. (2013). "The design and evaluation of a multiplayer serious game for pharmacy students." In *European Conference on Games Based Learning* (p. 140). Academic Conferences International Limited.

Freasier, B., Collins, G., & Newitt, P. (2003). "A web-based interactive homework quiz and tutorial package to motivate undergraduate chemistry students and improve learning." *J. Chem. Educ*, *80*(11), 1344.

Garrison, D. R., & Kanuka, H. (2004). "Blended learning: Uncovering its transformative potential in higher education." *The internet and higher education*, *7*(2), (pp. 95-105).

Gothelf, J. and Seiden, J. (2013) *Lean UX. Applying Lean Principles to Improve User Experience*, O'Reilly, Sebastopol, USA.

Haghshenas, M., Khademi, M., & Kabir, H. (2012). "E-learning and authoring tools: At a glance." *International Journal of Research & Reviews in Applied Sciences*, *10*(2), (pp. 259-263).

Hamshire, C., Whitton, N., & Whitton, P. (2012). "Staying the Course-a Game to Facilitate Students' Transitions to Higher Education." In *European Conference on Games Based Learning* (p. 627). Academic Conferences International Limited.

Hutchful, D., Matur, A., Cutrell, E., & Joshi, A. (2010). "Cloze: An authoring tool for teachers with low computer proficiency." In *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development* (p. 21). ACM.

Krajka, J. (2003). "Making web-based quizzes in an instant." *Teaching English with Technology*, *3*(1), (pp. 51-56).

Marchetti, E. and Valente, A. (2016) "It Takes Three: Re-contextualizing Game-based Learning, Among Teachers, Developers and Learners", In *10th European Conference on Games Based Learning: ECGBL 2016* (p. 399), Academic Conferences and Publishing International, Sonning Common, UK.

Preece, J., Sharp, H. and Rogers, Y. (2015) *Interaction Design. Beyond Human Computer Interaction*, New York, USA.

Romero, C., Ventura, S., & De Bra, P. (2009). "Using mobile and web-based computerized tests to evaluate university students." *Computer Applications in Engineering Education*, *17*(4), (pp. 435-447).

Schön, D., Kopf, S., & Effelsberg, W. (2012, September). A lightweight mobile quiz application with support for multimedia content. In *e-Learning and e-Technologies in Education (ICEEE), 2012 International Conference on* (pp. 134-139). IEEE.

White, R. J., & Hammer, C. A. (2000). "Quiz-o-matic: a free Web-based tool for construction of self-scoring on-line quizzes." *Behavior Research Methods*, *32*(2), (pp. 250-253).

Wolber, A. (2012) "Use Google Forms to create a self-grading quiz" http://www.techrepublic.com/blog/google-in-the-enterprise/use-google-forms-to-create-a-self-grading-quiz/

Yuuichi, S., Toshihiro, K., Seisuke, Y., & Hiroshi, N. (2006). "Web-based rapid authoring tool for LMS quiz creation." In *ITHET'06. 7th International Conference on Information Technology Based Higher Education and Training, 2006,* IEEE, (pp. 617-620).