ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

Designing a MOOC to foster critical thinking and its application in Business Education

Claudia Zimmerman
University of Graz
Academy for New Media and Knowledge Transfer
Graz, Austria

Gernot Dreisiebner
University of Graz
Department of Business Education and Development
Graz, Austria

Elke Höfler
University of Graz
Academy for New Media and Knowledge Transfer
Graz, Austria

Corresponding Author: Claudia Zimmerman, claudia.zimmermann@uni-graz.at

Abstract

This paper provides a didactical model for Massive Open Online Courses (MOOCs) to support the acquisition of 21st century skills such as critical thinking. For this purpose, the didactic triangle as a model of teaching and learning is extended to allow for the consideration of experts, resources, literacy and an all-encompassing learning space when designing digital learning settings. The "Dr. Internet" MOOC is presented as a case study for the proposed didactic model. Preliminary results from the evaluation of this MOOC indicated that the setting had met with reasonable acceptance from the participants. Based on these findings, we argue for a more extensive introduction of digital learning settings with an output-oriented approach to foster the acquisition of skills rather than simply knowledge.

Introduction

Due to digitalization, the topic of informal learning in digital contexts has become increasingly important. Skills required by 21st century learners are – among others – critical thinking, communication, collaboration and creativity (National Education Association, 2016). However, these learning processes necessitate not only a learner (student) and a specific subject matter (or skill) to be learned, but also a teacher (Meyer, 2012), acting as a coach and enabler of learning processes. To provide learners with informal digital learning settings, various forms of

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

Massive Open Online Courses (MOOCs) have been developed, which can also act as an extension of the classroom and which can have the purpose to assist the learners in acquiring skills, rather than acting as a mere platform for distributing information. However, MOOCs often lack a profound didactical model. For example, Ayala, Dick, and Treadway (2014) analyze factors for online-course satisfaction in business education and concentrate on the influence of content, accreditation, learning style and technology – indicating an input-oriented view on teaching and learning and not considering the underlying didactical model of the MOOC.

The purpose of this paper is to provide a didactical model for teaching and learning in digital contexts based on the concept of the didactic triangle (e.g. Meyer, 2012) to foster 21st century skills such as critical thinking. For this purpose, the didactic triangle as a basic model of in-classroom processes is extended by the dimensions of resources, experts and literacy and the surrounding dimension of the learning space to emphasize the focus on the formation of students' skills. As a case study for this specific didactical model, the Massive Open Online Course (MOOC) "Dr. Internet" is introduced. The presented MOOC demonstrates the viability of integrating teachers, learners and external experts into a setting of informal learning. Investigations into current applications of MOOCs in the field of business education indicate high potential for this type of MOOC (Ayala et al., 2014; Clarke, 2013). Thus, the topic has received an increasing amount of attention within recent years, making MOOCs with the purpose of skill acquisition rather than information distribution a field of great significance for research in business education.

A model of teaching and learning in digital contexts

Teaching and learning in digital contexts requires an underlying didactical model – similar to basic models designed for in-classroom learning. This section addresses the following matters: How can didactic situations be modeled? In which formal and informal settings can learning take place? What is the result of these learning processes and which skills and competences are important for 21st century learners?

The didactic triangle as a model of in-classroom processes

When designing a teaching and learning setting, the modeling of basic in-classroom processes is vital. The didactic triangle (Meyer, 2012) is a simple model of a didactic situation, since it points out that all parties involved are interconnected and have to be considered when designing teaching and learning settings. The didactic triangle in Figure 1 shows that teacher, student and subject matter are equally important aspects of every didactic situation and that all three elements are in bilateral relation. In contrast to other illustrations of the didactic triangle (e.g. Riedl, 2004), Figure 1 contains no information about the kind of relationship between teacher, student and subject matter. For example, Riedl (2004) puts the subject matter on top of the triangle, as the subject matter is taught by the teacher and learned by the student.

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

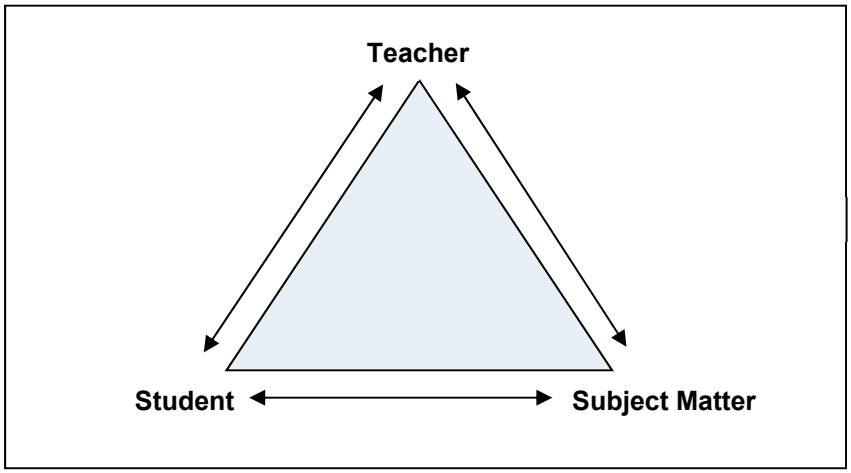

Figure 1. Didactic triangle. Adapted from Meyer (2012).

However, the simple model of the didactic triangle exhibits two limitations: (1) Processes of teaching and learning do not exclusively take place in the classroom. In addition to these formally recognized learning processes, there are informal learning processes that take place outside of the classroom, and for those the role of the teacher is of a different, more complex nature. (2) The didactic triangle might be a simplified model of an input-oriented teaching and learning setting. However, in the past decades, pedagogics has made a shift towards output-orientation, with the students' competences becoming the primary focus of teaching. This shift of teaching and learning settings towards output-orientation manifests itself in various forms, for example in competence orientation or the consideration of numerous literacy concepts. How to address these two limitations in designing modern teaching and learning settings is subject of the following elaborations.

Formal, non-formal and informal learning

The role of the teacher – despite being at the top of the didactic triangle in the illustration above – depends on the learning setting. Learning might take place as formal, non-formal or informal learning. *Formal learning* occurs in institutionalized learning environments (e.g. schools, universities) and leads to formally accredited degrees or diplomas. *Non-formal learning* does not lead to graduations, but includes a purposefully designed learning setting which might be supervised by a teacher (e.g. in the case of some MOOCs). In contrast to formal and non-formal learning, *informal learning* does not happen in institutionalized settings, but rather spontaneously, learner-led and without evaluation (Eshach, 2007).

Informal learning settings occur in countless contexts, e.g. a person might learn critical thinking by comparing articles in two different newspapers. Digital learning environments can be used to formalize such informal learning settings (Dabbagh & Kitsantas, 2012; McLoughlin & Lee, 2010). For this purpose, the didactic triangle might be used as a framework to intentionally model the teaching and learning setting. The idea behind the didactic design of the learning setting

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

described within this paper is to take a common informal learning process and provide a practically tested model that can be used to convert an informal into a formal learning setting.

Concepts of literacy

Learning processes result in the formation of competences or literacies. Within this publication, we follow a broad understanding of the term literacy (United Nations Educational, Scientific and Cultural Organization, 2006). In the 21st century, the definition of being literate is closely tied to the proper handling of new media and modern information technologies. An information literate person "must be able to recognize when information is needed and can locate, evaluate, and use effectively the needed information" (American Library Association, 1989). Following this notion, Markauskaite (2006) describes various related forms of literacy in an extensive review: digital literacy, computer literacy, technological literacy, information literacy or – in broader terms – new literacies or 21st century skills.

21st century skills – the four Cs

21st century skills are important assets in a modern work environment. The National Education Association (2016) defines four key competences to be achieved by 21st century learners: critical thinking and problem solving, communication, collaboration as well as creativity and innovation. Primary driver for the significance of these *4Cs* are technological advances. First and foremost, 21st century learners must possess the ability to critically reflect upon information available via modern information and communication technologies. Since these technologies offer the potential to reach an ever-growing number of recipients, communication-skills are becoming increasingly important. Because of the greater complexity of modern work-environments, the ability to collaborate in multi-professional teams represents an essential skill. And since dynamic and constantly evolving computer technologies affect an increasing share of tasks in the learners' environment, creativity and innovation are also among the four main skills for 21st century learners.

21st century skills are closely linked to digital learning environments. A broad definition of digital competence, which outlines the concept "as the confident, critical and creative use of ICT" (Ferrari, 2013, p. 2), includes two of the four previously discussed elements. Critical thinking also represents a fundamental part of every business student's skill set (Claiborne, Desai, & Lindenberg, 2016).

Within this paper, an approach to foster critical thinking in a digital learning environment is developed. The purpose of this paper is *not* to diminish the importance of other – equally relevant – skills and competences, but to offer a model of how a digital learning environment can be designed in a way to stimulate critical thinking (a 21st century skill) of students in tertiary education. The model described in the following section addresses all three dimensions of the didactic triangle: teacher, student and subject matter.

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

MOOCs as a learning environment

When George Siemens published his paper "Connectivism: A Learning Theory for the Digital Age" in 2004, he did not only describe a new learning theory but also a new learning environment based on actual societal requirements. He claimed that learning was a lifelong, continuing process, which is often related to informal learning processes: "Learning now occurs in a variety of ways – through communities of practice, personal networks, and through completion of work-related tasks" (Siemens, 2004). Formal learning settings can no longer accommodate all the skills needed by the learning individual, since modern working experiences are less predictable and predefined. People hardly ever stay in one professional field for their entire lifetime, but change fields of work or lines of business. Furthermore, technology plays an increasingly important role within the learning process, and with the rise of the Internet, the half-life period of facts in many areas is constantly shrinking (Arbesman, 2012; Siemens, 2004). It is impossible to know everything, consequently the "Know-how and know-what is being supplemented with know-where (the understanding of where to find knowledge needed)" (Siemens, 2004).

To keep pace with these societal developments, Siemens introduced a new learning theory, the connectivism, which is based on two main principles; namely that "[l]earning and knowledge rests in diversity of opinions" and that "[l]earning is a process of connecting specialized nodes or information sources" (Siemens, 2004). Two core skills derive from these principles, "[n]urturing and maintaining connections is needed to facilitate continual learning" and the "[a]bility to see connections between fields, ideas, and concepts is a core skill." The learners pace their learning per their own needs and (time) resources, and they decide in which specific fields of knowledge they wish to deepen their learning experience. Two things are especially important for a continuing learning experience: the learners' ability to learn on their own and their ability to tie and maintain nodes. These nodes comprise different resources, such as human beings, learning and teaching resources, teachers or experts in a field, libraries, online resources, and Web 2.0 tools, to name just a few of them. Consequently, the learning environment is highly customized, and the specific learning paths are not determined right from the outset, but evolve (individually) during the learning process.

In 2008, George Siemens and Stephen Downes designed a twelve-week course "Connectivism and Connective Knowledge" (CCK08) according to Siemens' connectivist learning theory, which marked the birth of a new course type, the cMOOC (i.e. the connectivist MOOC). The course program included guest speakers, live events and recommended literature as well as tasks for the students, but Siemens and Downes did not formulate specific learning objectives as predetermined learning paths. It was up to the 2.200 enrolled learners to decide which way to follow and which fields of knowledge to pursue. Consequently, there were no final exams and certificates but a learner-centered course where every individual learned on their own and in their specific pace.

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

Three years later Sebastian Thrun opened his lecture hall at Stanford University to an interested audience. His lecture "Introduction to Artificial Intelligence (AI)" attracted 160,000 enrolled learners before the portal had to be closed. The so-called xMOOC was born, where the 'x' stands for 'extended' or 'extension'. The physical lecture hall is extended to the virtual learning space. The learners also could form learning groups and to connect virtually outside the course in social networks or even physically in real-life learning groups. In accordance with a weekly schedule, the course content is transported via video lectures and supplementary resources such as web links, documents, and articles. The learners usually have the possibility to interact in a forum. Their knowledge is tested at the end of each week in a quiz based mostly on multiple and single choice questions or in a peer reviewed feedback system. The learners do not know each other, but are encouraged to find ways to connect within and sometimes outside of the course.

Thus, cMOOCs and xMOOCs are two rather new learning environments that meet an important criterion set by Dillenbourg, Schneider, and Synteta (2002) more than one decade ago: "A virtual learning environment is a designed information space" (Dillenbourg et al., 2002, p. 3). It is not the virtual space itself that can be seen as a learning space, but only a virtual space that follows instructional design principles (Kopp & Lackner, 2014). A second claim concerns the social component, because a "virtual learning environment is a social space: educational interactions occur in the environment, turning spaces into places" (Dillenbourg et al., 2002, p. 3). The MOOC is a starting point that can help to form learning groups, whose interaction does not necessarily take place within the MOOC but in a place chosen by the learning group itself. A third claim dissolves the strict distinction between physical and virtual learning environment: "Most virtual environments overlap with physical environments" (Dillenbourg et al., 2002, p. 4). Virtual learning environments may also accompany traditional in-class learning settings. A fourth claim focuses on the learner's perspective: "Students are not only active, but also actors: they co-construct the virtual space" (Dillenbourg et al., 2002, p. 3). The learners themselves make contributions to the virtual learning spaces; the course instructors offer possibilities, and the learners decide on their own how, where, and when to learn.

The MOOC itself, whether xMOOC or cMOOC, is the starting and primary meeting point for the learners. Its instructional design is crucial for the learners' well-being and motivation (Kopp & Lackner, 2014). A poor didactic concept or a misled didactic design is one of the most important reasons for dropouts, as Colman (2013) has pointed out. Traditional models often focus on the in-classroom processes (Meyer, 2012) or draw a strict line between virtual and physical learning spaces (Dillenbourg et al., 2002). To better understand learning processes and experiences in MOOCs, traditional learning models must be adjusted, especially when the MOOC's primary aim is not to deliver factual knowledge but to build competences.

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

Extending the didactic triangle to model digital learning environments

The traditional didactic triangle, as presented in Figure 1, focuses on the modeling of basic in-classroom processes which can be seen as one of its foremost limitations. Another limitation as mentioned above is its input-orientation, i.e. the focus on knowledge transfer instead of competence development. Its strength can be seen in highlighting the three main players in traditional learning settings and their interconnectedness.

Connectivist virtual learning environments benefit from an extension of this simple traditional setting. If we understand connectivism in the way Siemens (2004) described it, students not only *learn* the subject (content) *taught* by their teachers (Riedl, 2004), but they also learn from their fellow students. As Meyer (2012, p. 458) points out, it is not the student in the grammatical singular form, but the students that should be the teacher's target group. Meinert A. Meyer thus introduced two expansions of the traditional triangle: one of them is the focus on the students instead of the student, the second one is to add the society as a framework, since "[t]hree-quarters of what students learn is learned in informal settings at home in their family, in their peer group, with communication and information technology media" (p. 459). This point of view broadens the focus on in-classroom learning experiences to didactic perspectives on learning in general.

In the light of these insights, we would like to propose a different extension of the traditional didactic triangle: the addition of another triangle depicting other learning agents that are particularly relevant to digital learning environments. When it comes to MOOCs as a specific form of the traditional classroom, it is not only teachers and peer groups that students learn from, but also experts they may contact or meet in their course or their virtual learning space. Acting as a cornerstone for the additional triangle, it is the experts' experience and knowledge as well as their fellow students' experience that influences the learning process – not only on a factual basis, but also regarding the literacy gain. Literacy as the new triangle's second corner comprises the experiences and skills students already hold before the MOOC as well as the literacy they develop within the course. It is their prior knowledge and skill pool that shapes their ability to learn in a self-organized way and to find and evaluate information, to name just major two skills. A third corner can be identified in the resources used within and outside the course. MOOCs are mostly video-based, but there is supplementary Web 2.0 technology that enhances collaboration (e.g. forums, chats, messaging systems, social networks, collaborative writing tools), and often courses include web links that lead to the Internet as a learning resource, as well as reading recommendations. The teachers only make a preliminary selection from all the resources available in the virtual learning space and offer the learners a potential learning path. This selection plays an important role for the students' motivation to deepen their knowledge, as Colman (2013) has shown. The teachers' experience and competence to choose appropriate resources is critical; as is the students' literacy in finding supplementary resources that fit their own learning needs. The students tie nodes, they build up connections with their

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

fellow students, with the subject matter, their teacher, and experts in the field as well as the resources used within and outside the course itself. In doing so, they expand their skills, e.g. methodological and social skills, but also those skills that have been identified as essential assets for 21st century learners, like communication, collaboration, and especially critical thinking.

These nodes in the triangles and their interactions are not only based in a physical environment, but also in the virtual space, which is the predominant setting in MOOCs. Hence, the traditional triangle should not only be extended by adding a second triangle comprising Resources, Experts and Literacy as important players, but also by including an all-encompassing dimension, which is the *Learning Space* that surrounds all six players as shown in Figure 2.

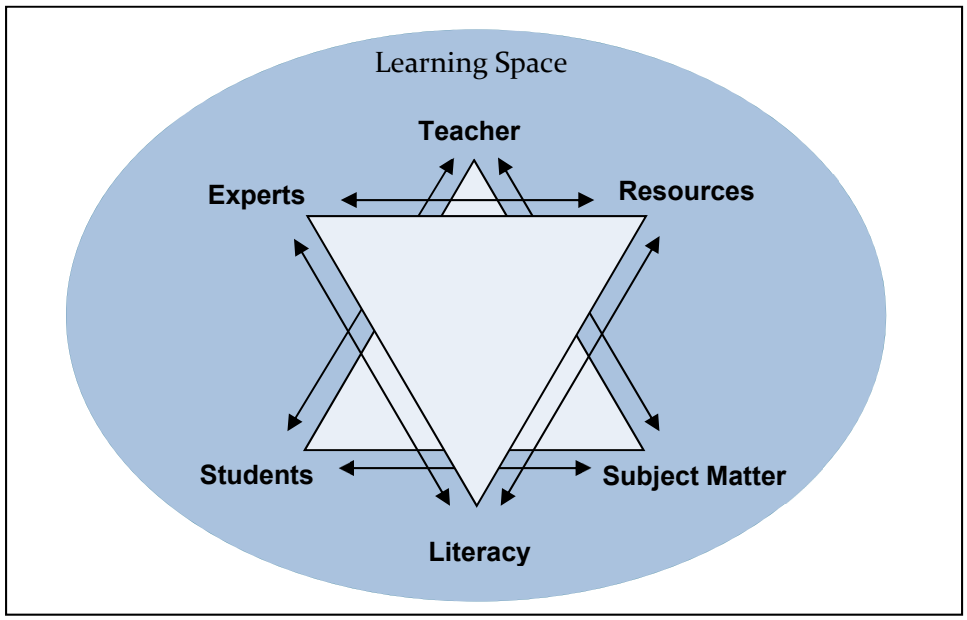

Figure 2. Extended didactic double triangle. Own representation based on the didactic triangle of Meyer (2012).

The learning space can be described as the virtual omnipresent space that cannot be seen as the Internet itself. Using the traditional triangle's diction, this learning space is a selection of possible nodes chosen by the teacher and the students, per the subject matter. It comprises supplementary resources as well as technology in a wide linguistic sense and describes the space teachers and students navigate in the process of learning. However, the most significant attribute of this learning space is the fact that students become teachers and teachers become students. Both might be experts regarding the subject (i.e. the input) but also regarding their literacy, especially in avant-garde MOOCs that have a more output-oriented view. Hanan Khalil and Martin Ebner (2013) point out that interaction in this context is not only meant as the

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

interaction between teachers and students, as researched by Hone and El Said (2016), but also among students, as well as between students and the teaching and learning resources.

This extension promotes output-orientation and students' literacy as the primary focus of teaching, as well as the 21st century skills, the *4Cs*. In online learning environments, the learners learn to learn on their own but also in a collaborative way. They learn to communicate with each other and to find creative solutions to new problems in an increasingly digitalized world, with the informal, continuing learning process as a dominating and necessary guiding principle. They must critically analyze the value of resources and pieces of information found in the virtual learning environment, and of course they must know where and how to access information.

The "Dr. Internet" case study MOOC

This emphasis on new skill sets and their integration within the triangle setting of the main didactic agents (teacher, student and subject matter) are best illustrated with a case study where the concept of the extended didactic triangle was implemented as effectively as possible. "Dr. Internet" is the title of a specific xMOOC that was conceived and designed to accommodate the acquisition of 21st century skills in a moderated online learning environment.

Background

The Dr. Internet MOOC is part of an interdisciplinary research project on which three Austrian universities cooperated: the University of Graz, the Graz University of Technology, and the Medical University of Graz (Zimmermann, Kopp, & Ebner, 2016). The main research question concerns the way in which the Internet influences health literacy among the general population and how the increasingly common practice of online research for medical purposes affects the relationship between physicians and their patients.

As more medical knowledge becomes available online, this development bears obvious risks as well as great potential: On the one hand, the acquired medical information can be difficult to evaluate regarding its quality, and the correct application without any background knowledge can prove very challenging (Benigeri & Pluye, 2003). This might lead to under- or overestimations regarding the severity of physical symptoms as well as increased insecurity about a physician's diagnosis, or even the complete substitution of traditional medical treatment with health advice from sometimes questionable sources. Any of these problematic aspects could worsen the health outcomes of the patient (Robertson, Polonsky, & McQuilken, 2014). On the other hand, the internet provides unprecedented possibilities to democratize the access to medical information, a kind of privileged knowledge that is usually restricted to certain groups of health professionals. Combined with an increase in information literacy that matches the requirements of the ever-evolving online environment, this development could strongly improve the health literacy of the general population (Brodie et al., 2000). Subsequently, this might lead

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

to more emancipated patients, better communication with doctors, a more efficient health care system and better health outcomes on a large scale. The ability for critical thinking is obviously one of the core components that will influence the manifestation of either benefits or drawbacks of online searches for medical information, and was therefore a key focus in the design of the Dr. Internet MOOC.

This MOOC is provided by the first and currently only Austrian MOOC platform named "iMooX" (www.imoox.at), which is hosted by the University of Graz and the Graz University of Technology (Ebner, Scerbakov, & Kopp, 2015). All course contents of the Dr. Internet MOOC were specifically created for this purpose and qualify as open educational resources licensed under a specific Creative Commons License. This means that the materials are freely available online even after the research project has come to an end, and that they can be used and modified by anybody, if this is not done for commercial purposes.

Didactic concept

Over the duration of six weeks, the participants of the Dr. Internet MOOC were presented with the task of assessing and diagnosing six medical case studies, all designed by an experienced general practitioner. The suggested standard procedure for the MOOC users was to watch the case study video (in which a patient would describe or exhibit various past and present symptoms in a sequence of scenes), followed by online research regarding the medical issues of said patient. Once the participants felt confident enough about their assessment of the situation, they were prompted to take a special quiz on the potential diagnoses for this case. In the subsequent week, another video regarding the case study was released, where the general practitioner was interviewed about the likelihood of the potential diagnoses he suggested. During these stages, the users were encouraged to discuss any related matters in the moderated forum of the MOOC. While the overall concept of this course is simple and straightforward, the individual components warrant a more in-depth inspection with regard to the underlying principles of the extended didactic triangle.

Special quiz format. To provide the participant with a tool to monitor knowledge gain and to track overall progress, most MOOCs include some form of tests or quizzes. Their successful completion is usually the main or in case of most xMOOCs the only criterion to receive certification of course completion, a model which reflects the traditional learning situation in the classroom. The most commonly used instruments for online testing are multiple choice questions, which are easy to navigate and allow for instant feedback on right or wrong answers directly after submission. However, they do not facilitate a more nuanced assessment of complex tasks, and while they can be adapted to various levels of difficulty, their potential to stimulate critical thinking is rather limited. Furthermore, some subject matters are not particularly well-suited for application in multiple choice settings. Diagnosing a patient based on symptoms alone appears to be one of them, and so the Dr. Internet MOOC incorporated a

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

different kind of quiz format, where participants were asked to rate a set of eight potential diagnoses on a four-part scale ranging from "very likely" to "not likely". Since there was no "correct" rating that could be revealed as a solution to the quiz, other feedback was necessary so that participants could assess their own rating choices. After submission, it was possible for the users to compare their own ratings to the average results of all other participants who had already taken the quiz, therefore encouraging not only the scrutinizing of peer opinion, but also the origination process of collective results, since the quiz was continually updated and the peer results could drastically change depending on increasing numbers of completed quizzes. Additionally, there was also the option to compare one's own ratings with those of a group of physicians who were surveyed beforehand and who judged the likelihood of the suggested diagnoses based on the same case study videos (see Figure 3). This quiz format perhaps best exemplifies the integration of peer group as well as expert assessments in the evaluation of the individual learner's performance, which resulted from the user's information literacy and its application to resources of (online) information.

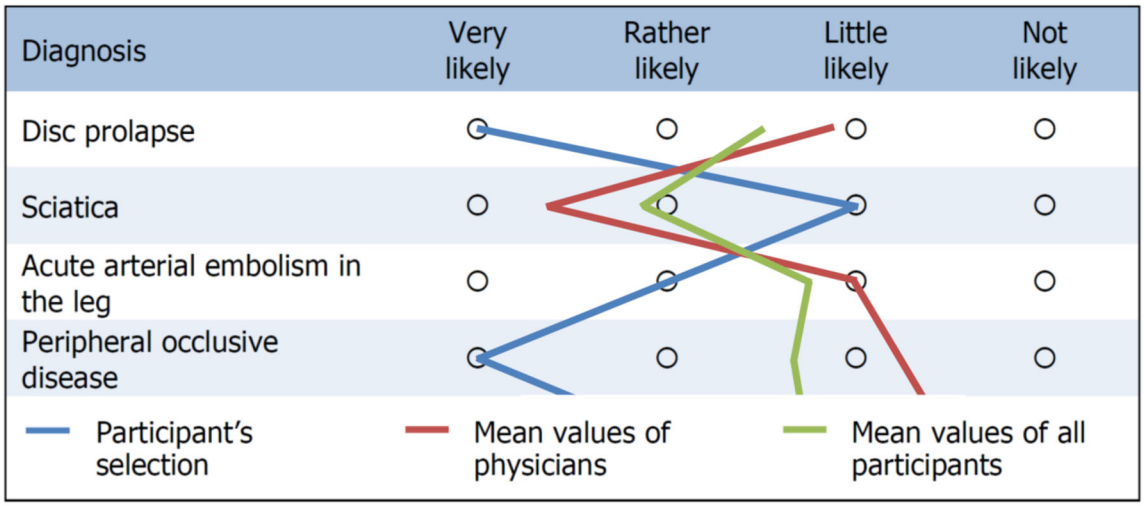

Figure 3. Results for four possible diagnoses of a medical case study.

Interview-style videos with an expert. In the resolution videos of the case studies, the general practitioner talks about the reasons for his own likelihood assessments of the suggested diagnoses, as well as giving advice on what to do in the event of noticing similar symptoms. It was a deliberate decision not to record these videos as a short lecture – while this format is well-suited to convey factual knowledge, it does not invite debate or questioning in the same way an interview does, which is commonly associated with conveying opinions. Even if the same matters are addressed, the expert in question will answer them in a different manner when talking to a large anonymous audience in comparison to having a somewhat ordinary conversation. Thus, the resolution videos for the case studies were important to incorporate both as a means of explaining the expert's opinion and providing additional information on the diagnoses, as well as to encourage the participants to revisit their own opinion-forming process

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

(hence the release in the subsequent week) and perhaps to question the various resources they used to gain information. Additionally, they were also presented with an opportunity to question the expert's opinion, as it could happen that his favored diagnosis did not correspond with the most popular choice of his fellow physicians whose answers were part of the quiz. Thus, the interview-style videos further stimulated the critical appraisal of differing opinions and sources of information.

Moderated forum discussion. Most MOOCs include a forum as a tool of communication, to allow conversations among the participants as well as to enable interactions with the instructor(s). In the case of the Dr. Internet MOOC, the forum was monitored for 20 hours each day (between 6am and 2am), so that any queries would be answered and any violations of the forum rules would be dealt with quickly. In addition to a team of administrators there was one designated moderator who had a more involved role in debates, posting contributions to the ongoing threads and trying to instigate discussions by asking questions about the participants' own experiences. Perhaps due to the encouragement to share diagnosing ideas with the other users, the most popular threads were dedicated to the discussion of the medical case studies, where people debated not only their favored diagnoses, but also the ways in which they reached these conclusions. While the forum was seen mainly as a place for peer group exchange and informal learning cues, it was also used to establish a communication line with the expert. If the participants had questions about the medical case studies, the general practitioner (a persona well-known from the resolution videos) could be reached via a specific thread in the forum where he would post answers once a week. This high level of disposability and a social context in which to explore one's own or others' ideas appears to foster a more in-depth examination of course contents and therefore serves as another stimulus for reflection as well as a resource for new information, which again needs to be critically appraised.

Empirical results

The Dr. Internet MOOC was conducted twice so far (in November/December 2015 and May/June 2016) with a total of 474 registered users, of whom 278 participated actively. When looking at the activity data throughout the course duration, there is an obvious decline due to dropout that is often seen in MOOCs (Colman, 2013), and subsequently a seemingly low completion rate. Depending on whether this parameter is calculated based on registered or active learners, the Dr. Internet MOOC achieved a completion rate of 7% and 12% respectively, which is a somewhat adequate result compared to general experiences with MOOCs (Hollands & Tirthali, 2014). The activity data also displays a relatively gentle decline and no "mass exodus", which suggests that the contents and the didactical structure of the course were reasonably well received by the participants.

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

Lessons learned: Potential applications in Business Education

The Dr. Internet MOOC provides a case study of how digital learning settings can be modeled to purposefully foster the development of 21st century skills such as critical thinking. Even though the content of this specific case study is oriented towards health literacy, the underlying didactical model might also be applied for the design of MOOCs in business education. After all, the ability to encourage critical thinking is a task of great significance for every business educator (Claiborne et al., 2016). Ayala et al. (2014), after evaluating a MOOC in business education, attest MOOCs a "significant place in education" (p. 237) – a claim that is also supported by Clarke (2013) after surveying the development of MOOCs in business education. However, since digital learning environments in general and MOOCs are still fairly young fields, more research is needed to evaluate specific theoretical models of online learning as well as practical strategies with regard to designing and implementing courses. Since one case study can hardly achieve more than an exemplary illustration of a certain approach, it would be beneficial to conduct research on a larger scale, like comparing several courses with higher student numbers. It seems likely that different disciplines have very distinctive needs when it comes to the development of new ways for integrating technological advances and existing disciplinary knowledge, especially when trying to foster 21st century skills, so the logical next step would be to design and study a specific MOOC tailored to suitable Business Education topics.

The adequate design and implementation of MOOCs is an issue likely to be concerning every business educator, since MOOCs have truly become a teaching and learning setting of great scope for the field of business education: Financial Times' *Mooc Tracker* currently lists 407 MOOCs with business or management-related content. 87% of all listed courses are hosted on the well-established platforms *Coursera*, *edX* and *FutureLearn*, with almost half of the listed business education MOOCs being hosted on *Coursera.* 375 out of the 407 courses include the possibility to obtain a certificate of achievement, though not necessarily a university qualification (Financial Times, 2016). However, this rise of digital learning settings does not imply the decline of business education on the tertiary level: A report published by the Association to Advance Collegiate Schools of Business (AACSB) shows that many MOOCs in business education is offered by institutions on the tertiary level (Nelson, 2015).

Two main challenges arise from the growing significance of MOOCs in business education: (1) The introduction of MOOCs includes the danger of dedicating too much attention to the development of students' professional competences (such as accounting or marketing skills), while neglecting other – equally important – competences, e.g. critical thinking. (2) Since many business education MOOCs addresses tertiary education students, the special requirements of a didactical setting for tertiary education students is a pressing issue.

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

The first challenge (the danger of neglecting other competence dimensions beside professional competences) is addressed within this paper by providing a didactical model for a MOOC to foster critical thinking. Regarding the second challenge (the needs of the tertiary education student), dropout rates might be one of the first things to look at when establishing how well new digital teaching and learning settings are received by the students. Despite the significance of digital learning settings, the concept of MOOCs in general still struggles with issues of low completion rates (Clarke, 2013), which were also observed in the presented case study. However, since the evaluation data also suggest a positive influence of content and didactic structure on the participants' readiness to actively participate in the course, a more extensive application of MOOCs based on the discussed didactic model is suggested. Furthermore, evaluations carried out for previous implementations of digital learning settings might provide insight into additional possible measures for quality improvement in MOOCs. Stock and Winkelbauer (2012) evaluate a concept of a digital portfolio for students of a master's program of Business Education and Development. For their specific digital learning setting, they argue among other things for a "clear communication of the objectives" and "systematic integration […] within the curriculum" (p. 54). Both factors – clear communication of aims and integration in the curriculum – are also most likely to be key factors for introducing MOOCs to a wider range of applications in business education. With a focus on output-oriented rather than input-oriented didactical concepts as well as the enhancement of students' 21st century skills, well-designed MOOCs might further contribute to the advance of digital learning settings in business education.

References

American Library Association. (1989). Presidential Committee on Information Literacy: Final Report. Retrieved from http://www.ala.org/acrl/publications/whitepapers/presidential

Arbesman, S. (2012). *The half-life of facts: Why everything we know has an expiration date*. *The human body*. New York: Current.

Ayala, C., Dick, G., & Treadway, J. (2014). The MOOCs are Coming! Revolution or Fad in the Business School? *Communications of the Association for Information Systems*, *35*(12), 226–243.

Benigeri, M., & Pluye, P. (2003). Shortcomings of health information on the Internet. *Health promotion international*, *18*(4), 381–386.

Brodie, M., Flournoy, R. E., Altman, D. E., Blendon, R. J., Benson, J. M., & Rosenbaum, M. D. (2000). Health information, the Internet, and the digital divide. *Health affairs*, *19*(6), 255–265. doi:10.1377/hlthaff.19.6.255

Claiborne, C., Desai, M., & Lindenberg, M. (2016). Critical thinking, future thinking and ethical judgment in business education. *International Journal of Business Research*, *16*(1), 161–170. doi:10.18374/IJBR-16-1.10

Clarke, T. (2013). The advance of the MOOCs (massive open online courses). *Education + Training*, *55*(4/5), 403–413. doi:10.1108/00400911311326036

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

Colman, D. (2013). *MOOC Interrupted: Top 10 Reasons Our Readers Didn't Finish a Massive Open Online Course*. Retrieved from http://www.openculture.com/2013/04/10_reasons_you_didnt_complete_a_mooc.html

Dabbagh, N., & Kitsantas, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education*, *15*(1), 3–8. doi:10.1016/j.iheduc.2011.06.002

Dillenbourg, P., Schneider, D., & Synteta, P. (2002). Virtual Learning Environments. In A. Dimitracopoulou (Ed.), *Proceedings of the 3rd Hellenic Conference "Information & Communication Technologies in Education"* (pp. 3–18). Kastaniotis Editions, Greece.

Ebner, M., Scerbakov, A., & Kopp, M. (2015). All About MOOCs. In P. Jost & A. Künz (Eds.), *Digitale Medien in Arbeits- und Lernumgebungen* [Digital Media in Working- and Learning Environments] (pp. 148–155). Lengerich: Pabst.

Eshach, H. (2007). Bridging In-school and Out-of-school Learning: Formal, Non-Formal, and Informal Education. *Journal of Science Education and Technology*, *16*(2), 171–190. doi:10.1007/s10956-006-9027-1

Ferrari, A. (2013). DIGCOMP: A framework for developing and understanding digital competence in Europe. In Punie, Y., & Brečko, B. N. (Eds.), *DIGCOMP: A framework for developing and understanding digital competence in Europe* (pp. 1–45). Luxembourg: Publications Office of the European Union. doi:10.2788/52966

Financial Times. (2016). Mooc Tracker. Retrieved from http://on.ft.com/2d0ART4

Hollands, F. M., & Tirthali, D. (2014). *MOOCs: expectations and reality*. Full report. Retrieved from Center for Benefit-Cost Studies of Education, Teachers College, Columbia University, NY. website: http://cbcse.org/wordpress/wp-content/uploads/2014/05/MOOCs_Expectations_and_Reality.pdf

Hone, K. S., & El Said, G. R. (2016). Exploring the factors affecting MOOC retention: A survey study. *Computers & Education*, *98*, 157–168. doi:10.1016/j.compedu.2016.03.016

Kaplan, A. M., & Haenlein, M. (2016). Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster. *Business Horizons*, *59*(4), 441–450. doi:10.1016/j.bushor.2016.03.008

Khalil, H., & Ebner, M. (2013). *Interaction Possibilities in MOOCs – How Do They Actually Happen?* Paper presented at the 3rd International Conference on Higher Education Development, Mansoura University, Egypt.

Kopp, M., & Lackner, E. (2014). Do MOOCs need a Special Instructional Design? In Chova, L. G., Martínez, A. L., & Torres, I. C. (Eds.), *Proceedings of the 6th International Conference on Education and New Learning Technologies* (pp. 7138–7147). Barcelona: International Association of Technology, Education and Development.

Markauskaite, L. (2006). Towards an integrated analytical framework of information and communications technology literacy: from intended to implemented and achieved dimensions. *Information Research*, *11*(3), 31–53.

McLoughlin, C., & Lee, M. J. W. (2010). Personalised and self regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology*, *26*(1), 28–43.

ISSN 2164-2877 (print)
ISSN 2164-2885 (online)

Meyer, M. A. (2012). Keyword: Didactics in Europe. *Zeitschrift für Erziehungswissenschaft*, *15*(3), 449–482. doi:10.1007/s11618-012-0322-8

National Education Association (NEA). (2016). *Preparing 21st Century Students for a Global Society*. Retrieved from http://www.nea.org/assets/docs/A-Guide-to-Four-Cs.pdf

Nelson, C. (2015). *Emerging Trends in MOOC Delivery of Business Education*. Retrieved from Association to Advance Collegiate Schools of Business (AACSB) website: http://aacsbblogs.typepad.com/dataandresearch/2015/07/emerging-trends-in-mooc-delivery-of-business-education.html

Riedl, A. (2004). *Grundlagen der Didaktik* [Essentials of dicactics]. Stuttgart: Steiner.

Robertson, N., Polonsky, M., & McQuilken, L. (2014). Are my symptoms serious Dr Google?: A resource-based typology of value co-destruction in online self-diagnosis. *Australasian Marketing Journal, 22*(3), 246–256. doi:10.1016/j.ausmj.2014.08.009

Siemens, G. (2004). *Connectivism: A Learning Theory for the Digital Age*. Retrieved from http://www.elearnspace.org/Articles/connectivism.htm

Stock, M., & Winkelbauer, A. (2012). ePortfolio-implementation in the Master's Program of Business Education and Development. *International Journal of Business Education*, (152), 48–55.

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2006). *Education for All Global Monitoring Report: Understandings of literacy*. Retrieved from http://www.unesco.org/education/GMR2006/full/chapt6_eng.pdf

Zimmermann, C., Kopp, M., & Ebner, M. (2016). How MOOCs can be used as an instrument of scientific research. In Khalil, M., Ebner, M., Kopp, M., Lorenz, A., & Kalz, M. (Eds.), *Proceedings of the European Stakeholder Summit on experiences and best practices in and around MOOCs (EMOOCS 2016)* (pp. 393–400). Noderstedt: Books on Demand.