MOOC@TU9 – Common MOOC Strategy of the Alliance of Nine Leading German Institutes of Technology

Daniela Pscheida [1], Sabrina Herbst [1], Thomas Köhler [2], Marlen Dubrau [1], Katharina Zickwolf [3]
[1] Technische Universität Dresden, Media Center,
[2] Technische Universität Dresden, Institute of Vocational Education
[3] Technische Universität Braunschweig, Projektgruppe Lehre und Medienbildung

Structured Abstract

Purpose – Since April 2014, the alliance of leading German Institutes of Technology (TU9) has been jointly producing and running massive open online courses (MOOCs) on the subject of engineering. On the one hand, the collaborative MOOC@TU9 project aims to combine the unique characteristics and strengths of the engineering courses offered by the TU9 universities, making inter-institute, cooperative, open learning both visible and accessible. This will enhance both local teaching and the national and international marketing of the universities. On the other hand, the project also aims to help build communal experience and develop quality and production standards for the use of different MOOC formats in digital higher education teaching. In this sense, the MOOC@TU9 project contributes to the vital development of sustainable digitalisation strategies at German universities in the form of a feasibility study, which can then be used in other contexts as a valuable example of best practice. Design/methodology/approach – The MOOC@TU9 project has a primarily practical approach. The focus of the collaboration between the TU9 universities is therefore the discussion, exchange and coordination of concrete actions in addition to the evaluation and assessment of the solutions reached and implemented. The collaboration within the TU9 network results in inter-organisation working and learning processes for the parties and institutions involved. These have a particular value, as this is how, through collaboration, we can build an effective, sustainable, multi-dimensional experience.

Originality/value – MOOC@TU9 is a joint inter-university project with the aim of strategically testing the possibilities, parameters and benefits of using massive open online courses in higher education teaching, the like of which has never been seen before in Germany. There is, therefore, currently no systematic development of quality and production standards for MOOCs: a gap, which MOOC@TU9 is actively attempting to fill.

Practical implications – Results and findings of the project are not only taken from specific practical work, they are also fed directly back into it. In this respect, it can and should provide valuable insights not only for course participants, but also for other universities and/or initiatives.

Keywords – MOOC, open online courses, higher education, digital strategy, interuniversity cooperation

Paper type – Practical Paper

1 Introduction

For some time now, German universities have been making increasing efforts to develop higher education-level digitalisation strategies for teaching. To some extent, this is long overdue, as after over 15 years of the E-Learning debate, German universities' digitalisation opportunities seem to have been insufficiently exploited, as revealed by a Centre for Higher Education Development study in late 2013 (CHE, 2013). An associated position paper set out a range of strategic action areas (access to education, efficiency of teaching, quality of teaching, further training, recruiting, university marketing), which could benefit from digitalisation measures. The universities' task here would be to more clearly determine what contribution digitalisation could make to achieving their strategic objectives and in terms of the institution's individual arrangements, as well as creating and implementing appropriate measures (Bischof and von Stuckrad, 2013, p. 52f.). It is clear, however, that this conflicts with the existing structural, financial and legal conditions of traditional universities. Even more insistently, a recent discussion paper by the German Forum for Higher Education in the Digital Age – a Federal Ministry of Education and Research-sponsored expert panel made up of representatives of the Stifterverband für die Deutsche Wissenschaft, the German Rectors' Conference (HRK) and the Center for Higher Education Development (CHE) – called for the active tackling of these "barriers to digitalisation" with the ultimate aim of overcoming them (HFD, 2015, p. 15). "Digitalisation" can, according to the paper's authors, "increase existing challenges and intensify inherent stresses", but it can also help to "face many of these challenges" and offer "unprecedented opportunities to develop teaching and universities" (Ibid. p. 4).

A central element of the considerations regarding developing digitalisation in university teaching continues to be so-called Massive Open Online Courses (MOOCs), which first emerged as an education trend in the US. Since the phenomenon reached German education in 2012/2013, questions have been raised about the potential and added value that MOOCs have in the context of university teaching. As expected, however, a survey of committees and vice-rectors of German universities in 2015 showed an ambivalent attitude to the approach. Nevertheless, around 40 per cent of universities declared that they were dealing with the topic on a strategic level (Jungermann and Wannemacher, 2015, p. 49).

These approaches include MOOC@TU9, a collaborative project undertaken by the alliance of nine leading German Institutes of Technology, which aims to jointly produce MOOCs in the field of engineering. This article presents the project in terms of interuniversity strategy development, with a particular focus on dealing with the universityspecific challenges of digital, network-based teaching.

2 The MOOC@TU9 project

2.1 TU9 project framework

TU9 is an association made up of nine technical universities in Germany, which are renowned for their leadership in research and teaching. The group was founded in 2006 and includes RWTH Aachen University, TU Berlin, TU Braunschweig, TU Darmstadt, TU Dresden, Leibniz Universität Hannover, the Karlsruhe Institute of Technology, TU München und the University of Stuttgart. It has its own office in Berlin and works towards strengthening science and research in the STEM subjects. One of the ways this is done is through cooperation with the different German federal states and scientific organisations, scientific research bodies, State Rectors' Conferences, the German Rectors' Conference (HRK), universities in other countries, industry and the economy, but also, last but not least, through inter-university cooperation in the form of TU9 panels, events and projects and establishing and clearly and consistently communicating positions with regard to university and educational policy (see: http://www.tu9.de/tu9/1473.php). This is the main way that the TU9 network constitutes a strategic alliance.

The arrival of the 'MOOC hype' in Germany meant that the TU9 universities were introduced to the topic in a specific way, with the open E-Learning format combining the idea of cutting-edge innovation and the opportunity to open up and internationalise teaching. Based on their initial university-specific MOOC activities of some TU9 members (RWTH Aachen University, TU Dresden, the Karlsruhe Institute of Technology and TU München), the MOOC@TU9 project was founded in spring 2014 as an interuniversity project for the whole TU9 network.

2.2 Project aims

The aim of the MOOC@TU9 project is the strategic testing of MOOCs in the field of engineering. First and foremost, this means working together to gain common experience in designing, producing and running MOOCs, along with developing specific processes and standards for implementing and establishing them under higher education teaching regulations. The project is a feasibility study for the institutes involved. This consists of the TU9 members combining their individual skills, experience and local media production and study structures and using the resulting synergy.

Furthermore, the project also aims to systematically establish the potential of using MOOCs in terms of the future expansion and enhancement of local teaching, by creating inter-university courses or integrating new target groups, for example. The different institutional and organisational regulations affecting each TU9 member play a particularly important role, as a wide spectrum of individual circumstances must be taken into account, while aspects of the collaborative implementation of digital courses could also be considered.

Finally, the MOOC@TU9 project also aims to use its coordinated German Engineering MOOC programme to establish a position on the international digital education market. This is why the project is also indirectly focusing on boosting the national and international public perception of the features and advantages of the TU9 universities' engineering courses as part of an innovative university marketing strategy.

2.3 Project structure

The MOOC@TU9 project, which has been adopted by all TU9 universities, is run by an editorial team of representatives from all of the TU9 members, all with relevant skills in the technical production or didactic design of digital courses. The team holds monthly status meetings and topic-based meetings via telephone or videoconference using Adobe Connect, and around twice a year, a joint workshop is held over several days at one of the TU9 institutions. The editorial team is assisted and guided by the assembly of the vicerectors or vice presidents of the TU9 universities. The project is coordinated by TU Dresden.

3 The MOOC@TU9 concept: experiences from the pilot phase and conclusions for the continuation

Based on the common objective of the TU9 universities to find innovative ways to develop engineering courses and make them more accessible and more visible on an international level, an initial joint MOOC was designed, produced, run and evaluated by all of the TU9 universities between April 2014 and March 2015. The 9-week, Englishlanguage course featured a series of lectures, which presented a different engineering discipline each week. The aim was to make prospective students around the world aware of the diverse, advanced range of courses offered by the TU9 universities and ensure that they know the quality, variety and prospects of German engineering studies. Besides comprehensive information about prospective TU9 institutions, the participants primarily received an overview of the key issues, content and working methods in the different fields and example tasks gave them the opportunity to test and expand their specialist knowledge. Viewed from this angle, the course was an instrument used to strengthen the German Engineering brand, but the participants could also use it to check their suitability for, and look into, further study in the field.

A total of 1,328 people from 80 countries attended the pilot course. The results of the follow-up survey show overall satisfaction in terms of fulfilling expectations of the course. 94% of respondents would recommend it, and almost half (48%) said that taking part in MOOC@TU9 helped them to evaluate and make a decision on their studies (a further 32% said that it was at least partially helpful). However, it is also clear that the pilot phase's conceptual approach of an overview-style series of lectures had a negative impact on the course itself. For example, the registered participants took a very selective approach to the different weekly topics and were also much less likely to take part in active course elements such as weekly tasks, chats and forum discussions. The effect of the accessible, collective course experience did therefore not materialise, which was viewed particularly critically by the 21 participating TU9 professors. In addition, the overview style of the lecture series allowed no meaningful link between the MOOC and the local course offering.

The focus of the second phase of MOOC@TU9, which has been underway since April 2015, is the collaborative design and production of thematically distinct specialist courses in the field of engineering. On the one hand, this conceptual shift from university marketing to specialist course takes up TU9's interest in a stronger link between the courses produced within the project and what is offered by standard teaching. On the other, it allows detailed analysis of the concrete questions and issues of a standard digital course in the context of higher education teaching. What is different about TU9 MOOCs is their consistently cooperative approach: at least two, ideally three or more, lecturers from different TU9 universities take part in producing each MOOC, giving it unique characteristics on a content and/or thematic level, which go far beyond the scope of a conventional local course.

4 Theoretical classification of TU9 activities in terms of effects

As should have already been made clear, the MOOC@TU9 project has a primarily practical approach. The focus of the collaboration between the TU9 universities is therefore the discussion, exchange and coordination of concrete actions in addition to the evaluation and assessment of the solutions reached and implemented. This approach does not only have a content-related dimension; it is also, and above all, crucial from a structural point of view. The collaboration within the TU9 network results in interorganisation working and learning processes for the parties and institutions involved. These have a particular value, as this is how, through collaboration, we can build an effective, sustainable, multi-dimensional experience.

The joint development, discussion and practical testing of approaches, as carried out within the MOOC@TU9 project, is also fundamentally interesting in terms of feasibility. Here, the question of the suitability of different MOOC formats (xMOOC

versus cMOOC) is a lesser focus than the creation of a highly effective and cooperative process in the university network.

If we look more closely at approaches and procedures from the perspective of the different parties involved in the project, different impact models can be developed depending on the position or task within the university and the relevant focus. Proportional to the limited scope of the paper, it should be sufficient in this case to briefly describe the basic expectations and designate an appropriate theory area without going into detail, e.g.:

- Objective: international recognition of German engineering - Relevant approach or theory: marketing/persuasion
- Objective: inter-organisational collaboration/saving resources/sharing production skills/mutual experiences - Relevant approach or theory: organisational learning/training
- Objective: transferring specialist knowledge of German engineering - Relevant approach or theory: learning and learning effectiveness
- Objective: feasibility study on collaboration in a virtual organisation - Relevant approach or theory: feasibility and/or production management

There are most likely other expected effects to be worked out. However, the variety listed above already shows that integrating expectations is no easy task. Specifically, there is mostly a lack of transparency in terms of these expected effects. In the present case, they would at least be discussed during strategy development, but theory-based processing has not yet explicitly been carried out. There are a number of references in specialist literature to widely established theories like marketing (in economics) or persuasion (in communication science), but also learning success (in education science and psychology). Somewhat less extensively covered is the issue of inter-organisation collaboration, which has only recently been explored (Köhler et al., 2010; Köhler and Neumann, 2011), at least in a university context, and the use of social media and the format of MOOCs provides new impetus.

5 Strategic challenges in the second phase

As the MOOC@TU9 has progressed since April 2015, the TU9 MOOC concept has shifted its focus towards the target group of students at the participating universities and producing online-based course content for engineering, which can be integrated into the standard courses at the TU9 institutions. This has led to specific legal and administrative challenges with regard to the examination and accreditation procedures of MOOCs as a component or foundation for a course, and also the burden of

producing and running MOOCs on the workload of the lecturers involved. There are also further organisational costs and issues, which are the result of the specific characteristics of creating a joint course.

5.1 Measurement of learning success and examination procedures

Clarifying how learning success and competence gains through course participation can be documented is generally a central issue in planning a MOOC (Pscheida et al., 2014): what scope should the activities have, and how is this recorded and verified? How can the knowledge acquired by the participants be made visible in the context of MOOCs?

In the pilot phase of MOOC@TU9, statements of accomplishment were issued to confirm successful completion of the course. In order to receive such certification, students were required to complete and submit a minimum of 19 of the weekly tasks. However, only the submission was registered, not the accuracy of its content. Focusing on integrating the TU9 MOOCs into standard higher education teaching in the TU9 universities, while opening them up to external participants, brings up totally new questions, which must be considered and resolved while developing an examination and certification concept. Initially, this concerns the awarding of ECTS credits for MOOCs: converting an attendance certificate into credits relevant to studies. As ECTS credits can only be awarded for passing a module examination, in principle, tests must be included in the course descriptions. This is regulated by each university and each course, and therefore presents a particular challenge when several universities are involved in one MOOC. There is also the principle question surrounding the reliability of online examinations. Authenticating those taking the examination via the MOOC platform is problematic, and a number of the universities are not familiar with the necessary procedures (Schultz, 2014, p. 19 f). In addition, teaching and learning content from outside of the university's own learning management system cannot be used as an examination requirement due to data protection laws. Last but not least, universities often lack the necessary infrastructure (e.g. large enough PC pools) to run the online examinations in the MOOCs themselves (Michel, 2015, p. 25).

Furthermore, the question remains, especially for the target groups of international students and other interested parties, to what extent acquiring an often paid attendance certificate from MOOC platforms can be a requirement for acquiring ECTS credits from the universities participating in the MOOC, such as by taking a module examination.

5.2 Compensating for teaching workload/production efforts

Depending on the methods and assessment types used, substantial staff effort is required for preparing and running MOOCs (Schultz, 2014, p. 23). Those responsible prepare the teaching material for the participants and are available for any questions. They also moderate the communication channels and provide replies. The time expended here far exceeds that of a conventional course, as Loviscach and Wernicke (2013) describe in detail in their remarks on creating and managing MOOCs (p. 88 ff). It is therefore important to find an incentive and/or compensation system, which offsets the enormous development and management effort involved in the MOOCs. Appropriate adjustment or compensation of the lecturers' teaching workload as part of MOOC@TU9 is primarily a legal obstacle, due to differing state legislation regarding compensating ELearning courses. The teaching workload amount, the number of higher education teaching hours required of lecturers per week during the semester, is regulated at German state level via appropriate regulations concerning teaching commitments (e.g. the Saxonian public service task regulation for higher education institutions, SächsGVBl. 2011 No. 12, p. 611). In the majority of states, with the exception of Brandenburg, Saarland and Saxony, this also applies to creating "multimedia", "internet-based" and "online" courses, as well as courses for "distance learning" (Faller, 2015 p. 8). In five states (Berlin, Bremen, Hamburg, Saxony-Anhalt and Schleswig-Holstein), a comparability test with classroom teaching is required: creating (preparation and followup) and running E-Learning courses must be converted into hours per week during the semester, which would be required for a comparable in-person event (e.g. Teaching obligation regulation for Saxony-Anhalt §3 (2) sentence 3). In two states (Bremen and Saxony-Anhalt), the time accrued for this must also be documented. Baden-Württemberg, Hamburg, Hesse, Lower Saxony, North Rhine-Westphalia and Thuringia restrict eligibility to a maximum of 25%, and Baden-Württemberg and Thuringia limit the duration of compensation to a maximum of two years (Faller, 2015 p. 8). North Rhine- Westphalia and Thuringia only permit compensation for E-Learning courses when they are required to safeguard the overall range of courses (Ibid.). Transferring this to the MOOC@TU9 project means that compensation for the teaching workload of MOOCs is fundamentally possible at eight of the nine participating universities, but this depends on the different conditions and requirements in individual states. There are therefore also other incentive systems to consider, where applicable, in order to convince higher education teachers to stage MOOCs.

6 Current approaches from the MOOC@TU9 project

6.1 Scenarios for the measurement of learning success and examination procedures

Due to the different target groups and the aforementioned challenges in terms of recognising performance in MOOCs for studies, a number of different test scenarios must be devised. These should recognise students' performance and the knowledge they acquire for their studies during the MOOC on the one hand, and allow external participants to gain certification on the other. The following three scenarios were developed for the MOOC@TU9 project:

(a) Formative assessment in MOOCs for all participants
The first performance assessment scenario within the MOOC concerns all participants, both registered students and external participants. The formative assessment comprises quizzes and other tasks, such as homework and peer reviews carried out on the MOOC platform and awarded marks. At the end of the course, the marks are compiled and, depending on the score obtained, certification for successful completion is awarded. This primarily takes place automatically via the MOOC platform. Depending on the platform, the attendance certificate may be subject to a fee. For registered students of the universities that take part in the MOOC, it does not count as a certificate of achievement or a precondition for examinations.

(b) Summative assessment for students of participating universities
In order to obtain a certificate of achievement after the successful completion of a MOOC, students registered with a participating university must take an exam, which complies with the relevant regulations and is compatible with the relevant module catalogue for their studies. Due to the aforementioned challenges, the successful participation in a MOOC is not recommended as a requirement for module examinations. It is also advisable to provide the teaching and learning content on the MOOC platform (e.g. videos, quizzes, additional materials, tasks) and additional sub-services and tasks via the university's learning management system or website. In the event of several universities participating in one MOOC, it must be ensured that the examination takes place at the same time at each institution in order to provide the same examination conditions for all participants.

(c) Recognising the performance of external participants
Participants who are not registered with the universities participating in the MOOC can easily obtain a certificate of attendance in scenario 1 (a). Sitting in-person university examinations is only possible when the relevant examination and study regulations are bound to the university in question, and some university fees may be charged (this

is the case for TU Dresden, for example). However, the certificate of achievement awarded by the TU9 universities participating in the MOOC following an in-person examination should be recognised by the other TU9 institutions in order to enable students to change universities without issue. Furthermore, it is conceivable in this scenario that recognition of the certificate of attendance awarded via the platform, such as for international students, would be required to sit the module examination. International students, who have successfully completed the MOOC, would only have to sit the next in-person examination after registering with the relevant university to be awarded the corresponding ECTS credits.

6.2 Compensating for teaching workload/production efforts

Differing legal regulations mean that consistent compensation for lecturers' teaching workload in terms of producing and running MOOCs is not possible within the MOOC@TU9 project. But even at the universities where compensation would be fundamentally possible from a legal perspective, it is proving difficult, as it requires conversion into hours per week during the semester (see 4.2). An initial step for MOOC@TU9 is therefore evaluating the time and staff required to produce and run a MOOC. This takes into account lecturers' resources in terms of staff, time and finances during the production phase (up to the end of the summer semester 2016) and the implementation phase (starting from the 2016/17 winter semester). Lecturers are also sent spreadsheets by the local project coordinators to be completed during the production and running of the MOOC. The number and status of the staff used is recorded (e.g. scientific assistant, student assistant), along with the time taken for individual stages (concept development, video production, etc.) in hours, the financial cost of any necessary additional purchases (e.g. technology) and the timing (length) of each stage. In addition to accounting for MOOC tasks in the lecturers' workload, there is also the opportunity to provide them with support staff, such as student assistants. In the long term, universities should also provide IT services for MOOCs on site and/or integrate support options for lecturers in existing services to create online courses. Looking ahead, it is also important to automate as many processes and procedures as possible as far as preparing and running MOOCs are concerned in order to minimise the time spent by organisers on this.

7 Potential and added value of joint MOOCs: an interim conclusion

The use of MOOCs in academic teaching is linked to vague expected effects. Its possible strategic potential is often insufficiently explained and differentiated from a theoretical standpoint. In addition, current scientific discourse focuses primarily on the financial implications of MOOCs, such as the discussion surrounding business models (Fischer et al., 2014). The project MOOC@TU9 makes clear that the creation and running of MOOCs in higher education primarily brings about a range of open

legal and administrative issues, to which there have as yet been no pre-packaged or standardised solutions whereas the educational and learning related outcomes will not be considered adequately.

The central challenge is to harmonise different state regulations for universities on the one hand and their stages of development in terms of e-assessment and online courses on the other. In addition to legal and administrative issues surrounding documenting and measuring learning success and MOOCs compensating for lecturers' teaching workload, special collaborative MOOC productions are also faced with specific challenges in terms of content. This includes determining a joint course curriculum, which is equally compatible with the respective range of courses and/or curriculum at different institutions, as well as determining a required level of prerequisite knowledge for taking the course (Möller et al., 2016). But there are also clear advantages to producing the courses collaboratively for the universities involved. Collaborative production enables sharing the creation of the required content, dividing the necessary effort between several partners and relieving the burden on one individual university. The same applies for the marketing and public relations work to advertise the MOOCs to the relevant target groups. A content-related benefit for the courses is that sharing the course between at least two lecturers opens up different perspectives on the topic at hand. Ideally, this enables reflection on interdisciplinary issues and clarification of complex areas through additional input from the lecturers involved. This also benefits the lecturers, who achieve a clear appreciation of their course through collaboration, just as it does the students, who also gain from the knowledge of lecturers from other renowned universities and providers and can develop their knowledge accordingly without needing to physically attend lectures – event though there are no statistical data yet about the effective usage of that opportunity in the chosen approach.

This opening up and development aspect also applies to involving target groups outside of universities' own students, such as those from other countries or the field of training. MOOCs do not only offer this target group new opportunities to take part in the respective university course, the university itself, its lecturers and its students can also benefit from the accessibility of MOOCs. MOOCs provide students in particular with a learning experience in a large, diverse group with the anonymity provided by the internet, stimulating increasingly important skills for the future such as searching for and selecting information and self-management (Pscheida et al., 2015). For the university or participating lecturer, MOOCs are 'cost-effective' ways to boost reputation for their course and support offering (Schultz, 2014, p. 32).

Above all, however, collaborative MOOCs, as conducted as part of MOOC@ TU9, allow the parties to work together to tackle the aforementioned challenges of developing a MOOC for higher education. The universities can benefit from their experiences on a number of levels and there is an exchange of ideas on key issues such as examination rights, data protection and teaching workload compensation.

References

Bischof, L. and von Stuckrad, T., (2013) Die digitale (R)evolution? Chancen und Risiken der Digitalisierung akademischer Lehre, Gütersloh. http://www.che.de/downloads/CHE_AP_174_Digitalisierung_der_Lehre.pdf

CHE, (2013) „Digitalisierung der Hochschullehre: Potenziale noch weitgehend ungenutzt“, News vom 30.10.2013. http://www.che.de/cms/?getObject=5&getNewsID=1637&getCB=398&getLang=de

Faller, M., (2015) Rechtsfragen zu digitalen Lehrformaten, Themengruppe “Governance & Policies”, Hochschulforum Digitalisierung: Arbeitspapier Nr. 7, August 2015. https://hochschulforumdigitalisierung.de/sites/default/files/dateien/HFD%20AP%20Nr%207_Rechtsfragen%20zu%20digitalen%20Lehrformaten.pdf

Fischer, H., Dreisiebner, M., Franken, O.B., Ebner, M., Kopp, M. and Köhler, T., (2014) „Revenue vs. costs of MOOC platforms. Discussion of business models for xMOOC providers, based on empirical findings and experiences during implementing the project iMooX“, Proceedings of the 7th International Conference of Education, Research and Innovation (ICERI2014), Seville. http://library.iated.org/view/FISCHER2014REV

HFD - Hochschulforum Digitalisierung, (2015) 20 Thesen zur Digitalisierung der Hochschulbildung. Diskussionspapier zur Halbzeitkonferenz des Hochschulforums Digitalisierung, Arbeitspapier Nr. 14. https://hochschulforumdigitalisierung.de/sites/default/files/dateien/HFD%20AP%20Nr%2014_Diskussionspapier.pdf

Jungermann, I. and Wannemacher, K., (2015) Innovationen in der Hochschulbildung. Massive Open Online Courses an den deutschen Hochschulen, Studien zum Deutschen Innovationssystem Nr. 15-2015. http://www.efi.de/fileadmin/Innovationsstudien_2015/StuDIS_15_2015.pdf

Köhler, T., Neumann, J. and Saupe, V., (2010) „Organisation des Online-Lernens“, in: Issing, L. J. and Klimsa, P., Online-Lernen. Ein Handbuch für das Lernen mit Internet, Wissenschaftsverlag München/Oldenbourg.

Köhler, T. and Neumann, J., (2011) Organisation des E-Learning, Band 2: Empirische Untersuchungen, TUDpress, Dresden.

Loviscach, J. and Wernicke, S., (2013) „Zwei MOOCs für Udacity. Planung- Durchführung- Produktion“, in: Schulmeister, R. (Ed.), MOOCs - Offene Bildung oder Geschäftsmodell? Waxmann, Münster, pp. S. 88–100.

Michel, L.P., (2015) Digitales Prüfen und Bewerten im Hochschulbereich. Im Auftrag von der CHE Themengruppe „Innovationen in Lern- und Prüfungsszenarien“ im Hochschulforum Digitalisierung, Arbeitspapier Nr. 1. https://hochschulforumdigitalisierung.de/sites/default/files/dateien/HFD%20AP%20Nr%201_Digitales%20Pruefen%20und%20Bewerten.pdf

Möller, S., Ahrens, J., Altinsoy, E., Fels, J., Müller, G., Reimers, G., Seeber, B., Vorländer, M. and Weinzierl, S., (2016) „Konzeption eines MOOC der TU9 zum Thema Communication Acoustics“, Proceedings der 42. Jahrestagung für Akustik (DAGA 2016), 14.-17.03.2016.

Pscheida, D., Lißner, A. and Müller, M., (2015) „Spielwiese MOOCs - Drei Experimente im #neuland“, in: Nistor, N. and Schirlitz, S. (Eds.). Digitale Medien und Interdisziplinarität. Waxmann, Münster, pp. 132-140. http://www.pedocs.de/volltexte/2015/11347/pdf/Pscheida_ua_2015_Spielwiese_MOOCs.pdf

Pscheida, D., Lorenz, L., Lißner, A., Kahnwald, N., Zauner, L. and Dubrau, M., (2014) „Massive Open Online Courses in Higher Education – Performance Assessment in Open Learning Arrangements“, Proceedings of the 8th International Technology, Education and Development Conference (INTED2014), Valencia 10-12 March 2014, pp. 5659–5667. http://library.iated.org/publications/INTED2014

Schultz, E., (2014) Potenziale und Probleme von MOOCs, Beiträge zur Hochschulpolitik 2/2014. http://www.hrk.de/uploads/media/2014-07-17_Endversion_MOOCs.pdf