

# THE POTENTIAL BENEFITS OF USING VIDEOS IN HIGHER EDUCATION

Isabel Vieira<sup>1</sup>, Ana Paula Lopes<sup>1</sup>, Filomena Soares<sup>2</sup>

<sup>1</sup> Polytechnic Institute of Porto (IPP) / ISCAP - CICE (PORTUGAL)

<sup>2</sup> Polytechnic Institute of Porto (IPP) / ESEIG (PORTUGAL)

## Abstract

The developments of digital technology have opened new outlooks for online education which offer students the flexibility to learn at any time and any place. With all this instructional changes instructors, in all levels of the educational chain have been compelled to adapt quickly to this reality. They have a wide diversity of tools available to grab student's attention and motivate them to embrace the knowledge in their own learning process. One of these resources is the use of videos. Through them lecturers can deliver complex information and contents to students and, if used creatively, videos can become a powerful technological tool in education. In this article we will explore some of the potential benefits and challenges associated with the use of videos in the teaching and learning process at higher education levels.

We will also discuss some thoughts and examples for the use of teaching materials to enhance student's learning and try to change ideas about the potentialities and future of video's annotation new software resources, as incoming open tools for group work involvement.

Keywords: Video, Higher Education, Online Learning.

## 1 INTRODUCTION

Video lectures have been growing in popularity and many higher education institutions, and educational technology companies such as Coursera, Udacity, EdX, Khan Academy are using them as a main of self-study medium or as tool to enhance the learning process. Their use is increasing both inside and outside classrooms. Inside a classroom it can motivate students and improve topics' debate and outside it is a good support for students' self-learning. In some cases they can be used to work some subjects standing behind and are needed to support actual courses contents that students don't remember (or were not even taught). So, in this way they can catch up with basic concepts making a self-review of these items. Videos have an advantage of, when done objectively, explaining in a few seconds something that needs several pages when written. This, together with the fact that students may see them whenever they can and play it as many times as they need it, makes them a very powerful tool for enhancing learning efficiency. The majority of our students are used to technology since they were born, so we must just provide them the tools, for them to use.

According to Moss [1] video is different from other learning technologies, because it offers the benefit of using the visual perception, "that powerful but neglected sense" in new ways. A moving image can help someone to see a process or realize how something works, moves, or performs. On the other hand, Goodyear and Steeples [2] argue that video can present in a clear and striking manner descriptions to articulate tacit information and knowledge hard to describe through text.

In [3] we can find a study done to explorer "the effect of the use of videos for assessing the enhancement of students' learning motivation". Universities are trying to get the best students and students search for the best learning experiences, so videos are appealing. Nowadays we can make videos with a low budget, which is one of the other important challenges to Universities.

## 2 MOTIVATION

According to various sources ([4],[5]) and to our own perception of worldwide distance online courses, the number of participants enrolled is still increasing, being the year 2012 marked as the "boom MOOC year" [5], and in Portugal, specifically, we feel it has a large margin to improve.

Video-lectures available via YouTube channel are "uncountable", just pick a subject, specifically ours – Mathematics – and there are a number of endless offers in English. But if you limit your search to

Portuguese language<sup>(1)</sup>, the results you face are some kind of “empty”. Moreover, the scientific quality of some is miles away from being assured and/or granted. When talking about Massive Open Online Courses (MOOC) offer, in Portuguese, by Portuguese Universities, this is almost non-existent<sup>(2)</sup>, being “we intend to...” or “soon...” the most common and frequent expressions in related news.

We can even try to understand why – we are just a small European Southern Country with about 10 million inhabitants – but we think Universities and Polytechnics are forgetting the potential that represents all the students in developing countries with official Portuguese language, like Brazil, Angola, Mozambique, etc<sup>(3)</sup>. Other possible source of “customers” is the candidates that enrol in higher education system through special contest for candidates over 23 years. For example, Universidade Aberta (UAb), the only institution of public higher education in Portugal of Distance Learning, in 2013, overcomes any of the other sixteen Portuguese universities in number of candidates for degree courses in this special contest, with 1298 candidates in a total of 4055 with effective enrolments accepted of 500 in a universe of 1629<sup>(4)</sup>. These same numbers in 2012 were, respectively, 1654 in 5315 with effective enrolments of 439 in a total of 1466<sup>(5)</sup>. Usually, these candidates are working students that want to complement their academic training but feel more comfortable with online based ones.

When we accepted the challenge from our institution – Polytechnic Institute of Porto (IPP)<sup>(6)</sup> – in October 2013, to develop MOOC for students “outside” IPP – pre-university students as target “customers” – we were not completely aware of what kind of “problems” we could come into and/or go through, and video-lectures construction has revealed to be one of the greatest.

### 3 VIDEO PRODUCTION AND OTHER QUESTIONS

We began to produce our own video-lectures, in 2008, for Moodle platform at ISCAP, under the MatActiva Project (<http://paol.iscap.ipp.pt/matactiva/>) and these are (and were) only available for ISCAP students. The problems we felt more difficult to overcome, on video developing and editing, were deeply related with pedagogical issues: try to turn a teacher-centred material (exposing/reading/talking/...) into, at least, a hybrid one, that stimulates the student/participant’s reactions to it and to the questions/contents developed in each one. After we were challenged to develop MOOC for pre-university students, we felt without “ground” because, until then, all the materials produced were for “internal consumption”. Our institution, as many others all over the world, sees MOOC as an opportunity to advertise the institution, its courses and so to attract more students. For example, more than 27% of USA higher education institutions ([4], p.24), pointed out “Increase Institution Visibility” as the answer to the question: “Primary Objective for your Institution’s MOOC: 2013” (and this was the observed “mode” of all the answers...).

Before embracing video production the first decision to be made is which type of video lecture to use, since there are some different types of video lectures, enhancing distinct skills, namely, among other types of possible compositions:

---

(1) from Portugal not Brazil, since the terms and some definitions are not the same, causing some confusion in students perception

(2) in the year 2013, you can “catch” a Master degree thesis in the Open University with the following illustrative title: First MOOC\* in Portuguese Language: Critical Analysis of its pedagogical model (<http://hdl.handle.net/10400.2/2946>). This MOOC was launched in January 2013, by Open University in Portugal, that has a long and successful experience in e-learning courses, in cooperation with PUC-SP (Brazil) and ABED – Distance Learning Brazilian Association

(3) PALOP that, in English, means African Countries with Portuguese Official Language - ACPOL

(4) Data in: [http://www.dgeec.mec.pt/np4/EstatVagasInsc/%7B\\$clientServletPath%7D/?newsId=120&fileName=Inscritos\\_Maiores23\\_2013\\_2014.ods](http://www.dgeec.mec.pt/np4/EstatVagasInsc/%7B$clientServletPath%7D/?newsId=120&fileName=Inscritos_Maiores23_2013_2014.ods)

(5) Data in: [http://www.dgeec.mec.pt/np4/EstatVagasInsc/%7B\\$clientServletPath%7D/?newsId=120&fileName=Inscritos\\_Maiores23\\_2012\\_2013.ods](http://www.dgeec.mec.pt/np4/EstatVagasInsc/%7B$clientServletPath%7D/?newsId=120&fileName=Inscritos_Maiores23_2012_2013.ods)

(6) Instituto Politécnico do Porto (IPP) began its activity in 1985 as a result of the 1979 re-definition of the national education strategy which re-instated polytechnic universities. IPP is the largest public Polytechnic of Portugal and plays a significant role in the economic development of the Northern part of Portugal. With faculties located in Porto, Matosinhos, Póvoa de Varzim, Vila do Conde, Vila Nova de Gaia and Felgueiras, IPP forms an academic community of over 15 000 students with seven schools in the fields of Engineering, Accounting and Administration, Management, Tourism and Hospitality, Industrial Studies, Technology, Education, Music and Performing Arts and Health Sciences. Its educational portfolio is very appreciated by the labour market due to the specialised competences and skills it provides to its students and has, indeed, a high graduate employment rate. The seven faculties are: ESE School of Education – Porto: <http://www.esse.ipp.pt>; ESEIG School of Management and Industrial Studies - Vila do Conde / Póvoa de Varzim: <http://www.esseig.ipp.pt>; ESMAE School of Music and Performing Arts – Porto: <http://www.esmae-ipp.pt>; ESTGF School of Management and Technology of Felgueiras – Felgueiras: <http://www.estgf.ipp.pt>; ESTSP School of Allied Health Sciences – Vila Nova de Gaia: <http://www.estsp.ipp.pt>; ISCAP Institute of Accounting and Administration – Porto: <http://www.iscap.ipp.pt>; ISEP Institute of Engineering – Porto: <http://www.isep.ipp.pt>

- **Lecture Capture:** the recording of a live lesson or lecture at Higher Education Institutions (HEI).
- **Talking Head Video:** is typically a webcam recording of an instructor, during which he talks on the subject matter.
- **Voice Over Presentation:** the key component of such video-lecture is usually a PowerPoint presentation, complemented with a voice over that describes the slides.
- **Interactive Video Lecture:** it includes video, audio, PowerPoint slides and other features, provided by the interactive video player.

We chose to record our video-lectures as Voice Over Presentation, one of the most commonly used, with Camtasia Studio Software, since it allows the association of visual information with audio narration and the use of verbal skills to explain the subject in the clearest way, which makes learning more effective. We were very careful when introducing the visual information of the subjects (working with enhancing, non-distractible, animations), in each video-lecture. It took us quite a long time to create our videos. In future videos we will try to make “short breaks” and give students a simple exercise/task to carry out while they are watching the video lecture which we feel will help them to engage with the video's content.

The amateur status in which we embraced this challenge was complete! Our voice was never analyzed or tested in terms of “sound appeal” as, for as weird as it may sound, the sound is very important to participant’s behavior/enrolment, although there is not sufficient research on the influence of this, and other characteristics [6] [7] [8]. The approaches/basis that supported the video-lectures were left to the care of the professors who had the respective topic assigned. This “distribution” was made taking several critical issues in perspective: the professors engaging with the subject, the video sequence, in order to optimize the conceptual construction and promote meaningful learning [9], among others.

At the end of the chain were the “editing techniques” and, at this stage, we had numerous questions in mind: how can editing transform a “normal” video into an engaging video-lecture, that is, one that students/users don’t just watch the first 30 seconds?... How can we encourage (from distance and not in “real” time) anyone to watch a “movie” for, at least, 5/10 minutes?... How can we promote interaction without being “on the air”?... All these questions arise in our minds and it was not easy to continue without any advice or guidance. We felt the lack of a supporting team to advice us in terms of producing, designing or even to help us with the inherent technology.

Reading numerous articles on the subject, seeing and listening others, registering all kind of problems we felt, assuming the role of “students/participants”, i.e. piloting the work of others and trying to avoid their mistakes, in our point of view, was virtually the only way we had to “keep on” doing something and not giving up. But, we have a very good advantage on our side more than 20 years teaching experience should be of some help. We have asked a Design student from ESEIG to draw and create a “mascot” with several animated expressions – like, yes, no, writing, surprised, questioning, among others – in order to anticipate student’s reactions along the video sessions and in this way “R2” (square root of 2) was born! Video-lectures are far away from being perfect, but the timeline for this first MOOC to enter the “testing-period” is the end of May<sup>(7)</sup>.

Having some background analytics experience, granted by Moodle platforms and MatActiva Project ([11], [12], [13], [14], [15]) to help us structure this first MOOC, as well as many other insights ([16],[17]), in the sense that the most watched video sessions were directly related with the assignments proposed immediately after, each video-lecture is connected to a single group of 5 questions (in a quiz format) that is randomly selected from a data base created only for this purpose (each question with individual feedback) as well as other available tools like a dynamic streamlined discussion forum and participant’s monitoring.

In our schools we don’t recognise a widespread use of video-lecturing resources. Although some studies reveal a smaller improvement in Mathematics than in other subjects (see [18] p.5) we feel that video-lectures available in MatActiva Project have an important role in the work of prerequisites items we feel (and know) the students have missed in their previous “educational life”. The video materials available have been very successful and with a wide and strong utilization from our students. However a question has come through our minds: students really feel it helps and know that, at this point in

---

<sup>(7)</sup> No one will have just a glance of the hours spent by four math professors (from 3 of the 7 faculties of IPP) to put together this course (from October 2013 until May 2014, using their almost inexistent free time, without earning a penny), trying hard to do the best with the complete notion of the impact and relevance that available resources have in final “product” (take a quick look at the first 5 minutes of [10]).

higher education system, professors cannot go back to that “unremembered” matters. So they try hard to be autonomous and gladly work the “missing parts”, but will we have the same responsible reaction to video-lectures when goals are not so direct and for “yesterday”?

Next time we will try to implement, at least for some topics, the flip flopped classroom, through video-lecture basis and selected activities. In this way we may obtain a direct perception and feedback of their quality and usefulness. However we feel this may confront us with another problem: flipped classroom only works with committed students and it seems this is more easily accomplished in lower than higher levels education (we don’t have the same “group” of students in every classes of the same subject – attendance “float”) but we think it is only a matter of attitude than can be easily overcome.

#### 4 NEWS AND IMPROVEMENTS

Although our institution – IPP – is trying to reinforce the investment in new learning technologies, it is facing the financial Portuguese difficult moment, with all the restrictions and retractions involved, so it is trying to go forward with the “home-grown” resources. But we cannot end without mentioning the extensive start-up costs in terms of preparation a video-lecture long before thinking of launching it. These go from all the staff involved in terms of scientific and technical support; the software support for editing all video-lecture components to all electronic media management and copyrights security. A very popular question in a conference was: should we allow students to download the videos so that they can keep them as traditional books for future reference or are they property of the authors’ team or of the Institution?

The analytics process, in particular video-lecture analytics, is crucial in MOOC improving and succeeding [5] and, as we already made reference, the research in this field is small (but beginning to grow). It is essential, in pedagogical terms, when thinking about video-lecture production to understand the learner interactions with them [19], to have the perception of what can be done to improve the learner enrolment, to look for and understand the “ingredients” available, as video annotations [5], among others, and all of these questions also depend upon what “type” of video-lectures we are talking about. As Guo mentioned ([20], p.41), “Video production style often affects student engagement in MOOCs” and he goes forward recognizing several video-lecturers typical styles, like PowerPoint slide presentations (that can be more or less dynamical), classroom lecture, talking instructor at a desk and digital tablet or blackboard drawing format (see Table 1. [20], p.42, for a summary of the main findings and video production recommendations).

Video annotations, in particular, are a recent subject that promotes collaborative work and the students’ participation, creating discussions around common points of interest (revealed by annotation). There are already some remarking developments in multimedia annotations, promoted by University Projects<sup>(8)</sup>, among others, with some free plugins allowing any participant to place tags on a video-lecture. These tags seem to be a way of promoting students’ enrolment since they can interact with a, until now, static content: they can make a direct question or remark, “straight on” the issue. From the video-lectures developers’ point of view, annotations can be a very important instrument to improve the following editions. However, allowing annotations of any kind and at any place will certainly be time consuming for the professor supervising and accompanying the course development since he also needs to be interactive (online), at least for a feedback, comment or withdraw the incoming (of any kind) annotations.

It seems that all higher education institutions actors could only benefit with the development of good video portfolios [9] [21], for instance:

- Extending classes anytime, providing students the possibility of learning in their own “timing”, even anticipate some topics, giving the professor more class available time to explore particular and practical difficulties or allowing multiple reviewing of specific items. Note that some studies reveal that learning is more effective when provided in real time accordingly to each student needs and, in this sense, video-lecture support may have direct impact [22].
- Extending classes anywhere, allowing study and review anyplace, even worldwide, is a way of promoting the “just-in-time” work frame.

---

<sup>(8)</sup> For example, OVA (Open Video Annotation Project) led by the Center for Hellenic Studies in Harvard University and supported by a grant from the Becas Talentia program from the Junta de Andalucía, Spain: <http://www.openvideoannotation.org> or Project Pad2 from Northwestern University: <http://dewey.at.northwestern.edu/ppad2/index.html>

- Supporting a natural multisensory learning environment, that takes advantage of well-known tools for students, remembering that they were born in the video and digital era, where image is crucial in their learning process, that began years before as Boster stated in [6], “There are several reasons to expect that the use of video streaming to supplement teacher lesson plans will enhance learning” and, speaking of Mathematics in particular “there is evidence to indicate that a technology-based instructional tool, such as video streaming, might be especially well suited to improving students’ mathematical proficiency” in the sense that visualisation helps to deconstruct some abstract concepts.
- The recent development in annotations software, opens new insights in video-lectures utilization, promoting a much more dynamical and interactive use that may promote students enrolment, particularly in MOOC courses and trying to illustrate how video annotations can be used in eLearning contexts [23].
- Among many others “pros” in video-lectures development/improvement and implementation, we cannot forget the financial ones [18]but, at least for a good starting point, institutions must consider the existence of a minimum “compulsory” investment.

## 5 CONCLUSION

There are no doubts that the number of people accessing internet through either mobile devices or desktop computers is growing very fast, storage costs are dropping, so these leads to the fact that video use will accelerate. In [24], New York University stated that “in the future, faculty expect to have more video available in digital form for streaming and download”. We consider that this is the aim of every higher education institution. In the case of Portugal there aren’t, yet many videos available to our students in our native language, and that is one of the reasons we have accepted the challenge from IPP to develop MOOC to pre-university students. It was a challenge because the conditions are not the best. Budget is zero and so we don’t have much support neither in terms of producing, designing or even technological help. What we have in favor is more than 20 years of teaching experience and a project that started six years ago where we have developed several videos and assessments for ISCAP students. We hope to go further and improve with our experience, do the learning analytics and keeping on doing some more Mathematics courses.

There are still many open fields for research in this area, and connected ones, and it seems to be a wide open space waiting to be developed. For instance, we have from Comunicar Journal<sup>(9)</sup> several calls for contributions in “Review best practices in didactic processes and significance of multimedia annotations” or “The Web 3.0. Possibilities and pedagogical functions of the annotations for educational processes”, among other themes.

In [16] we can see some results about some design implications for MOOC video interfaces with some insights about dropout and peak views of video in various MOOC and these depend “on the visual, pedagogical, and stylistic properties of the video” and they identify some issues to have in account when designing MOOC/video interfaces, like: Make short videos; Avoid abrupt transitions in videos; Offer interactive links and screenshots for highlights; Summarize (for selective watchers); One-click access to crucial parts in video-lectures.

As we have already mentioned, Kay in [8] states the emptiness reviled, in his literature review, about pedagogical problems namely: the optimum length for videos and it’s (in)dependence upon subjects; the compared effectiveness of summaries counter full video-lectures; possible feedback given through videos, among others.

*“Provision of student academic support services at a distance are as great a challenge as development of academic content.”<sup>(10)</sup>*

<sup>(9)</sup> Please see [www.revistacomunicar.com/pdf/call/call-44-en.pdf](http://www.revistacomunicar.com/pdf/call/call-44-en.pdf)

<sup>(10)</sup> In “The Paso del Norte Region, US-Mexico: Self-Evaluation Report”, Regional Stakeholders Committee (2009), OECD Reviews of Higher Education in Regional and City Development, IMHE, <http://www.oecd.org/edu/imhe/regionaldevelopment>

## REFERENCES

- [1] Moss, R. (1983). Video, the educational challenge. Croom Helm Ltd, London and Canberra, 1983.
- [2] Goodyear, P., Steeples, C. (1998). Creating shareable representations of practice, *Advance Learning Technology Journal (ALT-J)*, Volume 6 Number 3 (16-23).
- [3] Bravo, E.; Amante; B.; Simo, P.; Enache, M.; Fernandez, V. (2011). Video as a new teaching tool to increase student motivation. *IEEE Global Engineering Education Conference (EDUCON)*, 638-642.
- [4] Allen, I. Elaine and Jeff, Seaman (2014). "Grade Change - Tracking Online Education in the United States", Retrieved from: [www.onlinelearningsurvey.com/reports/gradechange.pdf](http://www.onlinelearningsurvey.com/reports/gradechange.pdf) (Babson Survey Research Group).
- [5] Ronchetti, Marco (2013). Videolectures Ingredients that can make Analytics Effective, In *Proceedings of the Workshop on Analytics on Video-based Learning (WAVE 2013)*, CEUR-WS, Vol. 983, 15-20 <http://ceur-ws.org/Vol-983/WAVE2013-Proceedings.pdf>.
- [6] Boster, F. J., Meyer, G. S., Roberto, A. J., Lindsey, L., Smith, R., Inge, C., et al. (2007). The impact of video streaming on mathematics performance. *Communication Education*, 56(2), 134–144. doi:10.1080/03634520601071801.
- [7] Giannako, Michail N.; Chorianopoulos, Konstantinos; Ronchetti, Marco; Szegedi, Peter and Teasley, Stephanie D. (2013). *Expanding Horizons and Envisioning the Future of Analytics on Video-Based Learning*, In *Proceedings of the Workshop on Analytics on Video-based Learning (WAVE 2013)*, CEUR-WS, Vol. 983, 1-6. <http://ceur-ws.org/Vol-983/WAVE2013-Proceedings.pdf>.
- [8] Kay, R. (2012). *Exploring the use of video podcasts in education: A comprehensive review of the literature*. *Computers in Human Behavior*, 28, pp.820-831. doi:10.1016/j.chb.2012.01.011.
- [9] de Boer, J., Kommers, P. A. M., & de Brock, B. (2011). Using learning styles and viewing styles in streaming video. *Computers & Education*, 56(3), 727–735. doi:10.1016/j.compedu.2010.10.015.
- [10] Rubin, Nancy; Hibbert, Melanie and Eder, Michael (2013). "Video in Online Learning: Connecting Analytics to Pedagogy", *Kaltura Connect 2013*, Video Conference assessed January 2013 in: [http://connect.mediaspace.kaltura.com/media/Video+in+Online+LearningA+Connecting+Analytics+to+Pedagogy/1\\_d6af6r3o/16038901](http://connect.mediaspace.kaltura.com/media/Video+in+Online+LearningA+Connecting+Analytics+to+Pedagogy/1_d6af6r3o/16038901).
- [11] Lopes, A., Babo, L., Azevedo, J. (2008). Teaching and Learning Mathematics Using Moodle. *INTED2008 Abstracts Book ISBN: 978-84-612-0192-1 and INTED2008 CD Proceedings ISBN: 978-84-612-0190-7*.
- [12] Babo, L., J. Azevedo, Lopes, A. (2008). The Active Mathematics Project at ISCAP. *ENMA2008 - International Conference on Engineering and Mathematics Proceedings Book ISBN: 978-84-612-5331-9*.
- [13] Torres, C., Lopes, A., Babo, L., Azevedo, J. (2009). Developing Multiple-Choice Questions in Mathematics. *ICERI 2009 - International Conference of Education, Research and Innovation, Proceedings CD ISBN: 978-84-613-2955-7, Abstracts CD ISBN: 978-84-613-2953-3*.
- [14] Torres, C., Lopes, A., Babo, L., Azevedo, J. (2011). Improving Multiple - Choice Questions. Volume 1, No.1, *US-China Education Review, Education Theory*, David Publishing ISSN 2161-6248, USA.
- [15] Babo, L., Azevedo, J., Torres, C., Lopes, A. (2010). New Challenges in Mathematics for the European Higher Education. In *proceedings of ICERI 2010, International Conference of Education, Research and Innovation, Proceedings CD ISBN: 978-84-614-2439-9, Abstracts CD ISBN: 978-84-614-2438-2*.
- [16] Kim, Juho; Guo, Philip J.; Seaton, Daniel T.; Mitros, Piotr; Gajos, Krzysztof Z. and Miller, Robert C. (2014). *Understanding in-video dropouts and interaction peaks in online lecture videos*, In *Proceedings of the first ACM conference on Learning @ scale conference (L@S '14)*, 31 - 40. <http://dl.acm.org/citation.cfm?id=2566237>.

- [17] Hibbert, Melanie (2014). What Makes an Online Instructional Video Compelling? (EDUCAUSE Review) | EDUCAUSE.edu, assessed May 4 in <http://www.educause.edu/ero/article/what-makes-online-instructional-video-compelling>.
- [18] Barbier, Joel; Cevenini, Pete and Crawford, Alain (2012). Video Solves Key Challenges in Higher Education - Video Solutions Help Universities Improve Instruction and Expand Reach Without Straining Tuitions or Budgets, Cisco IBSG © 2012. Assessed May 4 in <http://www.cisco.com/web/about/ac79/docs/re/Video-in-Higher-Education.pdf>.
- [19] Chorianopoulos, Konstantinos; Giannakos, Michail N. and Chrisochoides, Nikos (2014). *Open system for video learning analytics*, L@S '14 Proceedings of the first ACM conference on Learning @ scale conference (p. 153-154). <http://dl.acm.org/citation.cfm?id=2567855>.
- [20] Guo, Philip J.; Kim, Juho and Rubin, Rob (2014). *How Video Production Affects Student Engagement: An Empirical Study of MOOC Videos*, In Proceedings of the first ACM conference on Learning @ scale conference (L@S '14), (p. 41-50) [http://pgbovine.net/publications/edX-MOOC-video-production-and-engagement\\_LAS-2014.pdf](http://pgbovine.net/publications/edX-MOOC-video-production-and-engagement_LAS-2014.pdf).
- [21] Coddling, Andrew (2013). Results presentation of “Avaya Survey: Video-based Learning Solutions in K-12 & Higher Education” assessed May 10 in [http://www2.avaya.com/am/camp/us/rtc\\_he/files/Avaya\\_VBLS\\_2013\\_Public.pdf](http://www2.avaya.com/am/camp/us/rtc_he/files/Avaya_VBLS_2013_Public.pdf).
- [22] Wieling, M., & Hofman, W. (2010). The impact of online video lecture recordings and automated feedback on student performance. *Computers & Education*, 54(4), 992–998. doi:10.1016/j.compedu.2009.10.002.
- [23] Aubert, Olivier; Prié, Yannick and Canellas, Camila (2014). Leveraging video annotations in video-based e-learning, 6th International Conference on Computer Supported Education (CSEDU), Barcelone : Spain April 2014, assessed in May 11 2014 in: <http://arxiv.org/abs/1404.4607>.
- [24] Kaufman, P.B.; Mohan, J. (2009). Video Use and Higher Education: Options for the future, INT,NYU.