

The behavioural intention to use video lecture in an ODL institution

Insights from learners' perspective

Chooi Chea Chiam

Open University Malaysia, Bandar Baru Bangi, Malaysia, and

Tai Kwan Woo, Han Tek Chung and P. Rajesh Kumar K.P. Nair

Open University Malaysia, Kuala Lumpur, Malaysia

Abstract

Purpose – The purpose of this paper is to gain insight into learners' behavioural intention to use the video lectures as their learning material. The behavioural intention construct is measured in terms of perceived ease of use and perceived usefulness of video lectures. It is hoped that the findings of this study will provide feedback as to learners' intention to use as well as guidelines on how to improve the development of video lectures as the university gears to offer more courses in the fully online mode in the near future.

Design/methodology/approach – A total sample of 392 questionnaires were collected for this study using technology acceptance model model. Descriptive and inferential statistics are used as the main analytical tool to study the learners' behavioural intention to use the video lectures as their learning material. The behavioural intention construct is measured in terms of two dimensions: perceived ease of use and perceived usefulness of video lectures.

Findings – In conclusion, the findings from this research study seem to suggest that OUM learners have a positive perception of video lectures with reference to the two dimensions of "ease of use" and "usefulness", where ease of use is concerned, OUM learners rate content relevancy, appropriate language and viewing flexibility as the strongest points of video lectures. The aspects ranked lowest are technical (ability to play the video lecture smoothly from the beginning to the end) as well as objective of usage (video lectures are not rated high as revision material for exam preparation).

Research limitations/implications – Future studies can be conducted pertaining to issues on the context in which learning is taking place within higher education, various definitions of video, and ways of categorising and presenting these different types, teaching "with" and "through" video from the perspective of the lecturer and the educational institution, approaches to didactically embedding and integrating video into a course that results in effective learning and the process and support needed by the (traditional) lecturer to create and deploy various types of video content.

Originality/value – Over the last ten years, the production of video has gone from a complicated and technical process to one easily done by the general masses. It is now possible for anyone with a mobile phone to make a video recording. The question lies on whether the students have deeper meaning of learning via video lectures and the perception of students on using video lecture as teaching tool in the open and distance learning.

Keywords Video lectures, Online, Perceived usefulness, Perceived use

Paper type Case study

1. Introduction

The world of education has witnessed a dramatic shift in teaching and learning in the last two decades due to the advent of the internet and the wide usage of technology. As a result, education providers face a myriad of challenges in engaging learners, be it in conventional



universities or in ODeL institutions. There is a need to develop a repertoire of learning strategies and materials that can cater to the different needs of learners across a variety of learning environments. OUM responded to this call by leveraging on internet technology to transmit education across to its learners via supported academic materials such as video lectures, e-modules, an online forum, self-learning tasks and exercises, etc. Additional learning aids and tools are provided, upon request, to smooth out the long and challenging journey of ODeL learners.

In recent years, the trend seems to be an increasing emphasis on the development of video lectures, uploaded online on various learning platforms as well as on YouTube, to cater to the needs of learners who like to be “talked to”. The majority of these videos look like traditional lectures chopped up into smaller chunks, in the style of a “talking head” (lecturer talks to the class) or “tablet capture” (lecturer writes on the blackboard while talking). Over the years, a big trend in online learning has been to move lots of content and learning materials online in the form of video lectures. These video lectures courses cover a wide range of subjects and exist on a number of different platforms.

This trend, too, has been making an impact at OUM which now focusses on the development of PDF colour modules and video lectures as the primary e-content that drives learning at the university. This study, thus, aims to gain insight into learners’ behavioural intention to use the video lectures as their learning material. This approach is being implemented because open and distance learners’ attention span is limited and not long enough for the duration of a typical lecture (Bunce *et al.*, 2010). Thus, this leads to a “sink or swim” attitude amongst students (Seery, 2015). Learners tend to learn more effectively when engaging in active learning compared to students taught using the traditional lecture format (Freeman *et al.*, 2014). Kirkwood and Price (2014) highlighted that higher test scores and enhancement was often reported in the review of e-learning literature that the term technology enhanced learning but the studies did not examine whether the students developed a deeper or richer understanding of the subject. However, Merkt and Schwan (2014) found that video lectures can increase the learning outcomes of the students when compared to regular non-video learning because of its engaging and active participation from the students.

Figure 1 shows the current learning model in OUM. OUM puts strong emphasis on assisting its adult learners, who have to juggle studies with work and family commitments, through the learning process. Hence, has been introducing various innovative ways to guide them through the learning process. E-content, e-Gate, MRC, i-lecture were introduced and i-lecture was further improved from a non-engaging video to a more engaging and interactive video approach. OUM tries to provide ample and engaging approach to its learners, especially adult learners who has many other commitments in life such as work, family, etc. apart from their studies.

This research aims to study the OUM learners’ behavioural intention to use the video lectures as their learning material using descriptive and inferential statistics as the main analytical tool. The behavioural intention construct is measured in two terms: perceived ease of use and perceived usefulness of video lectures. It is hoped that the findings of this study will provide feedback as to learners’ intention to use as well as guidelines on how to improve the development of video lectures as the university gears to offer more courses in the fully online mode in the near future. Towards this objective, many new and innovative elements have been introduced in the teaching and learning process to assist learners including video lectures, task-based activities, exercises in various formats, etc. Nevertheless, not many studies been conducted to date, to test the usefulness and ease of use of such learning materials.

2. Literature review

Over the last ten years, the production of video has gone from a complicated and technical process to one easily done by the general masses. It is now possible for anyone with a

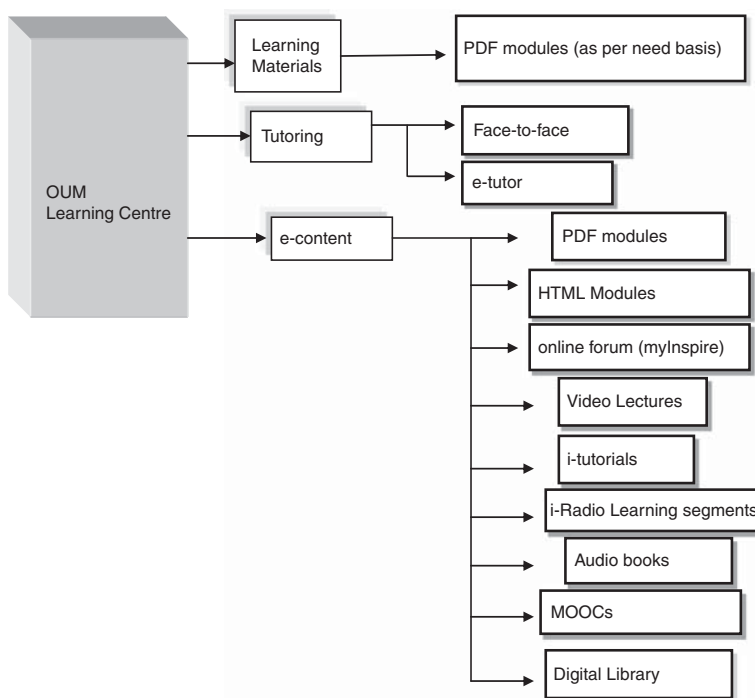


Figure 1.
Current ODL model
of OUM

mobile phone to make a video recording. In the past, this process required expert technicians with specific knowledge, and access to expensive specialist video equipment, processing and streaming files. Now, mobile devices, from smart phones, digital devices, iPads and digital cameras have the standard option of recording video at an ever increasing quality and these recorded video files can be instantly uploaded via WiFi to social media and to servers in the cloud.

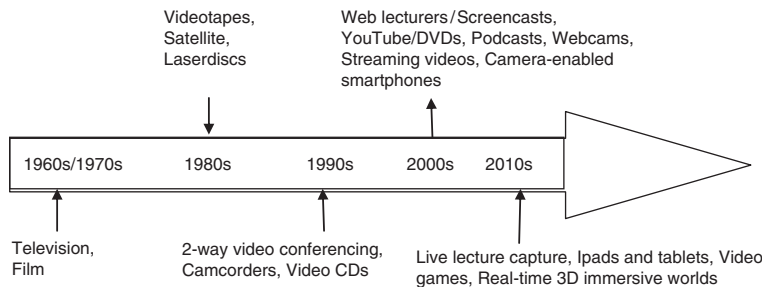
Teaching “into camera” requires an adjustment of established teaching practices and developing a new set of teaching skills. Guo *et al.* (2014) explained the importance of considering whether instructional technology adds value to the learning process and its experience by students because using technology simply because it is available does not necessarily lead to effective teaching outcomes. Video lectures are instructional videos prepared by the course instructor to supplement classroom lectures. These videos have the same content and subject rigour as classroom lectures, labs, homework and examinations, but are portable and can be viewed whenever a student wants and at the student’s learning pace. According to Merrill *et al.* (1992) and Kirschner (2002), as an informal supplemental instruction, video lectures provide instructor-delivered models of reasoning and problem solving. This reduces cognitive load for beginning students and is expected to increase learning and grade performance. Bryant and Hunton (2000) also discussed educational technology’s attributes from the perspective of behavioural and cognitive learning theory.

Zhang *et al.* (2006) studied interactive video where video segments can be directly chosen to engage learners. Moreno (2006) maintained that media characteristics affect technology-based learning. Lesser and Pearl (2008) and Van Wyk (2011) used topic-relevant cartoons and songs to enhance learning environments as course content relevance and social richness in a course’s learning environment are positively associated with student enjoyment and performance in traditional classroom courses (Nemanich *et al.*, 2009). Meanwhile, Nicholson *et al.* (2008) found

that less complexity and more sensory richness increased student interest and performance. Additionally, Bryant and Hunton (2000) examined the influence of visual and audio elements on learning outcomes in distance education. Videos can take a multitude of forms, from a nature documentary (Ibrahim *et al.*, 2012) to whiteboard imitations (Chen and Wu, 2015).

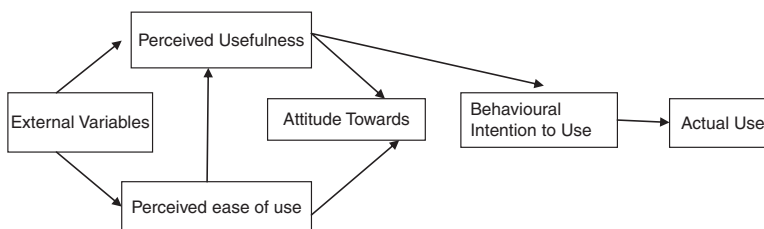
According to Delen *et al.* (2014), interactive elements in interactive videos are divided into two types, namely, micro-level interactivity, which is the pausing, playing, rewinding/forwarding which is common for all videos. Macro-level interactivity such as the videos providing opportunities for note taking, self-evaluation and seeking supplemental resources (Delen *et al.*, 2014) Bransford *et al.* (2000) highlighted the importance of interactivity in videos in helping students learn by being able to re-visit and review the material. They emphasised the potential of technology to help learning, but only if used properly. The use of video has changed dramatically over the years, from the use of television and physical cassette tapes in the 1960s to screen casts and live lecture captures today. When the format of video was a physical video cassette, video viewing was restricted by the physical copy of the cassette (Pitman, 1989). A lecturer could borrow a video from the library and play it to the class via a television. This required planning, ensuring adequate equipment was available, and had certain technological challenges ensuring sound quality and visibility of the image. Figure 2 shows the timeline, adapted from Greenberg and Zanetis (2012).

This study adopted the technology acceptance model (TAM) developed by Davis (1986). TAM identifies two dimensions – perceived ease of use and perceived usefulness – as precursors to intention to use a technology. The model has proven to be useful in helping to explain and predict user behaviour of information technology (Legris *et al.*, 2003). According to TAM, one's actual use of a technology system is influenced directly or indirectly by the user's behavioural intentions, attitude, perceived usefulness of the system and perceived ease of the system. TAM also proposes that external factors affect intention and actual use through mediated effects on perceived usefulness and perceived ease of use. Figure 3 shows the original TAM (Davis, 1989). For the purpose of this research study, an attempt was made



Source: Greenberg and Zanetis (2012)

Figure 2.
Timeline on the uses
of video in teaching
and learning



Source: Davis (1986)

Figure 3.
Technology
acceptance
model (TAM)

to gauge the “ease of use” and “usefulness” of the video lectures as perceived by OUM learners as these two dimensions would affect the learners’ behavioural intention to use (view) the video lectures and facilitate the learning process. Due to the trend of online learning, an e-learning system is designed to provide students with online access and learning content. However, there are numerous barriers to the integration of instructional technology into higher education, such as technology infrastructure, faculty effort, technology satisfaction and graduates competency (Surry *et al.*, 2005). Many higher online educational institutions have failed due to the high cost of technology, poor decisions, competition and the absence of a business strategy (Elloumi, 2004). Many universities that provide e-learning face enormous difficulty in achieving successful strategies including the delivery, effectiveness and acceptance of the courses (Saadé, 2003). Merely offering any conceivable course and attempting to replicate classroom experience online cannot meet the students’ needs and may cause unexpected failure (Kilmurray, 2003). University students’ persistent frustration in web-based education is another problem in terms of online learning. Studies conducted on e-learning using interactive videos generally show positive results for student learning of the subjects (He *et al.*, 2012; Schultz *et al.*, 2014; Shattuck, 2016; Wells *et al.*, 2012). Other than that, students are mostly positive in their reactions to the use of video lectures (Schultz *et al.*, 2014; Shattuck, 2016). Besides that, students also tend to enjoy an active approach (Jensen *et al.*, 2015).

Video lecture has been used in the teaching and learning widely. Video lecture is a vital tool used in teaching and learning today due to the many advantages it provides. Teaching and learning process can be further enhanced and experienced today because with video lecture, learners can learn anywhere anytime. Basically learners will have more authority on their learning pace, time and place. It provides sense of responsibility and flexibility to learners especially adult learners in ODL mode. Other than that, video lecture can be very engaging with learners and also it is very easy to be managed by education institutions. It is beneficial to both the education providers and the learners.

This study adopted the model of TAM with only perceived usefulness and perceived ease of use on attitude and behavioural intention to use. Refer to Figure 4 for the model used for this study.

3. Methodology

As mentioned earlier, there are various learning materials provided by the university and learners can now access the university’s e-content – 1,560 PDF modules, 865 HTML modules and 221 video lectures. These 221 video lectures were produced by academicians and the Centre for Instructional Design and Technology (CiDT) in tandem with the university’s future fully online courses pathway. These video lectures cover a wide range of courses to cater various learners in all programmes.

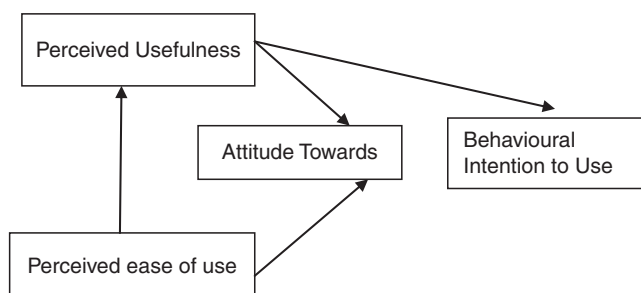


Figure 4.
Model used in
this study

A total sample of 392 questionnaires were collected for this study. The respondents were learners from five OUM learning centres in the Klang Valley, namely, Sri Rampai, KL Main Campus, Shah Alam, Bangi and Petaling Jaya with convenience sampling design. The collection of questionnaires was done in the September 2016 and January 2017 semester. The respondents were from various programmes and faculties and they were requested to fill up the questionnaire during their classes. Descriptive and inferential statistics are used as the main analytical tool to study the learners' behavioural intention to use the video lectures as their learning material. The behavioural intention construct is measured in terms of two dimensions: perceived ease of use and perceived usefulness of video lectures. The questionnaire consists of 20 questions from the two identified dimensions (perceived ease of use and perceived usefulness of video lectures) and uses four-point Likert scale. Each dimension consists of ten questions. A median value based on the four-point Likert scale is 2.5; hence, the threshold value of 2.5 is used to measure the dimensions.

A brief summary of the respondents' demographic profile is shown in Table I. The distribution in the gender category among the respondents is relatively equal, 43.1 and 56.9 per cent are male and female, respectively. Most of the respondents are lesser than 30 years old, followed by 31-50 years old; only 2.6 per cent of the respondents are above 51 years old.

Table II shows the descriptive analysis for the respondents based on OUM learning centres. A total of the responses from 392 respondents were collected from five learning centres during September 2016 and January 2017 semester. Approximately, 41.6 per cent of

Details	Number of respondents	%
<i>Gender</i>		
Male	169	43.1
Female	223	56.9
<i>Age</i>		
< 30 years old	209	53.3
31-50 years old	173	44.1
> 51 years old	10	2.6
<i>Learning centre</i>		
Sri Rampai	77	19.6
KL Main Campus	31	7.9
Shah Alam	52	13.3
Bangi	69	17.6
Petaling Jaya	163	41.6
<i>Device used</i>		
PC/Laptop	336	85.7
Mobile	44	11.2
Tablet	12	3.1

Table I.
Respondents'
demographic profile

Learning centre	Respondents	%
Sri Rampai	77	19.63
KL Main Campus	31	7.90
Shah Alam	52	13.30
Bangi	69	17.59
Petaling Jaya	163	41.58

Table II.
Respondents based
on OUM's
learning centres

the respondents are from the Petaling Jaya Learning Centre, followed by Sri Rampai (19.6 per cent), Bangi (17.6 per cent), Shah Alam (13.3 per cent) and KL Main Campus (7.9 per cent). Most used device to assess the video lectures based on these respondents is personal computer/laptop (85.7 per cent), mobile phones (11.2 per cent) and tablets (3.1 per cent).

4. Results and analysis

Descriptive and inferential statistics are used as the analysis tool. In total, 20 questions were asked in the questionnaire and this was later sorted out into two dimensions: perceived ease of use and perceived usefulness of video lectures.

Table III shows the overall mean and standard deviation value for the two dimensions. The mean value is used due to ease and convenience of interpretation. Both the overall mean for perceived ease of use and perceived usefulness are above 2.5 with 2.807 and 2.713, respectively. Overall perceived value on video lectures based on the two dimensions is 2.76; higher than the threshold value of 2.5 as well. This shows a relatively high likelihood of learners to be using and viewing the video lectures in the future. Learners find the video lecture rather ease to use and rather useful in the learning process via ODL.

Table IV shows the mean value for each question based on the two dimensions. The mean in the perceived ease of use dimension ranges from 2.75 to 2.89, while the standard deviation ranges from 0.828 to 0.910. The mean in the perceived usefulness dimension ranges from 2.60 to 2.83, while the standard deviation ranges from 0.825 to 0.866. Both the dimensions generated results at lowest mean value of 2.6 and highest at 2.89. This clearly shows that learners are quite receptive on video lectures but those videos would have to be of a certain quality, standard and also be interactive to capture learners' interest and attention for the course. In comparison between the two dimensions, perceived ease of use tends to have a slightly higher mean value as compared to perceived usefulness of video lectures among the respondents in this study.

The overall mean value for perceived ease of use for video lecture and perceived usefulness of video lecture is 2.807 and 2.713, respectively. This shows that the results for both dimensions tend to have a higher end of value 2 but have yet to reach the more positive

Table III.
Overall mean and
standard deviation
based on dimensions

Dimension	Mean	SD
Perceived ease of use	2.807	0.8671
Perceived usefulness	2.713	0.8553
Overall value	2.76	0.8625

Table IV.
Mean value for
perceived ease of use

Dimension	Mean value	SD
<i>Perceived ease of use</i>		
Q18: the language used in the presentation is appropriate	2.89	0.828
Q11: viewing at my own time is convenient	2.89	0.841
Q1: the content is relevant to the topic discussed	2.88	0.882
Q2: the presentation is well-organised and systematic	2.83	0.854
Q3: I can find the video easily in myInspire	2.78	0.910
Q7: I can use any device to view the video lecture	2.77	0.870
Q15: I can access the video wherever I am	2.77	0.889
Q6: the presentation flow is well-paced	2.76	0.851
Q19: the video plays smoothly from start to finish	2.75	0.837
Q12: I use the video lecture in my revision for exams	2.75	0.887
Overall mean value for perceived ease of use of video lecture	2.807	

level of 3 in the scale. Therefore, CiDT would need to work hand-in-hand with the subject matter academics to ensure the latest and most engaging video approaches are produced to assist learners in online learning. This is because based on this study, the receptiveness of learners towards video learners, though positive, can still easily lean the other way and fall into the “unfavourable” category.

These video lectures need to be reviewed frequently in order to ensure latest information has been incorporated into the courses, especially courses such as taxation and accounting guidelines, public finance policies, laws, information technology, latest science findings, etc. These courses need to be updated so as to provide learners with the latest regulations, findings, breakthrough, etc. in the real world.

Research findings also show that the sample video lectures rank lower in areas such as “helps me to complete my assignment” and “grab my attention till the end”. A possible reason for the slightly lower ranking in helping learners to complete assignment might be due to the fact that OUM’s video lectures are not developed for the purpose of helping students do their assignments. The primary objective is more to reinforce learning and explain difficult concepts in a mode other than “grey text”.

However, the findings do seem to suggest that more can be done in terms of enhancing the graphics and visual elements to make them more attractive so as to hold learners’ attention till the end. These are areas that can be looked into to improve the quality of the video lecture so that a higher value can be reached in future.

Table IV shows the mean value for perceived ease of use dimension. The three highest mean score items are pertaining to the language used in the video lecture (2.89), the relevancy of the content of the subject itself (2.89) as well as the flexibility to view it by learners (2.88). Nevertheless, the three lowest mean score are pertaining to the pace of the video (2.76), revision for exams (2.75) and the video to be played smoothly from the beginning till the end (2.75). The lowest score were expected because the video lecture that are developed currently mainly to assist learners in the learning process especially in the final examination and not in completing the assignment tasks. This is because assignment questions change every semester.

Meanwhile, in the perceived usefulness dimension, three highest mean score value are on the content of the course (2.83), coverage of the subject (2.78) as well as assisting learners in understanding the course (2.72). However, three aspects scoring lowest in mean value are help in assignments (2.6), ability to grab attention (2.66) and visuals attractiveness (2.67). This result can reflect the need to develop video lecturers with certain enhanced features for assist learners in their learning experience for OUM (Table V).

Dimension	Mean value	SD
<i>Perceived usefulness</i>		
Q17: the content is concise, focussing on main concepts	2.83	0.828
Q5: the video lecture has adequate coverage of the topic	2.78	0.825
Q8: I have better understanding of the difficult concepts	2.72	0.866
Q9: the content in the video lecture is accurate	2.72	0.855
Q20: it motivates me to learn more about the subject	2.72	0.901
Q13: it contains information that is current and up to date	2.72	0.867
Q16: I find it useful for my online forum interaction	2.71	0.835
Q14: I enjoy the attractive visual aids in the video lecture	2.67	0.854
Q10: the presenter is able to grab my attention till the end	2.66	0.834
Q4: it lecture helps me to complete my assignments	2.60	0.864
Overall mean value for perceived usefulness of video lecture	2.713	

Table V.
Mean value for
perceived usefulness

To sum up in a nutshell, the results findings show that OUM learners have a positive perception on the “ease of use” and “usefulness” dimensions. This suggests the behavioural intention to view the video lectures and the likelihood of OUM learners using video lectures as a learning reference.

However, certain areas, such as enhancing the visual elements, innovating on ways to hold students’ interest, ensuring that the video lectures play smoothly from start to finish, need attention if video lectures are to be ranked higher than the current scores. The implication is that OUM academics and the team responsible for video lecture development do need to strategise on ways to improve the video lectures in terms of visual presentation and technical issues if they wish video lectures to feature more prominently in the learners’ preferred modes of learning.

One of the questions tried to superficially gauge learners’ preference in terms of face-to-face tutorials or video lectures. Feedback from the questionnaire seems to suggest that for this group of respondents at least, the majority still prefers to learn via the face-to-face mode (80.1 per cent). Only 19.9 per cent opted for video lectures (see Table VI). This is interesting as it seems to suggest that while learners view video lectures as “easy to use” and “useful”, they still preferred to have face-to-face tutorials if asked to choose between face-to-face interaction and video lecture mode only. This is an aspect that merits attention in future research.

5. Conclusion

To sum up, OUM learners have a positive perception of video lectures, with reference to the two dimensions of “ease of use” and “usefulness”. Where ease of use is concerned, OUM learners rate content relevancy, appropriate language and viewing flexibility as the strongest points of video lectures. The aspects ranked lowest are technical (ability to play the video lecture smoothly from the beginning to the end) as well as objective of usage (video lectures are not rated high as revision material for exam preparation).

In conclusion, the findings from this research study seem to suggest that OUM learners have a positive perception of video lectures with reference to the two dimensions of “ease of use” and “usefulness”. Where ease of use is concerned, OUM learners rate content relevancy, appropriate language and viewing flexibility as the strongest points of video lectures. The aspects ranked lowest are technical (ability to play the video lecture smoothly from the beginning to the end) as well as objective of usage (video lectures are not rated high as revision material for exam preparation).

Likewise, in the “usefulness” dimension, OUM learners find the video lectures useful because they are concise and useful to reinforce learning as they focus on main concepts; the aspect ranked lowest is the usefulness of video lectures in assisting to complete their assignments.

Video as a medium continues to have an on-going impact on higher education, challenging the traditional role of the lecturer and the format of delivering course content. Many lecturers, however, still lack adequate knowledge, guidance and training to integrate this technology into their teaching, either at a practical, technical level, or at a didactic, teaching level (Stover and Veres, 2013). Lecturers may not be convinced of potential benefits, may be afraid of this new technology, or see no need to adapt (Reece, 2013). The possibilities offered by new technology can appear overwhelming, challenging and unsettling to traditional teaching.

Table VI.
Percentage on mode
of learning

Mode of learning	Percentage
Learn via face-to-face	80.1 (<i>n</i> = 314)
Learn via video lecture	19.9 (<i>n</i> = 78)

At OUM, however, technology has become an integrated part of the operations of the university. The focus is to offer learners PDF modules as the primary e-learning material and video lectures as important supplementary learning material. The objective is not only to reinforce learning but also to cater to learners' different learning styles (one-dimensional modules as well as two- and three-dimensional video lectures) and learning preferences (from print modules to learning from tablets, iPads and smart phones). Video lectures are being used as mode of correspondence and communication and without exception this technology has become an integrated part of the operations of the OUM. The underlying philosophy for the university is that learners have a choice to select the most cost-effective system which allows them flexibility for learning interaction, whether through the web-based, and/or multi-media modes together with PDF modules. As the OUM works in maintaining quality education and increasing excellence in higher education, it is conscious of the continuous competition from other ODL institutions within Malaysia and globally that also seek to offer the same opportunities to a similar pool of potential clients.

If the mushrooming of online courses in recent years is anything to go by, video lectures will definitely be increasingly favoured as a choice mode of learning in the near future. It is thus imperative that more studies be done to gauge learners' preferences *vis-à-vis* the use of video lectures. Studies pertaining to aspects such as the context in which learning is taking place in higher education, ways of integrating videos into instruction so as to result in effective learning, teaching "with" and "through" video, and the support needed to create and deploy various types of video content will definitely chart new directions and shed light on the way forward for educationists in the twenty-first century.

Higher education providers should make greater efforts to boost university students' e-learning self-efficacy. It is necessary for the university to put more emphasis on offering a greater variety of e-learning options and advertising the benefits of e-learning to students. The overall results from this study reflect positive feedback from the respondents regarding video lectures, with areas to improve on. Video lectures need to be engaging and able to grasp the learners' attention till the end of the video. Many aspects need to be considered in order to achieve that, including the skill of the presenter, the content of the video lecture, the flow of the content, etc. Another aspect to look into is to decide whether video lectures should assist learners in completing assignments and if so, then how to guide the learners to do this. This can be a challenge because assignment tasks usually require learners to apply learning to real-life scenarios. However, this is an area that the academicians and the CiDT can work together for the benefit of ODeL learners.

Future studies can be conducted pertaining to issues on the context in which learning is taking place within higher education, various definitions of video, and ways of categorising and presenting these different types, teaching "with" and "through" video from the perspective of the lecturer and the educational institution, approaches to didactically embedding and integrating video into a course that results in effective learning and the process and support needed by the (traditional) lecturer to create and deploy various types of video content.

References

- Bransford, J.D., Brown, A.L. and Cocking, R.R. (2000), *How People Learn; Brain, Mind, Experience and School*, National Academy Press, Washington, DC.
- Bryant, S.M. and Hunton, J.E. (2000), "The use of technology in the delivery of instruction: implications for accounting educators and education researchers", *Issues in Accounting Education*, Vol. 15 No. 1, pp. 129-162.
- Bunce, D.M., Flens, E.A. and Neiles, K.Y. (2010), "How long can students pay attention in class? Study of student attention decline using clickers", *Journal of Chemical Education*, Vol. 87 No. 12, pp. 1438-1443, doi: 10.1021/ed100409p.

- Chen, C.-M. and Wu, C.-H. (2015), "Effects of different video lecture types on sustained attention, emotion, cognitive load, and learning performance", *Computers & Education*, Vol. 80, pp. 108-121, available at: <http://dx.doi.org/10.1016/j.compedu.2014.08.015>
- Davis, F.D. (1986), "A technology acceptance model for empirically testing new end-user information systems: theory and results", doctoral dissertation, MIT Sloan School of Management, Cambridge, MA.
- Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-339.
- Delen, E., Liew, J. and Willson, V. (2014), "Effects of interactivity and instructional scaffolding on learning: Self-regulation in online video-based environments", *Computers & Education*, Vol. 78, pp. 312-320, available at: <http://dx.doi.org/10.1016/j.compedu.2014.06.018>
- Elloumi, F. (2004), "Value chain analysis: a strategic approach to online learning", in Anderson, A. and Elloumi, F. (Eds), *Theory and Practice of Online Learning*, Athabasca University, Athabasca, pp. 61-92.
- Freeman, S., Eddy, S.L., McDonough, M., Smith, M.K., Okoroafor, N., Jordt, H. and Wenderoth, M.P. (2014), "Active learning increases student performance in science, engineering, and mathematics", *Proceedings of the National Academy of Sciences*, Vol. 111 No. 23, pp. 8410-8415 doi:10.1073/pnas.1319030111.
- Greenberg, A.D. and Zanetis, J. (2012), "The impact of broadcast and streaming video in education", Wainhouse Research, San Jose, CA, available at: www.cisco.com/web/strategy/docs/education/ciscovideowp.pdf (assessed 6 June 2017).
- Guo, P.J., Kim, J. and Rubin, R. (2014), "How video production affects student engagement: an empirical study of MOOC videos", available at: http://pgbovine.net/publications/edX-MOOC-video-production-and-engagement_LAS-2014.pdf (assessed 6 June 2017).
- He, Y., Swenson, S. and Lents, N. (2012), "Online video tutorials increase learning of difficult concepts in an undergraduate analytical chemistry course", *Journal of Chemical Education*, Vol. 89 No. 9, pp. 1128-1132, doi: 10.1021/ed200685p.
- Ibrahim, M., Antonenko, P.D., Greenwood, C.M. and Wheeler, D. (2012), "Effects of segmenting, signalling, and weeding on learning from educational video", *Learning, Media and Technology*, Vol. 37 No. 3, pp. 220-235, doi: 10.1080/17439884.2011.585993.
- Jensen, J.L., Kummer, T.A. and Godoy, P.D.D.M. (2015), "Improvements from a flipped classroom may simply be the fruits of active learning", *CBE-Life Sciences Education*, Vol. 14 No. 1, pp. 1-12, doi: 10.1187/cbe.14-08-0129.
- Kilmurray, J. (2003), "E-learning: it's more than automation. The technology source archives", available at: <http://technologysource.org/article/elearning/> (accessed 21 June 2017).
- Kirkwood, A. and Price, L. (2014), "Technology-enhanced learning and teaching in higher education: what is 'enhanced' and how do we know? A critical literature review", *Learning, Media and Technology*, Vol. 39 No. 1, pp. 6-36, doi: 10.1080/17439884.2013.770404.
- Kirschner, P.A. (2002), "Cognitive load theory: Implications of cognitive load theory on the design of learning", *Learning and Instruction*, Vol. 12, pp. 1-10, available at: www.sciencedirect.com/science/article/pii/S0959475201000147 (assessed 6 June 2017).
- Legris, P., Ingham, J. and Collette, P. (2003), "Why do people use information technology? A critical review of the technology acceptance model", *Information & Management*, Vol. 40, pp. 191-204.
- Lesser, L.M. and Pearl, D.K. (2008), "Functional fun in statistics teaching: Resources, research and recommendations", *Journal of Statistics Education*, Vol. 16 No. 3, pp. 1-9, available at: www.amstat.org/publications/jse/v16n3/lesser.pdf (assessed 6 June 2017).
- Merkt, M. and Schwan, S. (2014), "How does interactivity in videos affect task performance?", *Computers in Human Behavior*, Vol. 31, pp. 172-181, available at: <http://dx.doi.org/10.1016/j.chb.2013.10.018>
- Merrill, D.C., Reiser, B.J., Ranney, M. and Trafton, J.G. (1992), "Effective tutoring techniques: a comparison of human tutors and intelligent tutoring systems", *The Journal of the Learning Sciences*, Vol. 2 No. 3, pp. 277-305, available at: www.cs.pitt.edu/~chopin/references/tig/effective_tutoring.pdf (assessed 6 June 2017).

- Moreno, R. (2006), "Learning in high-tech and multimedia environments", *Current Directions in Psychological Science*, Vol. 15 No. 2, pp. 63-67, available at: <http://cdp.sagepub.com/content/15/2/63.full.pdf+html> (assessed 6 June 2017).
- Nemanich, L., Banks, M. and Vera, D. (2009), "Enhancing knowledge transfer in classroom versus online settings: the interplay among instructor, student, content, and context", *Decision Sciences Journal of Innovative Education*, Vol. 7 No. 1, pp. 123-148, available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-4609.2008.00208.x/pdf> (assessed 1 June 2017).
- Nicholson, J., Nicholson, D. and Valacich, J.S. (2008), "Examining the effects of technology attributes on learning: a contingency perspective", *Journal of Information Technology Education*, Vol. 7, pp. 185-204, available at: www.jite.org/documents/Vol7/JITEv7p185-204Nicholson364.pdf (assessed 16 May 2017).
- Pitman, R. (1989), "Pushing pause: hesitations about the video revolution", *Library Journal*, Vol. 114 No. 19, pp. 34-37.
- Reece, R.J. (2013), *Lecture Capture at the University of Manchester*, Manchester, available at: www.tlso.manchester.ac.uk/media/services/tlso/content/files/Lecturecapturesupportingdocument.pdf (assessed 26 May 2017).
- Saadé, R.G. (2003), "Web-based education information system for enhanced learning, EISL: Student assessment", *Journal of Information Technology Education*, Vol. 2, pp. 267-277.
- Schultz, D., Duffield, S., Rasmussen, S.C. and Wageman, J. (2014), "Effects of the flipped classroom model on student performance for advanced placement high school chemistry students", *Journal of Chemical Education*, Vol. 91 No. 9, pp. 1334-1339, doi: 10.1021/ed400868x.
- Seery, M.K. (2015), "Flipped learning in higher education chemistry: emerging trends and potential directions", *Chemistry Education Research and Practice*, Vol. 16 No. 4, pp. 758-768, doi: 10.1039/C5RP00136F.
- Shattuck, J.C. (2016), "A parallel controlled study of the effectiveness of a partially flipped organic chemistry course on student performance, perceptions, and course completion", *Journal of Chemical Education*, doi: 10.1021/acs.jchemed.6b00393.
- Stover, S. and Veres, M. (2013), "TPACK in higher education: using the TPACK framework for professional development", *Global Education Journal*, Vol. 1, pp. 93-111.
- Surry, D.W., Ensminger, D.C. and Haab, M. (2005), "A model for integrating instructional technology into higher education", *British Journal of Educational Technology*, Vol. 36 No. 2, pp. 327-329.
- Van Wyk, M.M. (2011), "The use of cartoons as a teaching tool to enhance student learning in economics education", *Journal of Social Science*, Vol. 26 No. 2, pp. 117-130.
- Wells, J., Barry, R.M. and Spence, A. (2012), "Using video tutorials as a Carrot-and-Stick approach to learning", *IEEE Transactions on Education*, Vol. 55 No. 4, pp. 453-458, doi: 10.1109/TE.2012.2187451.
- Zhang, D., Zhou, L., Briggs, R.O. and Nunamaker, J.F. (2006), "Instructional video in e-learning: assessing the impact of interactive video on learning effectiveness", *Information & Management*, Vol. 43 No. 1, pp. 15-27.

Corresponding author

Chooi Chea Chiam can be contacted at: chooi_chea@oum.edu.my

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgrouppublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com