

Impact of Video Based Learning on the Performance of Post Graduate Students in Biostatistics: A Retrospective Study

KARTHIKEYAN MURTHYKUMAR¹, DEEPAK NALLASWAMY VEERAIYAN², PREETHAM PRASAD³

ABSTRACT

Introduction: Education, being a process of knowledge transfer always has advances which are generally on par with the discovery of newer technologies. Currently, most of the education process has shifted away from the conventional black board towards the usage of more student friendly technologies. This leads us to the aim of this study, which is to analyse the impact of video based learning on the performance of dental post graduate students in their biostatistics course.

Materials and Methods: A new video based discussion method was followed to teach biostatistics to MDS postgraduate students in 2013 (test group, n=44). The performance of these students were compared to a historical cohort of scores obtained by students of the 2012 batch (control group, n=44) who underwent

a traditional lecture based teaching for the same course. The scores obtained by the students in their undergraduate board exams were compared to test for difference in academic aptitude of the students in the two groups.

Results: The mean exam score of the test group was significantly higher (66.60 ± 8.92) when compared to the control group (53.48 ± 8.38); ($p < 0.001$ Independent Sample t-test). There was no significant difference in the overall academic performance of the students from both groups (test group mean academic performance was 61.47 ± 4.86 and control group was 63.19 ± 4.69).

Conclusion: The results of this study suggest that video based discussion based teaching is more effective in training postgraduate dental students in biostatistics.

Keywords: Education, Advancements, Teaching methodologies, Biostatistics learning

INTRODUCTION

Video based lectures have shown to improve student's learning output in various disciplines [1-7]. However, most of the research has focused primarily on videos as adjuncts to traditional lectures [8-10]. This study is a unique attempt to evaluate the learning outcomes where in the entire biostatistics course was covered as video based discussions. Biostatistics is not taught as a part of the undergraduate dental curriculum and so is a good platform to evaluate teaching learning methods with minimal confounders [11,12]. Traditionally the subject of biostatistics is viewed by dental post graduates as a relatively difficult course [13,14]. Therefore the aim of this study is to analyse the impact of video based learning on the performance of dental post graduate students in their biostatistics course.

MATERIALS AND METHODS

This study obtained permission from the Institutional Review Board of the University. (Saveetha University, Chennai, India). Biostatistics and Research methodology is taught one of the courses in many postgraduate programs in many countries [14-16]. In our Institution, biostatistics is taught as a short course in the first six months for 44 postgraduates. Until 2012, the course was taught as a series of lectures for students followed by a project and a descriptive exam (control group). In 2013 video based discussions were introduced for this course (test group). Here the lectures were replaced with video based discussions within the same teaching schedule. The videos were downloaded from "you tube" and were used to teach the Biostatistics subject. The sessions were much shorter and there was more time for discussions related to the topic. The videos that were downloaded and used along with teaching schedule are mentioned in [Table/Fig-1]. Each session began with a 1-2 minute introduction about the purpose of the lecture and a series of 4-9 minutes videos were played based on the schedule. Each video was followed by discussion which lasted for 5-10 minutes. After the completion of University exams, the performance of 2012 batch

(control group) and 2013 batch (test group) were compared. The average marks secured by these students in their undergraduate examination were also collected from the office of the controller of exams with approval of Educational Review Board of the University in order to determine any difference in the academic potential of the two groups. The data were analysed using SPSS version 20 software package. Independent sample T-test was performed to compare the biostatistics score as well as their undergraduate examination scores.

RESULTS

The results of examination scores obtained are mentioned in [Table/Fig-2]. There was no significant difference ($p=0.1$) (Independent sample test) between the average undergraduate examination academic performance of the students in both groups. The mean biostatistics examination scores obtained by the students of the control group (Batch of 2012) were 53.48 ± 8.38 and the mean undergraduate examination score obtained were 63.19 ± 4.69 . Similarly, the mean biostatistics score obtained by the students of the test group (Batch of 2013) were 66.60 ± 8.92 and the mean undergraduate examination score obtained were 61.47 ± 4.86 . There was significant difference ($p < 0.001$) (Independent sample test) between the performance of the two groups in the biostatistics examination.

DISCUSSION

The results of this study shows that there is a 13.12% increase in the mean performance of students who were taught biostatistics exclusively with video based discussions. Since there is no statistical difference in the mean undergraduate examination scores obtained by the students of both group, the observed difference in the scores can only be attributed to the change in the teaching methodology. Fischer et al., had noted the advantages of audio and video podcasts in higher education. They observed that audio and video podcasts can "provide students with the ability to learn on demand based on

Biostatistics Schedule	Videos
Introduction to Biostatistics- Mean, Median, Mode, Variance	https://www.youtube.com/watch?v=h8EYEJ32oQ8 https://www.youtube.com/watch?v=IUixkNvGuWc
Distribution- Normal distribution, Skewed distribution and Defining variables, Standard error	https://www.youtube.com/watch?v=cgxPcdPbujl
Types of Data, Probability	https://www.youtube.com/watch?v=hZxnzfn5v8 https://www.youtube.com/watch?v=XHmlRCw5CLY&list=PLm9FYjKtq7Pzjh7e727hSr8VvSR9OvqsZ&index=1 https://www.youtube.com/watch?v=eyknGvncKLw&list=PLm9FYjKtq7Pzjh7e727hSr8VvSR9OvqsZ&index=1
Histograms, Stem and leaf plot, Box plots	https://www.youtube.com/watch?v=635ErzR9Xzc https://www.youtube.com/watch?v=_7m0Q_m2ppg https://www.youtube.com/watch?v=4eLJGG2Ad30
Hypothesis Testing p-value and confidence intervals	https://www.youtube.com/watch?v=0zZYBALbZg https://www.youtube.com/watch?v=PLm9FYjKtq7Pzjh7e727hSr8VvSR9OvqsZ https://www.youtube.com/watch?v=tFWsuO9f74o&list=PLm9FYjKtq7Pzjh7e727hSr8VvSR9OvqsZ&index=1
Sampling Sample size and power	https://www.youtube.com/watch?v=be9e-Q-jC-0&list=PLm9FYjKtq7Pzjh7e727hSr8VvSR9OvqsZ&index=1 https://www.youtube.com/watch?v=QBONLUj7i28 https://www.youtube.com/watch?v=Nnx7MxQx0Xo
Important Statistical Concepts	https://www.youtube.com/watch?v=FG7xnWmZlPE&index=5&list=PLm9FYjKtq7Pzjh7e727hSr8VvSR9OvqsZ
Relative risk, Odds ratio, Attributable risk Likelihood Ratio, Sensitivity Specificity, ROC curves	https://www.youtube.com/watch?v=lnZTOoGc_F0 https://www.youtube.com/watch?v=-PwDwaQQpY https://www.youtube.com/watch?v=LCndoLgoPvk https://www.youtube.com/watch?v=xk2uK14eHNs https://www.youtube.com/watch?v=wJXaroDs9oo https://www.youtube.com/watch?v=fxbdOZbh-G4 https://www.youtube.com/watch?v=Kp_sFzB05i8
Survival Analysis Kaplan Meyer graph	https://www.youtube.com/watch?v=llHQh8m_nfw https://www.youtube.com/watch?v=1Fz6kBXmAt0
Choosing Statistical Tests	https://www.youtube.com/watch?v=rullUAN0U3w&list=PLm9FYjKtq7Pzjh7e727hSr8VvSR9OvqsZ&index=4

[Table/Fig-1]: Downloaded videos which were used along with the teaching schedule

	Groups	N	Mean	Standard Deviation	Sig. (2-Tailed)
Biostatistics	Control Group	44	53.48	8.382	0.000
	Test Group	44	66.60	8.920	
Ug Aggregate	Control Group	44	63.1921	4.69534	0.100
	Test Group	44	61.4751	4.86653	

[Table/Fig-2]: Results of examination scores obtained

their own learning styles” and can also provide a mechanism that motivates students to “actively engage in the course content” [17].

The students in this study had also reported that the videos were also useful for quick revision during their examination preparation. This could be attributed to change in the trends and technology; where in today’s students are more digitally fluent managing numerous electronic devices including iPods, iPads, cell phones, internet and televisions [18]. The students largely use the video/ audio pods for reviewing in future; the concepts presented in lectures that they had previously attended [19-21]. This could explain the better performance of the test group observed in this study. With respect to Dentistry, Brittan et al., has reported that video podcasts helped the students in revision more effectively than the textbook [19]. The difficulty of the examination questions could have been confounding and greatly impacted the results of the study. However this is unlikely because the University has an organized question bank with structured answer keys that are given to the students in the beginning of all courses. All the students in this study had

no previous exposure or knowledge on the applied biostatistics covered in this course and hence, it could not have affected the results of this study.

As there is growth in the available literatures on the usage of podcasts in education, there is mixed response on the acceptability of this mode of learning. Deal and Lazzari found no significant improvement on student grades [22,23] whereas McKinney found that students only benefitted from podcasts when they took notes and listened to the podcast many times [21].

LIMITATIONS

The limitations of the study include the use of retrospective control group. A prospective randomized controlled trial could have improved the validity of the results. However this may be difficult to achieve due to our small sample and logistical reasons. The portions covered in this course was limited to the applied aspects of biostatistics and so effect of video based discussions on the mathematical aspects of biostatistics was not interpreted.

CONCLUSION

Within the limitations of this study, we believe that the video based discussions seem to significantly improve the student performance in biostatistics when compared with traditional lecture based teaching.

REFERENCES

- Copley, J. Audio and video podcasts of lectures for campus based students: production and evaluation of student use. *Innovations in Education and Teaching International*. 2007;44(4):387-99.
- Ronchetti, M. in Proceedings of the IASTED International Conference” Computers and Advanced Technology in Education 305 (2003).
- Ma WH, Lee YJ, Du DH, McCahill MP. In Proceedings of the fourth ACM International Conference on Multimedia 449-450 (ACM, 1997).
- Barron, B. Problem solving in video-based microworlds: Collaborative and individual outcomes of high-achieving sixth-grade students. *Journal of Educational Psychology*. 2000;92(2):391.
- Nieder GL, Nagy F. Analysis of medical students’ use of Web based resources for a gross anatomy and embryology course. *Clinical Anatomy*. 2002;15(6): 409-18.
- Cardall S, Krupat E, Ulrich M. Live lecture versus video-recorded lecture: are students voting with their feet? *Academic Medicine*. 2008;83(12):1174-78.
- Nikopoulou-Smyrni P, Nikopoulos C. Evaluating the impact of video-based versus traditional lectures on student learning. *Educational Research*. 2010;1(8): 304-11.
- Herder P, Subrahmanian E, Talukdar S, Turk AL, Westerberg A. The use of video-taped lectures and web-based communications in teaching: a distance-teaching and cross-Atlantic collaboration experiment. *European Journal of Engineering Education*. 2002;27(1):39-48.
- Whately J, Ahmad A. Using video to record summary lectures to aid students’ revision. *Interdisciplinary Journal of E-Learning and Learning Objects*. 2007; 3(1):185-96.
- Shyu HYC. Using video based anchored instruction to enhance learning: Taiwan’s experience. *British Journal of Educational Technology*. 2000;31(1):57-69.
- Jamali A, Aghdam FA, Hassanpour K, Moghaddam KM. Undergraduate Medical Students’ Knowledge About Principles of Research Methodology and Impact of Extracurricular Principles of Research Workshops: A Cross-Sectional Study in Tehran University of Medical Sciences. *Thrita Student Journal of Medical Sciences*. 2012;1(1):8-12.
- Mundle M, et al. A survey exploring research perception of homeopathic undergraduate students in West Bengal, India. *International Journal of High Dilution Research*. 2014;13(46):28-44.
- West CP, Ficalora RD. In Mayo clinic proceedings 939-943 (Elsevier, 2007).
- EI Tantawi MM. Factors affecting postgraduate dental students’ performance in a biostatistics and research design course. *Journal of Dental Education*. 2009;73(5):614-23.
- Polychronopoulou A, Eliades T, Taoufik K, Papadopoulos MA, Athanasiou AE. Knowledge of European orthodontic postgraduate students on biostatistics. *The European Journal of Orthodontics*. 2011;33(4):434-40.
- Harroway J, Sharples K. A first course in biostatistics for health sciences students. *International Journal of Mathematical Education in Science and Technology*. 2001;32(6):873-86.
- Fisher M, Baird DE. Making mLearning work: Utilizing mobile technology for active exploration, collaboration, assessment, and reflection in higher education. *Journal of Educational Technology Systems*. 2006;35(1):3-30.

- [18] Hsi S. Conceptualizing learning from the everyday activities of digital kids. *International Journal of Science Education*. 2007;29(12):1509-29.
- [19] Brittain S, Glowacki P, Van Ittersum J, Johnson L. Podcasting lectures. *Educause quarterly*. 2006;(3):24-31.
- [20] Evans C. The effectiveness of m-learning in the form of podcast revision lectures in higher education. *Computers & education*. 2008;50(2):491-98.
- [21] McKinney D, Dyck JL, Luber ES. iTunes University and the classroom: Can podcasts replace Professors? *Computers & education*. 2009;52(3):617-23.
- [22] Deal A. Podcasting: a teaching with technology white paper, Office of Technology for Education & Eberly Center for Teaching Excellence. Carnegie Mellon University, [Online]. Available from: http://connect.educause.edu/files/CMU_Podcasting_Jun07.pdf, [Accessed 4 October 2007]; 2007.
- [23] Lazzari M. Creative use of podcasting in higher education and its effect on competitive agency. *Computers & Education*. 2009;52(1):27-34.

PARTICULARS OF CONTRIBUTORS:

1. Student, Department of Prosthodontics, Saveetha Dental College and Hospital, Chennai, India.
2. Director of Academics, Department of Prosthodontics, Saveetha Dental College and Hospital, Chennai, India.
3. Senior Lecturer, Department of Prosthodontics, Saveetha Dental College and Hospital, Chennai, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Mr. Karthikeyan Murthykumar,
46/2, Vadamalai Maistry Street, Sowcarpet, Chennai-600079, India.
E-mail: karthikmohan87@yahoo.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Jul 11, 2015**

Date of Peer Review: **Sep 07, 2015**

Date of Acceptance: **Oct 24, 2015**

Date of Publishing: **Dec 01, 2015**