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Delivering a medical school elective with massive open online course (MOOC) technology

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Introduction: The educational technology of massive open online courses (MOOCs) has been successfully applied in a wide variety of disciplines and are an intense focus of educational research at this time. Educators are now looking to MOOC technology as a means to improve professional medical education, but very little is known about how medical MOOCs compare with traditional content delivery. **Methods:** A retrospective analysis of the course evaluations for the Medicine as a Business elective by fourth year medical students at Southern Illinois University School of Medicine (SIU-SOM) for the 2012-2015 academic years was conducted. This course was delivered by small group discussions for 2012-2014 and delivered via MOOC technology in 2015. Learner ratings were compared between the two course delivery methods using routinely collected course evaluations. **Results:** Course enrollment has ranged from 6-19 students per year in the 2012-2015 academic years. Student evaluations of the course are favorable in the areas of effective teaching, accurate course objectives, meeting personal learning objectives, recommending the course to other students, and overall when rated on a 5 point Likert scale. Ratings show no statistically significant difference between the small group or MOOC format versions of the course ($p = 1.00$ for all comparisons). **Discussion:** Students found this elective to be an effective means of meeting their personal learning objectives when delivered in a small group discussion format or by using MOOC technology. The primary advantage of this new course format is flexibility of time and place for learners, allowing them to complete the course objectives when convenient for them. The course evaluations indicate this is a change that is acceptable to the target audience. **Conclusions:** This study shows that learner evaluations of a fourth year medical school elective course do not significantly differ when delivered in small group discussions or via MOOC technology. This suggests that MOOCs may be a reasonable format to deliver medical school courses.

1 Delivering a medical school elective with massive open online course technology

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10 Introduction

11 The educational technology of massive open online courses (MOOCs) has been successfully applied in a
12 wide variety of disciplines and are an intense focus of educational research at this time (Bozkurt et al,
13 2015). MOOCs are a disruptive force in education because they challenge the tradition of lectures and
14 decentralize the education experience in a learner centered way. Learners have embraced this
15 approach, giving some MOOCs an enrollment of over 100,000 (Mehta, Hull, Young, and Stoller 2013).
16 Educators are now looking to MOOC technology as a means to improve professional medical education
17 (Harder 2013, Mehta; Hull, Young, and Stoller 2013).

18

19 Hundreds of medical MOOCs exist for topics ranging from the Ebola virus to medical informatics
20 (Grobusch and Browne 2015; Paton 2014; Liyanagunawardena and Williams 2014), but very little is
21 known about how these medical MOOCs compare with traditional content delivery.

22

23 MOOC delivery platforms allow educators to create and deliver interactive courses with videos, online
24 resources, quizzes, virtual patients (Stathakarou , Zary, and Kononowicz 2014; Kononowicz et al., 2015)
25 and an ability to interact with other students taking the course. This technology could allow students to
26 learn at a time and place of their choosing, freeing valuable curricular time for hands on experiences.
27 Despite these potential advantages, medical schools have been slow to explore MOOC technology for
28 content delivery.

29

30 This study aims to compare learner evaluations and ratings of a course that was previously delivered by
31 traditional methods (in person lecture and case discussions) that is now delivered as a MOOC. The

32 hypothesis is that learner ratings of the course will not significantly differ between the new format and
33 the previous format. The results of this investigation could have significant implications for how medical
34 education is delivered.

35

36 **Materials & Methods**

37 Course evaluations for the Medicine as a Business elective (Course IM 45434) by fourth year medical
38 students at Southern Illinois University School of Medicine (SIU-SOM) were collected as customary for
39 the 2012-2015 academic years. The SIU-SOM is located in Springfield, Illinois with an enrollment of 65-
40 80 fourth year medical students during the years of this study.

41 The Medicine as a Business course was offered for the first time in the 2012 academic year and used a
42 small group discussion format spread over 5 half days. This course was converted to an on demand
43 MOOC format hosted at Udemy.com for the 2015 academic year to meet student requests for greater
44 flexibility in course content delivery. Course content is delivered in the form of video presentations with
45 associated reading materials that could be accessed on a smartphone, tablet, or traditional computer via
46 the internet when convenient for the student.

47 The objectives for Medicine as a Business are:

- 48 Understand and apply medical documentation rules
- 49 Understand the medical billing process
- 50 Understand medical coding terminology and resources
- 51 Understand the medical practice revenue cycle
- 52 Evaluate physician productivity using a variety of measures

53

54 The course is available online at <http://udemy.com/business-of-medicine>. Course registration is free
55 and open to anyone.

56 SIU-SOM compiles de-identified aggregate course evaluations for elective faculty for use in course
57 improvement. These course evaluations were compared before and after transition to the MOOC
58 format. This data was compared for differences between traditional and online content delivery.

59 The SIU-SOM elective course evaluation includes:

- 60 • Was the faculty an effective teacher?
- 61 • Stated course objectives accurately reflected the course.
- 62 • I was able to meet my personal learning objectives.
- 63 • I would recommend this elective to other students.
- 64 • Overall rating of the course.

65 These items are rated on a 5 point Likert scale. The mean value and the range for each question are
66 reported on the evaluation form.

67 Quantitative variables will be compared using the non-parametric Mann–Whitney *U* test to determine if
68 any significant differences exist.

69 Statistical analyses were performed using SPSS version 22 (SPSS Inc., Chicago, IL, USA). Two sided *P*-
70 values < 0.05 were considered significant.

71 Institutional review board review for this study was obtained from the Springfield Committee for
72 Research Involving Human Subjects. This study was determined to not meet criteria for research
73 involving human subjects according to 45 CFR 46.101 and 45 CFR 46.102.

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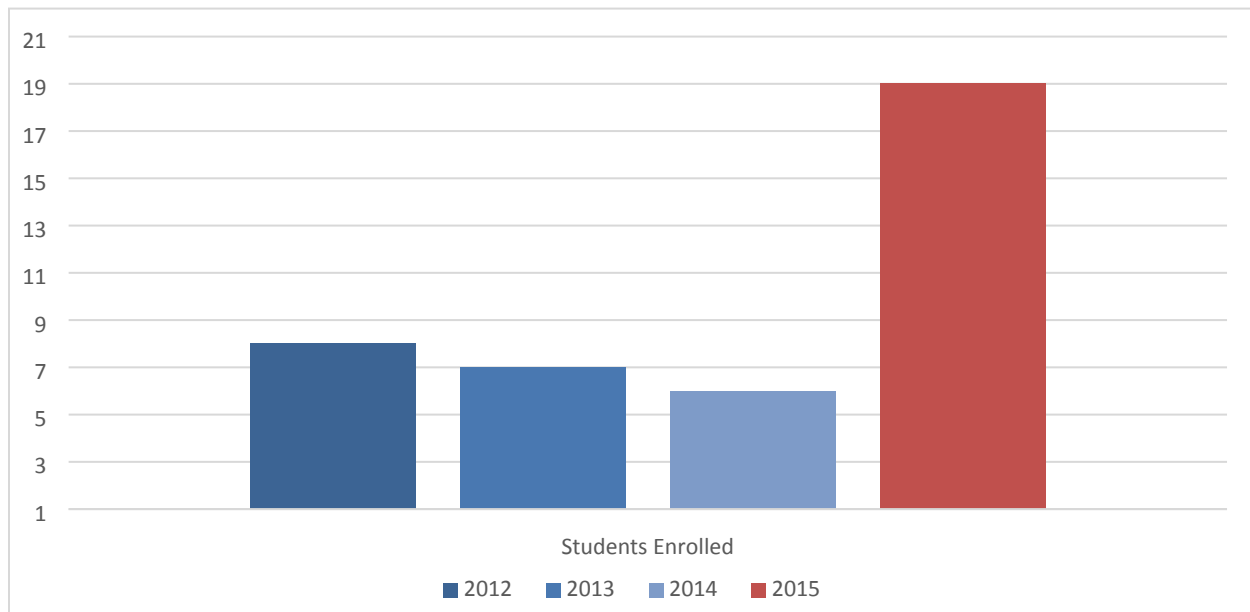
75 Results

76 The Business of Medicine elective has been offered for four years at SIU-SOM starting in the 2012
77 academic year. Course enrollment has ranged from 6-19 students per year as shown in Figure 1.

78 Student evaluations of the course are favorable (Table 1 and Figure 2), and show no statistically
79 significant variation after the change to a MOOC format ($p = 1.00$ for all comparisons).

80

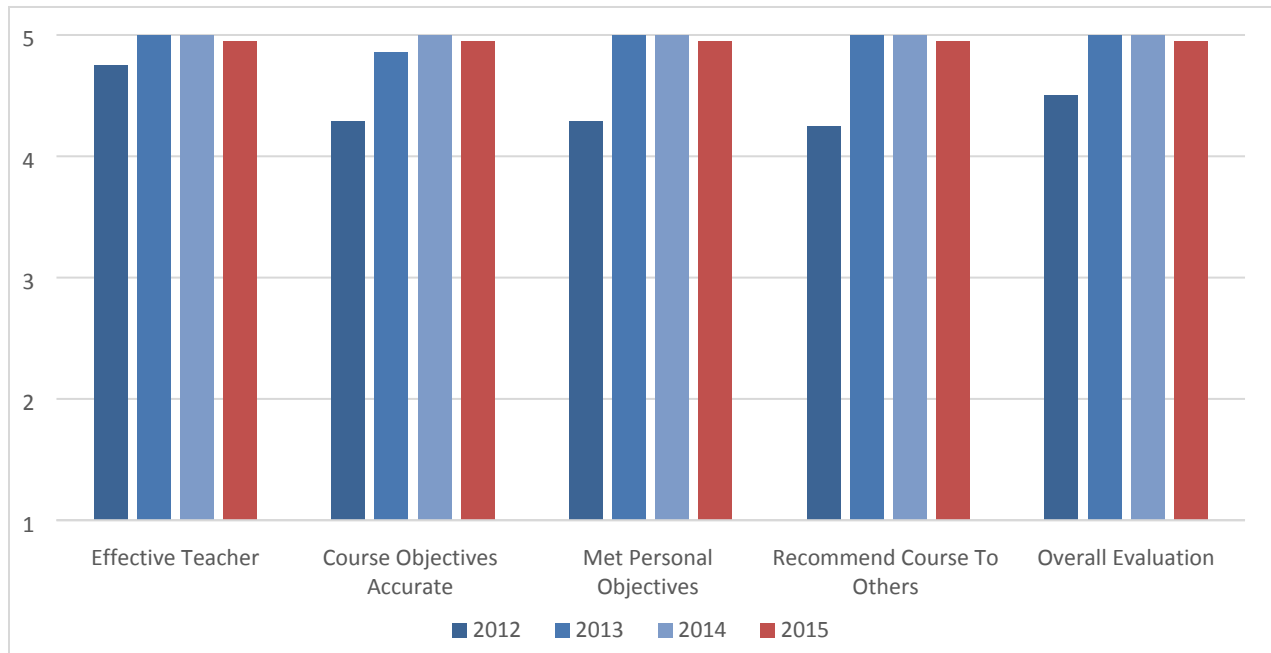
81 Figure 1. Student enrollment by academic year.



82

83 Figure 2. Mean student ratings of course on 5 point Likert scale by academic year

84



85

86 Table 1. Mean student rating and range on 5 point Likert scale

Year	Course Enrollment	Effective Teacher	Course Objectives Accurate	Met Personal Learning Objectives	Recommend Course to Others	Overall Evaluation	MOOC Format
2012	8	4.75 (4-5)	4.29 (3-5)	4.29 (3-5)	4.25 (3-5)	4.50 (3-5)	No
2013	7	5.00 (5-5)	4.86 (4-5)	5.00 (5-5)	5.00 (5-5)	5.00 (5-5)	No
2014	6	5.00 (5-5)	5.00 (5-5)	5.00 (5-5)	5.00 (5-5)	5.00 (5-5)	No
2015	19	4.95 (4-5)	4.95 (4-5)	4.95 (4-5)	4.95 (4-5)	4.95 (4-5)	Yes

87

88

Discussion

89 Students found this elective to be an effective means of meeting their personal learning objectives when
 90 delivered in a small group discussion format or by using MOOC technology. The primary advantage of
 91 this new course format is flexibility of time and place for learners, allowing them to complete the course
 92 objectives when convenient for them. The course evaluations indicate this is a change that is acceptable
 93 to the target audience.

94 The course subject, the business aspects of a medical practice, is likely to be more amenable to delivery
95 via MOOC technology than many other subject areas in medical education. However, the University of
96 California-San Francisco (UCSF) has successfully offered a clinical problem solving MOOC with tens of
97 thousands of learners, suggesting that complex clinical education can be delivered by this format
98 (Harder 2013).

99 This study is a single institution observational study with limited follow up. These limitations may
100 reduce the generalizability of the results of this study.

101

102 Conclusions

103 This study shows that learner evaluations of a fourth year medical school elective course do not
104 significantly differ when delivered in small group discussions or via MOOC technology. This suggests
105 that MOOCs may be a reasonable format to deliver medical school courses.

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