ORIGINAL RESEARCH

Investigating medical students' satisfaction towards video-based learning versus face-to-face lectures: a Jordanian tertiary teaching hospital experience

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Purpose: We aimed to evaluate the disparity between video-based learning and lecture-based learning on Jordanian medical students' satisfaction.

Methods: We conducted this cross-sectional study using a web-based questionnaire adapted from Student Evaluation of Educational Quality survey. Using convenience sampling, medical students studying at the University of Jordan and Jordan University Hospital were recruited. Participants in either clinical or basic-science years that have completed the entire survey were included in the final analysis.

Results: We surveyed a total 487 participants among which male to female ratio was 1.19:1. Participants perceived greater benefit in terms of learning, instructor enthusiasm, content organization, breadth of teaching, and quality and number of assignments when using video-based learning (all $p<0.01$). In contrast, face-to-face learning was associated with significantly higher benefits in terms of group interactions ($p<0.01$) and capacity for rapport building ($p<0.01$). There was no significant difference in perceived examination performance between the two learning modalities ($p=0.11$).

Conclusion: Video-based learning is the preferred learning modality among Jordanian medical students. Despite its dominance across multiple domains, it should be implemented as an adjunct to traditional classroom teaching for it is vital in the development of good communication skills and building rapport in medical students.

Key Words: Lecture, Medical students, Educational measurement, Spatial navigation, Educational technology, Distance education

Introduction

Educational methods are constantly evolving. The continuous advancement in technology pushes institutions to implement modernized models of education [1]. This has led to a rapid increase in the number of resources available to students and the emergence of video-based learning methods. Such methods have been gaining popularity among students and are becoming an integral part of their learning process, especially among medical students. Video-based lectures pose numerous advantages including the ability to view lectures at any setting [2], eliminating the time to travel to lectures, and improving

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accessibility (e.g., control the flow and speed of the videos) [3,4]. Nonetheless, video-based lectures may decrease live lecture attendance which could eliminate more profound student-teacher interactions [5].

The literature demonstrates that both video-based lectures and face-to-face learning had similar test performances [3,6-8]. Despite similarities in examination performance, these studies showed significant disparity in preference. Several studies showed that students preferred live lectures in comparison to video lectures [6-8]. Nonetheless, these observations are non-consistent throughout the literature. Ramlogan et al. [9] in 2014 demonstrated that mean post-test scores were statistically significantly higher in students who attended face-to-face lectures compared with those relying on video-based lectures. Moreover, it appears that in the greater context of clinical practice, e-learning modalities, such as video-base lectures, have little to no effect in affecting patient outcomes or healthcare professionals' behaviors [10].

Preparing future healthcare workers for today's internet-heavy environment calls for the reconsideration of teaching methods. The adoption of online learning frees institutions from time and space limitations [11]. However, it is also influenced by a myriad of barriers including administrative issues, social interactions, academic and technical skills, motivation issues, and accessibility gaps among others. Nonetheless, due to the insurgency of the coronavirus disease 2019 (COVID-19) pandemic, implementing virtual learning methods became a necessity [12]. E-learning modalities proved to be an accessible and practical method of learning during the pandemic [13]. Video-based learning can serve as a powerful tool due to the widespread use of technology by students [14]. In addition, it can contribute to achieving the necessary pandemic-oriented safety measures (e.g., social distancing) thereby limiting the spread of the disease [15].

To our knowledge, there have not been sufficient studies that investigated the preference and efficacy of those platforms, or compared their effects to live lectures on student satisfaction. Since video-based resources have become a well-established resource for medical students, we conducted this study to compare the effects of video-based learning and lecture-based learning on students' satisfaction among Jordanian medical students.

Methods

1. Study setting

This study was conducted throughout September of 2020 at the University of Jordan and Jordan University Hospital. The University of Jordan is the largest and oldest university in Jordan harboring more than 50,000 students. Medical students go through 3 years of basic medical sciences learning (i.e., year 1, 2, and 3), then move to complete their clinical training at the Jordan University Hospital (i.e., year 4, 5, and 6).

2. Implementation of video-based learning

Throughout their medical education, students primarily attend face-to-face lectures. The use of video-based lectures is strictly exclusive to supplementary courses where attendance is not mandatory. During the COVID-19 pandemic, video-based learning was exclusively utilized in the continuing of medical education. However, as the degree of pandemic's extreme distancing restrictions were lowered, video-based learning was officially integrated within the medical curriculum for both basic sciences and clinical clerkships.

Video-based learning was implemented at the University of Jordan and Jordan University Hospital through two modalities. Firstly, recorded lectures, which are made in the same exact fashion as traditional lecture but lacking

the interactivity component. Post-lecture feedback or forum discussions were not available for these lectures. Recorded lectures were primarily used for continuing basic sciences education. Secondly, live-lectures were administered to small batches of medical students per assigned groups and topics. All lectures were either provided through Microsoft Teams or Zoom, which enabled moment-to-moment interactivity between medical students and their lecturers. Live-lectures were primarily used as a temporary replacement for clerkship-oriented learning.

In terms of video-based learning extent and depth of usage, recorded lectures were exclusively used instead of traditional teaching within some courses (e.g., microbiology) or was used interchangeably with traditional learning in others (e.g., cardiac and blood vessel physiology). On the other hand, live-lectures completely replaced traditional teaching during the early phases of the pandemic, then are now used interchangeably with traditional clerkship learning depending on a variety of factors including number of students, clinical workload, availability of lecturers, and practical utility of topics within routine clinical practice.

3. Questionnaire development

In this study, we surveyed medical students and trainees using an online, anonymous, and self-administered questionnaire. The questionnaire was composed of a variety of question types including a 6-point Likert scale, multiple choice, dropdown, and free response questions which amounted to a total of 60 items. Throughout its development, we adapted the Student Evaluation of Educational Quality (SEEQ) survey, a reliable and valid instrument used to collect students' evaluations of university teaching, as well as several questions derived from a personalized survey [16]. The final survey instrument was composed of a sociodemographic domain (three items), a modified SEEQ questionnaire (24 items), instructor preference domain (three items), and an overall preference domain (two items). The sociodemographic domain pertains to gender, age, and academic year. The modified SEEQ questionnaire was composed of the following sub-domains: learning (four items), enthusiasm (three items), organization (four items), group interaction (three items), individual rapport (four items), breadth (four items), examinations (one item), and assignments (one item). For the exception of the sociodemographics and overall preference domains, the questions were asked twice for both video-based lectures and classroom lectures. A final free response question pertaining to type of utilized video-based learning programs was also added. The survey was tested in a pilot study which received 73 participants, not included in the final analysis, and yielded a Cronbach α value of 0.736.

4. Sampling and participants characteristics

Participants that matched the inclusion criteria included those in their basic-medical sciences years to trainees at the Jordan University Hospital. First year students were excluded because the study was conducted at the beginning of the academic year which stripped such students of any exposure to either learning methods. A convenience sampling technique was used to recruit participants. The students of each class at the University of Jordan are members of an online group specific to each batch. The survey was posted on the group of each class and all participations were voluntary and anonymous. In addition, participants were encouraged to share the questionnaire amongst their peers creating a snowball sample. Google forms was used to construct and disseminate the survey. The use of a web-based method of survey administration allows for a greater reach and easy accessibility for the students. A QR code (quick response code) was developed and disseminated on campus in order to increase the number of responses.

5. Statistical analysis

There are 2,981 medical students and trainees at the premises of the University of Jordan. To reach a statistical power of 0.8 with a confidence interval of 95%, the calculated sample size was 340. Statistical analysis was performed using STATA Statistical Software ver. 16.0 (Stata Corp., College Station, USA). Two-sample Student t-test was used to compare video-based and classroom learning according the mean score for each domain. The differences in learning tool preferences between genders as well as educational levels were assessed using chi-square test. A p-value of less than 0.05 was considered statistically significant.

6. Ethical approval

The study's protocol was approved by the Institutional Review Board of University of Jordan (205/2020/67). Consent was required prior to study participation. Participants were informed that they will not be compensated for their completion of the questionnaire.

Results

A total of 487 medical students and trainees participated in our study. Male to female ratio was 1.19:1 (265 males to 222 females). The majority of respondents were students undergoing their clinical training (76.6%). Amongst our participants, 16.2% used one video-based learning resource, 15.2% utilized two resources, while 60.4% utilized more than three sources. Only 8.2% reported using no form of video-based resources. Participants demographics are presented in Table 1. Gender did not influence preference of learning methods (p=0.7), while training level was associated with a predilection in terms of learning platform preference (p<0.01).

We reported preference among eight domains including learning, enthusiasm, organization, group interaction, individual rapport, breadth, examinations, and assignments. The results of the survey data analysis are summarized in Table 2. The students were divided based on their training level into basic medical sciences students and clinical students, in accordance with whether or not they had commenced the clinical part of their training.

Overall, in terms of learning (i.e., the value of information they obtained from the course), students and trainees demonstrated a significance preference for video-based learning (p<0.01). For both video-based learning and face-to-face lectures, no differences in learning preferences were found between students in their basic sciences years or clinical years (p=0.012 and p=0.08, respectively). Moreover, students and trainees perceive significantly greater enthusiasm and organization within the video-based platforms (all p<0.01). Perceptions of greater enthusiasm and organization were profoundly

Table 1. The Preferred Method of Learning According to the Age and Educational Level

Variable	Total (%)	Video-based learning (%)	Classroom-based learning (%)	p-value
Total	487 (100.0)	325 (68.3)	151 (31.7)	
Gender				0.7
Males	222 (45.6)	150 (69.12)	67 (30.88)	
Females	265 (54.4)	175 (67.57)	84 (32.43)	
Training level[a]				<0.01
Basic	114 (23.4)	61 (54.0)	52 (46.0)	
Clinical	373 (76.6)	264 (72.7)	99 (27.3)	

[a]Training level in Jordanian medical schools is divided into basic medical years (years 1 through 3) and clinical training years (years 4 through 6).

Table 2. The Difference between Video-Based and Classroom Teaching Based on Students' Evaluation and Educational Level

Domain	Video	Classroom	p-value	Video			Classroom		
				Basic	Clinical	p-value	Basic	Clinical	p-value
Learning	16.7±4.1	13.4±4.3	<0.01	16.2±4.2	16.9±4.0	0.12	14.0±3.9	13.2±4.4	0.08
Enthusiasm	16.3±4.0	12.6±4.6	<0.01	15.6±4.4	16.5±3.9	0.05	12.9±4.6	12.5±4.6	0.47
Organization	16.8±3.7	13.4±4.3	<0.01	15.9±3.8	17.1±3.7	<0.01	14.4±3.9	13.4±4.4	0.02
Group interaction	9.0±4.8	14.6±4.9	<0.01	8.7±4.5	9.0±4.9	0.4	15.2±4.6	14.5±4.9	0.16
Individual rapport	11.2±4.6	13.8±4.4	<0.01	11.0±4.4	11.3±4.7	0.56	14.7±3.8	13.5±4.6	0.01
Breadth	14.8±4.1	13.8±4.3	<0.01	14.2±4.3	15.0±4.1	0.08	14.6±3.9	13.6±4.4	0.03
Examinations	3.6±1.2	3.5±1.3	0.11	3.4±1.3	2.7±1.2	0.1	3.8±1.2	3.4±1.3	<0.01
Assignments	3.9±1.1	3.7±1.2	<0.01	4.0±1.1	3.9±1.2	0.44	3.9±1.1	3.6±1.2	0.02

Data are presented as mean±standard deviation or number.

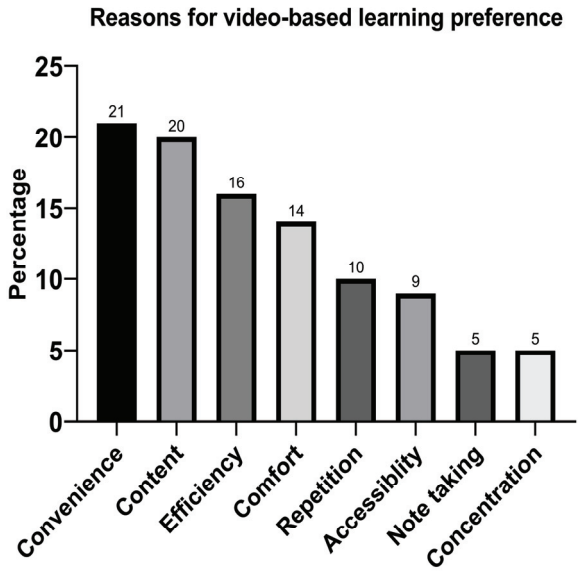
demonstrated by clinical students using video-based platforms (p=0.05 and p<0.01, respectively). In contrast, students in their basic medical sciences years significantly perceive greater organization within face-to-face lectures compared to their clinical counterparts (p=0.02).

Development of student-instructor rapport and frequency of group interactions were perceived to be more likely within a face-to-face learning environment (all p<0.01). Our results show that face-to-face rapport was significantly more perceived by students in their basic medical sciences years (p=0.01). Perceptions of better examination scores did not significantly differ between the two teaching methods (p=0.11).

When examining differences based on the breadth (i.e., depth of presented material) and number of assignments of taught medical material, students and trainees significantly leaned towards video-based learning (all p<0.01). It appears that medical students in their basic years are significantly more appreciative of their material's breadth and number of assignments within their face-to-face lectures compared to clinical medical students (p=0.03 and p=0.02, respectively). Whereas, these differences were not noted in between different training levels for video-based learning.

A total of 128 (26.3%) reported a clear preference to one of the given teaching methods. Participants favoring video-based learning (76.6%) report convenience and comfort as their two main reasons (Fig. 1). In contrast, those favoring face-to-face classroom learning attributed their choice to the presence of greater room for interactions (e.g., discussion with instructor, ability to ask questions).

Fig. 1. Reasons for Preferring Video-Based Teaching Modalities



Discussion

The principal purpose of this study was to examine student preference and satisfaction between video-based and face-to-face classroom-based teaching. Our findings showed significant differences across nearly all domains

for the exception of perceived examination score benefits. Substantial disparity favoring video-based teaching lied centrally within the following domains: quality of learning, instructor enthusiasm, organization of provided materials, depth, and number of assignments. On the other hand, frequency and magnitude of instructor-student interactions, and buildup of instructor-student rapport were the major factors influencing preference and satisfaction with face-to-face classroom-based teaching.

Our results demonstrated that students perceive greater value from video-based learning in terms of improved interest, enhanced understanding, and intellectual stimulation. This can be attributed to the recurrent theme of convenience that accompanied video-based lectures among our participants. The ability to view lectures at the student's own pace in a more familiar and comfortable setting empowers the learner to focus and understand the material in a comprehensive manner. Videos provide students with the option to view lectures at any playback speed, pause and repeat the content to their liking. Therefore, improving students' efficiency by revisiting certain aspects that they may find difficult and strengthen any weak links. An assessment of undergraduates at the Harvard Medical School and the Harvard School of Dental Medicine demonstrated that video-based learning is preferred for its efficiency and capability to save time [4]. Previous studies portray that the flexibility of online learning, when implemented and proctored under a specific set of quality standards, contributes to a variety of advantages including increased self-direction and autonomy [17-19]; this form of increased learner independence is regarded as both a goal and desirable adverse effects of computer-assisted learning [18].

We demonstrated that medical students perceive greater instructors' enthusiasm, more profound content, and improved content organization within video-based learning, in which clinical students/trainees are significantly more appreciative of such enthusiasm. These findings can be explained by inherent differences and challenges faced by instructors preparing either format. Historically and conventionally, Jordanian medical students are assigned to short clinical rotations that are maximally 2 months in length, throughout which each rotation is given by a randomly assigned clinical instructor covering a myriad of clinical topics and skills. Those instructors are not exclusive teachers but rather medical practitioners that often rely on giving in-round lectures due to their extremely busy schedules.

The high workload, manifesting due to a variety of reasons (e.g., hospital nature), often forces instructors to conduct in-round seminars with barely any visual aids (e.g., presentations). Furthermore, even if such aids are present, their content, organization style, and depth are rarely, if ever, updated or given considerable attention. On the other hand, video-based learning, whether part of the university's efforts to battle the pandemic or when sought within subscription-based platforms (e.g., Boards and Beyond) provide content/materials (i.e., presentations, seminars, flashcards, or quizzes) that are meticulously made and are often the product of the consensus of many experts within the field. Therefore, its only expected that these teaching modalities exhibit greater degrees of quality. The breadth of content, in terms of its origins, implications, and future development, when presented in an organized and accessible fashion plays a major role in building interest in the covered material and facilitates taking more meaningful notes, therefore amplifying the level of understanding.

The opportunity to discuss the content of the lecture and interact with the lecturer remain vital aspects of the learning process. As students get to ask questions, highlight personal weaknesses, and hear other students' outlooks, they tend to acquire a better grasp of concepts. Our results demonstrate that instructor-student interac-

tion was perceived more positively within face-to-face teaching. Moreover, the majority of students who preferred face-to-face classroom-based lectures value the ability to participate in live and instantaneous interactions with mentors through in-depth class discussions or merely through asking questions regarding vague topics of interest. These findings are consistent with previous studies and confirm the importance of having an expert for discussion [18,20].

We demonstrated that there was no disparity in perceptions of examinations scores across between video and face-to-face learning. Nonetheless, students in their basic medical sciences years perceive better examination scores when utilizing classroom-based learning compared to their clinical counterparts. Such phenomenon might be explained by the nature of exam development between those two training stages. Clinical examinations are developed by all physicians who participate in the teaching process and often need to target specific concepts that a general practitioner must know for future practice. On the other hand, basic medical sciences are often developed by the instructor that provides lectures, thus, such exams will mostly reflect and be adapted from the lecturer's own perception of important topics or concepts. Thus, attendance of these "biased" lectures could possibly influence students' examination scores.

Nonetheless, the lack of meaningful differences in educational outcomes (i.e., examination scores) may indicate that both modalities of teaching are equally effective. This notion has been portrayed by a multitude of trials comparing the effectiveness of different learning modalities to traditional didactic lectures [21]. However, it should be noted that such observation may not stand consistent throughout the literature due to disparity in assessment methodologies or biases. The literature demonstrates that alternative learning methods such as video-based learning are most effective and accepted as adjuncts to traditional teaching, offering a more personalized learning experience. Interestingly, mean scores for perception of rapport were significantly higher within traditional, face-to-face, learning methods. It appears that students use the classroom as a mean to achieve relational goals, these are, being liked and accepted [22]; the accomplishment of which could bolster learning outcomes. Furthermore, education research shows that instructor rapport is a consistent predictor of learning and participation, ultimately promoting affective learning, reducing student anxiety, and providing a suitable learning environment through the facilitation of better in-class and out-of-class communication [23]. Thus, it appears that ability of traditional teaching methods to fill psychological needs of students renders its existence rather imperative.

This notion is particularly pronounced during the COVID-19 pandemic. Azlan et al. [24] in 2020 demonstrated that Malaysian post-graduates preferred traditional classroom teaching over a variety of e-learning modalities, possibly due to dramatic social life changes incurred over the pandemic leading to an intense psychological burden manifesting as loneliness, anxiety, stress, or even depression. Similar attitudes were demonstrated by medical students in the United Kingdom and Libya [25,26]. In addition to the psychosocial burden, pandemic-related disdain of digital learning could also be a product of the sudden shift to exclusive online learning, under preparation of online curriculums, negative attitudes from instructors towards digital technology, or technical difficulties inherently associated within an unoptimized digital infrastructure [27].

Nonetheless, an overall consensus on the acceptability of distant learning during the pandemic is yet to be reached. In contrast to the aforementioned studies, there exists a body of literature which demonstrates favorable perceptions by all stakeholders involved in the medical educational process [28-30]. Undergraduates, both me-

dical and pre-medical, post-graduate students, and instructors showed positive behaviors, dedicated learning, and high satisfaction from utilizing different forms of distant learning. This positive reception is further supplemented by a systematic review which showed that health professions students' perceptions, acceptance, motivation, and engagement toward e-learning are predominantly positive and are similar to pre-COVID-19 era literature targeting this very same topic [31].

Interestingly, the impact of COVID-19 on education is yet to be determined. Various commentaries speculate on the meaningful role of e-learning during the post-pandemic era [32,33]; speculations that are rather ambitious and positive. However, there is a dearth of studies investigating post-pandemic perceptions of students towards e-learning. Sharma and Alvi [34] in 2021 demonstrated that students' perception of post-pandemic learning methods (i.e., web-based learning) are negative compared to their pre-pandemic perceptions of blended learning methods. These results may not hold consistent grounds for different populations as they might the net result of low-preparedness of targeted students to use technology in learning or accessibility issues (e.g., lack of reliable internet services). Moreover, Guppy et al. [35] in 2022 provides evidence on the congruence between educators and students on the adaption of blended/hybrid learning post COVID-19 and the increase in online courses. However, students were more skeptical about such changes [35].

While convenience might act as the primary drive for students' acceptance of e-learning, the examination of professionalism is vital to continuing education among medical students as it seeks to ensure that students abstain from unethical practices. Professionalism is a topic characterized by a variety of dimensions such as information literacy, commitment to values, and responsiveness to name a few. Studies demonstrate that students are aware of their capacity to develop professionalism through e-learning modalities [36,37]. In fact, self-discipline and commitment to assignments were among the most recognized factors leading to success in online learning [38]. However, a survey of Polish medical students demonstrated that online learning results in less activity and is often associated with lack of discipline which was primarily noted in junior students [39].

Overall, a systematic review examining the effects of offline digital education on medical students demonstrated that digital education is effective in influencing the knowledge and skill-set of medical students, with the latter having a greater impact [40]. Despite the great heterogeneity and high risk of bias reported by the authors, the potential of offline digital education lies within its scalability, cost-effectiveness compared to building an online digital infrastructure (e.g., virtual reality), and its acceptance among health professionals [40,41]. Thus, it could serve as a major teaching tool in low resource countries and an alternative in developed nations. Nonetheless, the potential of digital education, even if offline, could be hindered by the quality of hardware, resource investment and acceptance of the paradigm change by policy makers and institutions, and most importantly, access to the internet for download. As of 2021, nearly 3 billion people have never used the internet [42]. It should be noted that effectiveness of digital education is measured only in the short-term as no trials exist measuring the long-term adverse effects of primarily using such teaching modality.

It appears that the utility of e-learning transcends that of providing medical students with lectures in different formats but was also shown to be effective in promoting technical skills. The body of literature shows promising results across the following topics: laboratory skills [43], electrocardiogram visualization and interpretation [44], chronic wound management [45], fundus examination [46],

and general ward examination skills (e.g., cannulation, physical examination) [47]. It should be noted that the effectiveness of teaching such skills must be within a blended/hybrid context between e-learning and traditional feedback teaching. Based on our results, we recommend the implementation of a learner-centered teaching module in which the student is initially exposed to the required concepts through offline video-based lectures that are coupled with traditional live lectures throughout which experts assess understanding of said concepts and illuminate on advanced concepts (i.e., asynchronous blended teaching). Such flipped pedagogical process has shown promise in enhancing student performance [48,49].

1. Limitations

Our results should be considered with great caution. The cross-sectional nature of the design and its associated sampling technique may show the preferences of only a sub-set of medical students at the University of Jordan. The usage of a web-based survey might introduce selection bias which attracts students that are likely users of web-based learning. Furthermore, despite the University of Jordan having the largest and oldest medical school in Jordan, our results may not be representative of all medical students across Jordan's other five medical schools. Finally, due to the diversity of quality provided by video-based teaching modalities, participants answers might be only a reflection of their personal experiences with a subset that does not represent the entire platform.

2. Conclusion

In light of what's above, video-based learning was the preferred method among students at the University of Jordan across multiple domains, yet, it should not act as substitute to traditional didactic lectures. Face-to-face classroom-based lectures aid in the development of good communication skills and building rapport, both of which are the foundations of a good physician and amplify the mental fortitude of students. Taking into account the recent COVID-19 pandemic, a shift towards video-based learning was inevitable during times of social isolation. This has put the capacity of video-based learning to the test, highlighting major advantages and drawbacks. Certainly, a long road lies ahead towards perfecting the use of this learning tool. However, the integration of video lectures has proved to be of great benefit, as it has recently become a more appealing option to students which may improve student learning and interest.

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