

Impact of adding E-learning to the conventional pathology practical teaching

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Abstract

Introduction: WhatsApp is a popular standard smart-phone application being used by all students routinely. It could be used as an easy way of introducing E-learning in medical education.

Objective

1. To study the impact of E-learning by WhatsApp in Pathology practical teaching.
2. To analyze the students' perception and satisfaction for E-learning

Materials and Methods: This interventional study included 100 second-year MBBS students, divided into two groups (50-each)- 'Study Group' and 'Control Group'. The "control group" underwent conventional microscopic teaching during the Pathology practical sessions. The 'study group' in addition to the conventional teaching had E-learning through WhatsApp. Microscopic images of the slides were sent to 'study group' a day prior to the practical session and discussion/interaction was encouraged. After 12 practical sessions, assessment was done by post session test (Quantitative assessment). The 'Study Group' was asked to answer the feedback Questionnaire (Qualitative assessment) related to their perception for the use of WhatsApp methodology of teaching.

Results: The mean test score (Quantitative assessment) of the students in the 'study group' was 18.6/20 (93%) whereas the score in the 'control group' was 13.5/20 (67.5%). The difference in the scores of the two groups was statistically significant (p-value=0.0194). Feedback questionnaire revealed 100% satisfaction among the students and all recommended WhatsApp as an additional method of E-learning. There were no students in the 'disagree' and the 'strongly disagree' categories. 94% of the students felt that adding WhatsApp teaching motivated them for further reading.

Conclusion: E-learning by WhatsApp was found to have high student satisfaction and it improved their performance in objective assessment in this study. It could be easily incorporated in the current teaching curriculum on a wider scale.

Keywords: Pathology teaching, WhatsApp, Medical education, E-learning, Mobile learning.

Introduction

E-learning is the 'flavour of the day' and it is being widely talked about in the medical education research projects. E-learning has remained a 'recent advance' in medical education because of the continuing change and advancement in the information technology and introduction of more user-friendly methods of e-learning. It has been studied extensively and has been compared with the traditional method of teaching in various papers. Despite some caveats there is no doubt that e-learning can be an effective addition to the conventional method of teaching.¹⁻³ E-learning which was initially introduced through the desktops has gradually progressed to mobile phones- 'mobile learning'.³ Mobile learning has become popular because the mobile devices (smart phones) are being used by medical students worldwide for their personal use and thus form an easy platform to introduce education through it.⁴ So, there is no additional cost or logistics required to introduce e-learning as the platform is already existing. Its other main advantage is its easy accessibility. Mobile information can be used by students anytime, anywhere and any number of times. So, they can learn 'at their own pace'. Mobile learning has increasingly become popular and is expected to become the primary mode of e-learning in future.³ WhatsApp is one of the most popular applications on smart phones and is routinely used by almost all of the students for their social interactions.⁴ Hence, it could serve as a simple 'readymade track' to introduce e-learning to the medical students. Few recent publications have studied the

impact of adding WhatsApp to conventional teaching in various streams of medical teaching.⁵⁻⁸ While majority of the articles have found it to be an effective method of enhancing teaching, few have raised doubts on its impact.⁹ Overall the review of literature reveals a positive impact of introduction of WhatsApp as a teaching modality.^{10,11} However, its use in pathology practical teaching has not been studied.

Pathology should be learned as a dynamic subject for clinical problem solving. An integral aspect of Pathology is microscopic slide based learning and is considered as one of the most difficult exercise by the students. A pilot study in my institute revealed that 92% of the second year MBBS students felt that the Pathology slides are 'difficult' aspect of Pathology exams. Hence, I decided to introduce E-Learning in this aspect of Pathology teaching. The difficulty is basically because of inability to remember the visual picture of the pathologic finding seen under the microscope. This problem can be potentially solved by repeated viewing of the microscopic image by the students using slide projections or by various e-learning platforms. Prior introduction of the microscopic images using the WhatsApp could be a great method of priming the students before the conventional microscopy teaching in Pathology Practicals. This aspect of pathology practical teaching has not been studied well and hence I decided to study the impact of adding WhatsApp to conventional teaching in this prospective study. A pilot study in my institute provided confidence for my present study as it showed that 100% of

the students in the second year MBBS were using the smart phones and WhatsApp. Hence, this study was designed with the following aims.

1. To study the impact of E-learning by WhatsApp in Pathology practical teaching (Primary Objective).
2. To analyze the students' perception and satisfaction for E-learning (Secondary Objectives)

Materials and Method

This was an Interventional study performed at the Department of Pathology, Govt. Medical College and ESI Hospital, Coimbatore, India during the period of May 2018-July 2018. After Institution Review Board (IRB) and Institution Ethical committee (IEC) clearance this study was performed which involved 100 second year MBBS students at my institute. All the students had been undergoing the conventional microscopy teaching for Pathology practical classes before this study. The 100 students were divided into two groups- roll number 1 to 50 were termed as 'Study Group' and 51 to 100 were termed as 'Control Group'.

Control Group: This group included students who underwent the conventional microscopic teaching. During this study, 24 slides of different pathological conditions were discussed with students in 12 practical sessions. Each practical session had two slides of two different pathological conditions. Students were encouraged to discuss the slides among themselves and with the faculty in charge during the practical session.

Study Group: Written consent was taken from all the students of this group for their willingness to participate in the WhatsApp study and to include them in the WhatsApp group through which the microscopic slide images were shared and discussions were done. Interactive discussion among the group members was encouraged and was moderated and guided by me. The consent form had the following specific instructions:

1. The WhatsApp images will be sent to the students a day prior to the practical session after the college hours.
2. The mobile phones should NOT be used and should be kept switched OFF in the lecture halls and during the lectures and practical sessions.
3. They will be advised NOT to use the mobile phone during the college hours.
4. The images sent to them should not be shared with the students of the 'Control Group' till the study period and assessment is over.
5. They will be reassured that the same WhatsApp information will be shared with their batch mates belonging to the 'Control Group' after the evaluation of this study is completed.

The WhatsApp images were sent to the students of this group a day prior to the practical session after the college hours. The images were accompanied with a set of questions

relating to the salient features a student should observe to identify the pathological condition in the slide. They were encouraged to answer the questions asked. They were also encouraged to actively interact by putting forward their queries and by answering the queries of the other students.

For this study, 24 slides of different pathological conditions were discussed with students in 12 practical sessions. Each practical session had two slides of two different pathological conditions. The images of these slides were sent to the students a day prior along with the related questions. During the practical session they were shown the slides with special reference to the images sent to them the day prior. Students were encouraged to discuss the slides among themselves and with the faculty in-charge during the practical session.

After completion of all the practical sessions for the 'Study' and the 'Control' group the assessment of both the groups was done by post session test. The 'Study Group' was asked to answer the feedback Questionnaire related to their perception for the use of WhatsApp methodology of teaching. The results were analyzed based on quantitative and qualitative scales.

Qualitative assessment was done based on specially designed student feedback questionnaire with responses graded on a Likert scale¹².

Quantitative assessment was done with a - **post session test**. The post session test was conducted using slide spotters, one day after the last practical session and marks were awarded.

Statistical Analysis: Statistical analysis was planned with a null hypothesis that the post session test scores [dependent variable] were not different between the interventional groups [independent variable]. The post session test scores were normally distributed as per the Shapiro – Wilk test for normality. An unpaired t-test was then chosen to test significance of the difference between the mean test scores of the groups.

Results

The average test score of the students in the slide spotters, as part of the objective assessment, in the study group was 18.6/20 (93%) whereas the score in the control group was 13.5/20 (67.5%). Statistical analysis with 'Unpaired t-test' was done to assess the statistical significance of this new methodology of teaching. A statistically significant difference in the scores of the two groups was found, with a p-value of 0.0194.

While analysing the student's perception (Qualitative assessment) for the WhatsApp modality on a Likert scale, 100% satisfaction was noted among the students for the WhatsApp method of E-Learning (Fig. 1). There were no students in the 'disagree' and the 'strongly disagree' categories.

Students' Satisfaction for E-Learning

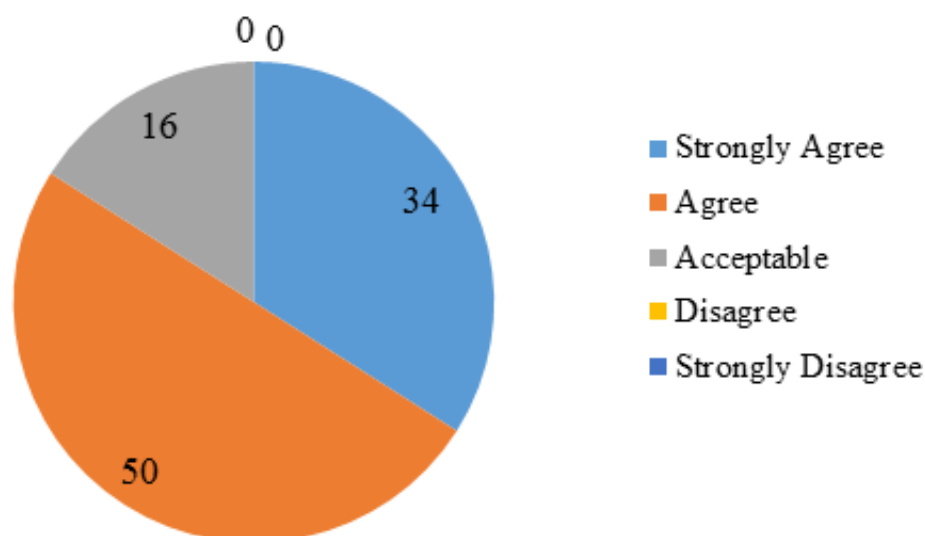


Fig. 1: Chart showing the overall satisfaction of the students for WhatsApp modality of teaching.

Fig. 2-5 show the response of the students to various questions of the feedback questionnaire on a Likert Scale.

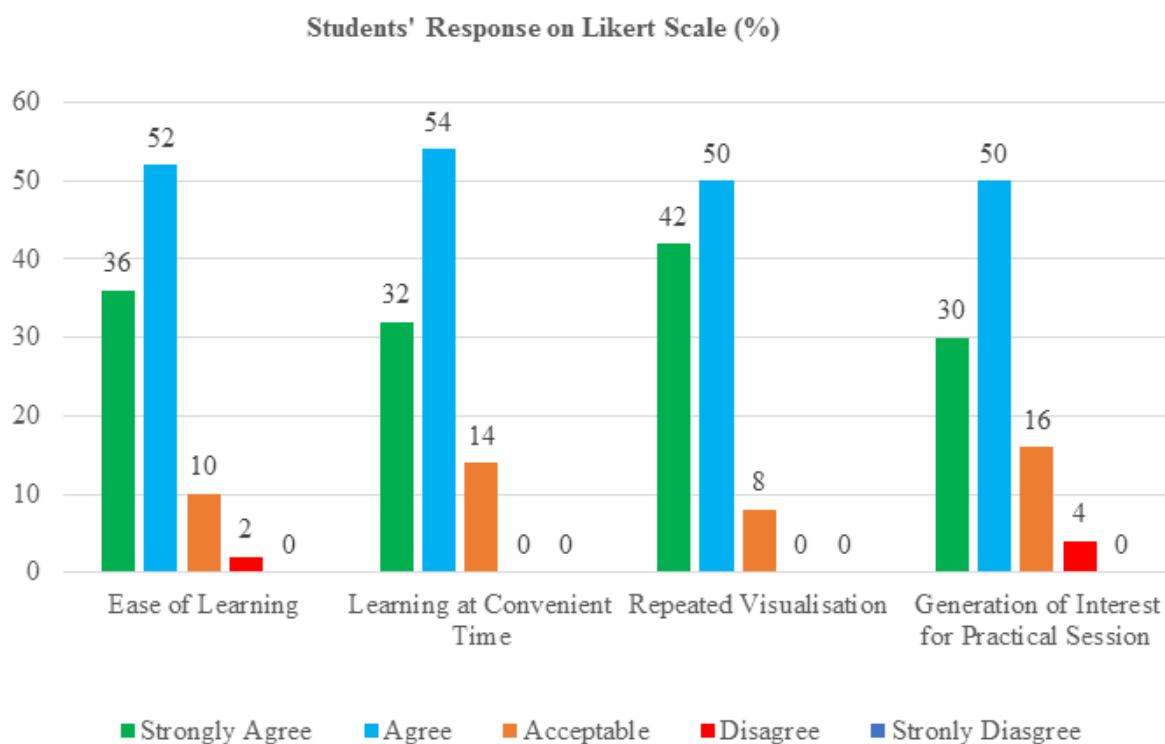


Fig. 2: Column diagram showing the distribution of students' response to various questions in the questionnaire used for qualitative assessment of the impact of WhatsApp modality of teaching.

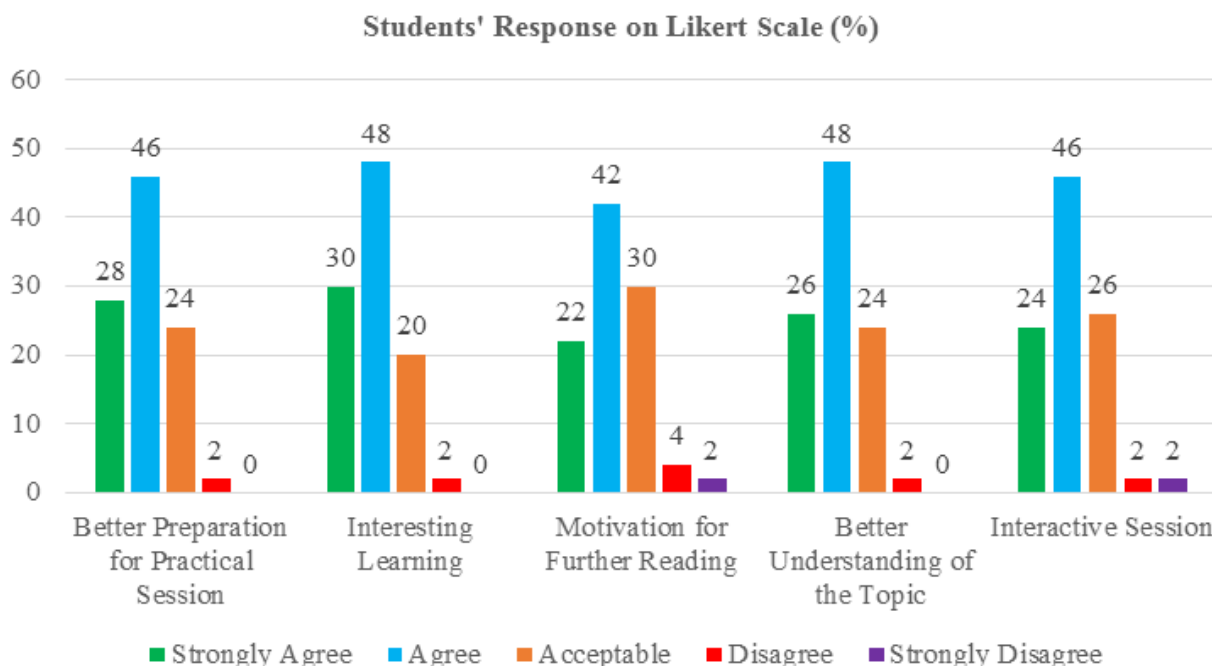


Fig. 3: Column diagram showing the distribution of students' response to various questions in the questionnaire used for qualitative assessment of the impact of WhatsApp modality of teaching.

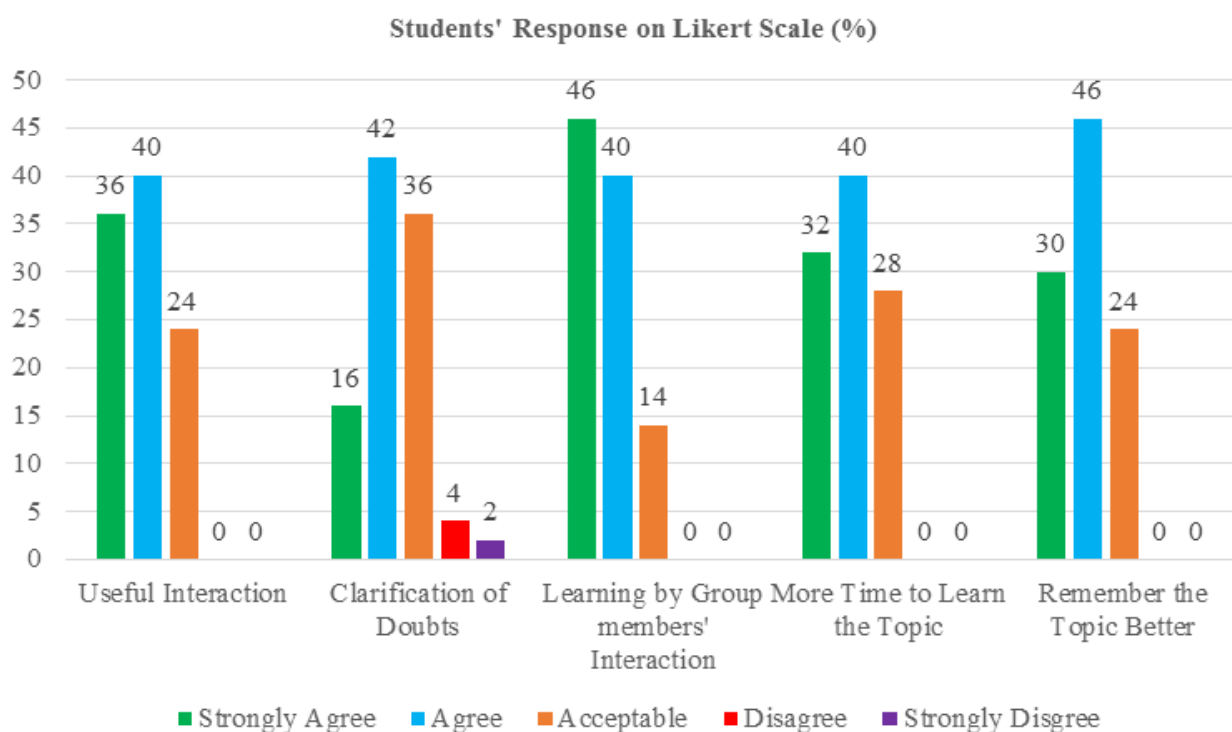


Fig. 4: Column diagram showing the distribution of students' response to various questions in the questionnaire used for qualitative assessment of the impact of WhatsApp modality of teaching.

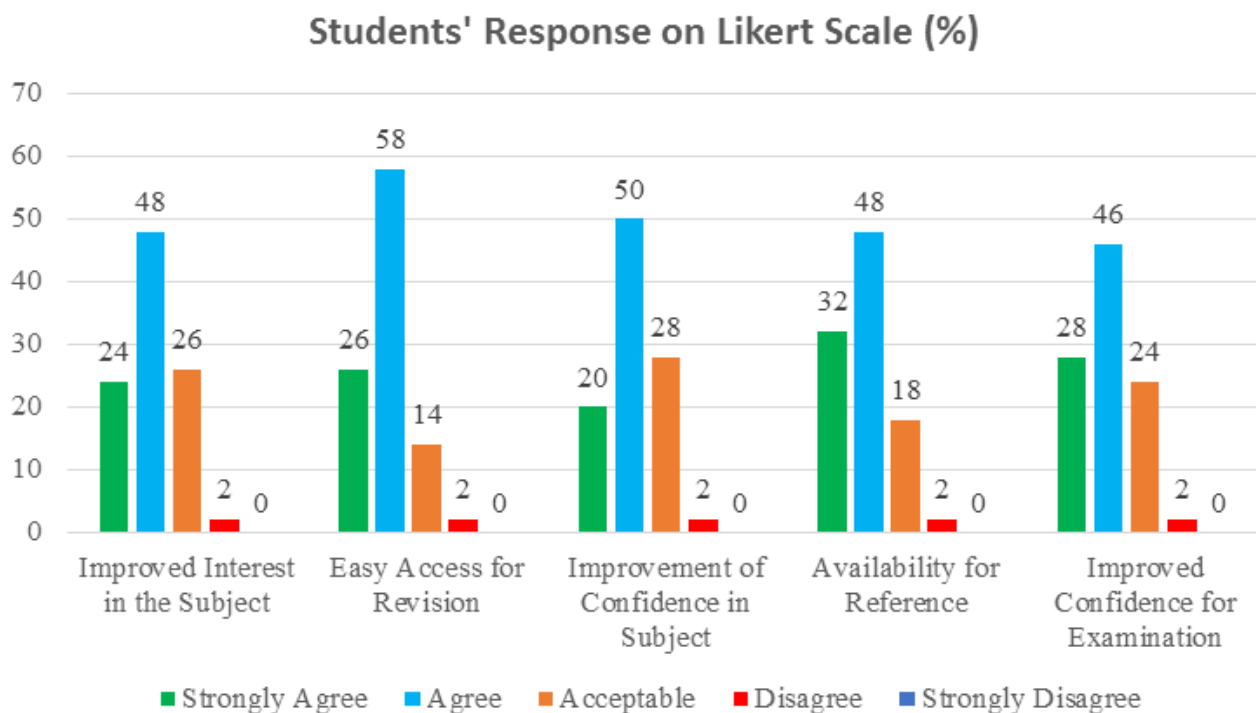


Fig. 5: Column diagram showing the distribution of students' response to various questions in the questionnaire used for qualitative assessment of the impact of WhatsApp modality of teaching.

Chart in the figure 6 shows the recommendation of the students for E-learning. It was observed that 100% students recommended WhatsApp as an additional method of E-learning.

Students' Recommendation for E-Learning (%)

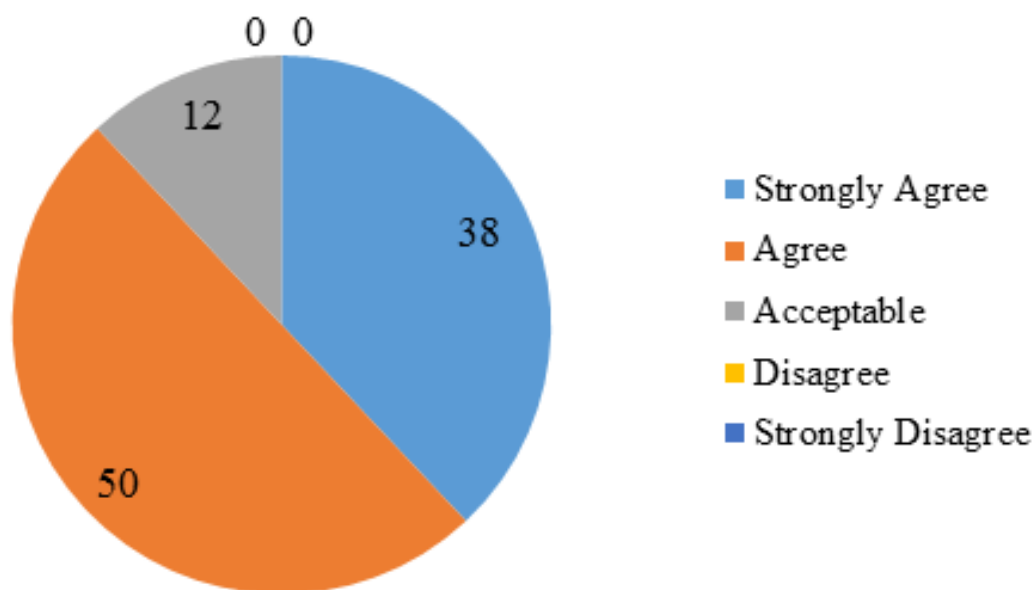


Fig. 6: Chart showing the students' recommendation for introducing E-learning using WhatsApp in regular teaching curriculum.

When the students' response score for each question on the Likert scale was aggregated, I noted that all had a total score of more than 42, indicating agreement to E-Learning by WhatsApp. (Fig. 7).

Students' Perception for E-Learning

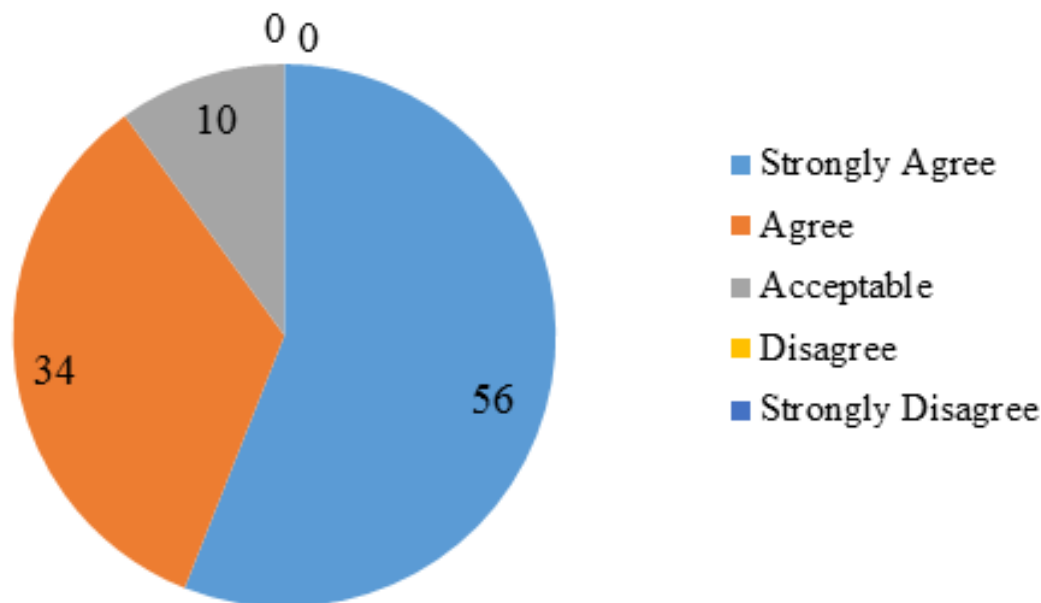


Fig. 7: Chart showing the total score of the responses (on Likert Scale) to all the questions in the questionnaire for student's perception regarding E-learning.

Discussion

In essence, E-learning is a computer based educational tool or system that enables us to learn anywhere and at any time. The 'learner-centric' and flexible approaches in E-learning account for its success in medical education today.¹³ Mobile learning or M-learning is a form of E-learning and has been described as "learning across multiple contexts, through social and content interactions, using personal electronic devices such as MP3 players, notebooks, mobile phones and tablets".¹⁴ With advent of smartphones, 'mobile-learning' via the various internet platforms like WhatsApp, Google groups, and facebook has become a mainstream of E-learning now. Many studies have found that mobile learning supports teaching and learning.^{15,16,17} Smart phones have become a regular commodity among students and medical students are no exception.¹⁸⁻²⁰ WhatsApp is currently one of the most popular social networking platform. Jamal et al in a cross-sectional multi-centric survey in Saudi Arabia found that WhatsApp was most popular applications on smart phones and was routinely used by almost all of the students for their social interactions.⁴ In a pilot project performed in our department we noted that all the students in the second year MBBS possessed a smart phone and were using the WhatsApp regularly. Hence, WhatsApp could serve as a 'readymade' platform to introduce the E-learning at no additional cost or logistics. The teaching material can be easily sent to

multiple students at a single time without the barrier of distance. The information can be studied by the student at their convenient time and as many times as they want.¹⁸⁻²¹ The information can be saved for later reference and there is a possibility of interaction and discussion among the members of the WhatsApp group. Any teaching-learning methodology which is easy and flexible will be surely welcomed.²² Teaching through WhatsApp appears to be one of that type but is yet to tested on a larger scale.

Use of WhatsApp as a teaching modality has been analysed by some recent publications, however, its use in pathology practical sessions has not been studied yet. Ability to share high quality representative images on smart phones is a great advantage.²³ Interaction and repetitions are the cornerstones for learning any skill.²⁴ I believe that in Pathology practical teaching the visual memory is of great importance and repeated seeing could greatly improve the students' ability to spot the pathological features in the slides. This repeated visualization can be done by sending the images to the students through WhatsApp a day before the practical session so that they can be mentally prepared and can understand the slides better. The WhatsApp group discussion could allow the students to interact, clear their doubts and learn from each other. Moreover, it could serve as a material for later reference. Introducing WhatsApp in the conventional teaching program should not be a great burden to the teacher as well because it only involves taking

good quality microscopic picture of the slides and they can be shared easily with the students using the smartphones at their convenient time.²⁵ Keeping all this in mind this study was conducted, which included 100 students of second year MBBS in our institute.

We noted a highly positive response from the students in the feedback questionnaire regarding the introduction of the WhatsApp modality of teaching. The ultimate and most objective indicator of the impact of any study is the improvement in the academic performance in the test. Even if the students are happy with a given method of teaching and there is no improvement in the academic performance it would be difficult to debate it as an effective method of teaching. In our study we noted a statistically significant improvement in the test scores of the group which underwent the WhatsApp method of teaching along with the conventional teaching group (study group). The test score of the 'control group' was 13.5/20 whereas the score of the 'study group' was 18.6/20. The difference was found to be statistically significant ($p=0.019$). Dyavarishetty and Patil in their study to assess the effectiveness of WhatsApp as a learning tool in community medicine also found a statistically significant improvement in the post-test scores ($p<0.001$).²⁶ Similar was the experience of Mohanakrishnan et al when studying the usefulness of WhatsApp for second year medical students ($p<0.001$).⁷ Altaany also found a statistically significant improvement in the academic performance of the students at Irbid National University in Jordan.¹¹ However, Gon and Rawekar when comparing the effect of WhatsApp and didactic lecture on student performance in Pathology teaching found no statistical difference in the post-intervention scores of the two groups ($p=0.63$).⁶ The reason for the difference in outcome of the study of Gon and Rawekar and this study is not clear. However, I assume that it could be because of the large quantity of material shared with the students in the WhatsApp group which comprised of micro-photographs, text, audio as well as small video clips. Larger quantity of the information is difficult to go through on the mobile especially the long text documents. Probably this was the reason that more than 60% learners in their study agreed on technical challenges comprising of message flooding, time consuming and continuous focusing towards the mobile screen leading to ocular muscle fatigue.⁶ Moreover, the study group only had WhatsApp teaching, with no face to face interaction with the teacher, which is a well-known drawback and limitation of any method of E-learning. In this study only images of the slides were sent (no lengthy text material), which could be seen any time. Repeated visualization can directly improve the performance of students in Pathology slides examination. I think when the study material is sent to the students by WhatsApp it should be very precise, more of images and only smaller text information should be shared rather than the whole chapter or articles, which they are most likely to just scroll and not go through completely. This could be a challenge for the teacher which they need to accept to get the best out of WhatsApp teaching.

Any new method of teaching has to be acceptable to the students and their feedback matters- 'ultimate learner satisfaction'. The questionnaire that I used to assess the students' perception towards WhatsApp had 21 questions. Questions 1-19 assessed the perceptions about the WhatsApp teaching methodology like ease of learning, convenience, repeated visualization, generation of interest in the subject, improved understanding; motivation for further reading, better interaction and discussion, better memory, increased confidence for exams and availability of the material for reference and revision in the future. Question 20 assessed their recommendation for including WhatsApp in regular teaching program and question 21 assessed the overall satisfaction with this new method of teaching.

All the students in the study recommended E-learning by WhatsApp and expressed high level of satisfaction for it. For both of these questions, there were no students in the 'disagree' and 'strongly disagree' category. 100% of the students recommended WhatsApp as an additional teaching methodology and 100% expressed overall satisfaction for this new method of teaching. Dyavarishetty and Patil found that 88.6% of the respondents felt that WhatsApp can be used as a teaching-learning tool and 91.4% recommended its further use.²⁶ Mohesh and Meerasa in their study involving Physiology students concluded that 100% students liked the WhatsApp modality of teaching and were satisfied with it.¹⁹ 97.4% students recommended to use WhatsApp as a teaching method for every subject.¹⁹

In this study, when the students' responses' score for each question on the Likert scale was aggregated we noted that none had a total score of less than 42 (disagreeing to E-Learning by WhatsApp) (Fig. 7). All these results convey that there is a universal acceptance for this new method of teaching among students. They are very keen and ready.

I observed that the students were very interested and excited about this new method of teaching-learning (98%). Mohanakrishnan et al when studying the usefulness of WhatsApp for second year medical students reported that 98% students agreed that it is interesting and thought provoking.⁷ Mohesh and Meerasa found that 93.51% felt it was interesting.¹⁹ This reflects the overall trend towards the new technology amongst the young generation. An educator may use this symbiosis to improve the teaching and learning.

In present study 98% students found the WhatsApp method of teaching to be easy and they did not have to put any extra effort or time into it and it was readily available to learn. Gon and Rawekar found that it was easy to use in 85.68% students.⁶ Here again the difference could be because of the quantity and type of the content which could determine the ease of its use.

Learning 'on the go' or at their convenient time can be one of the greatest advantage of the WhatsApp method of teaching as the information is there in the mobile phone and the students can see it whenever they wish and wherever they wish to. As expected, this question got a high positive response and 100% of students felt this as a main advantage. Mohesh and Meerasa found that 96.1% students felt that it

made the learning convenient (on the go).¹⁹ Even in the study of Gon and Rawekar where there were relatively low scores for many questions related to the WhatsApp Learning there was a high positive score of 91.59% for this question.⁶

98% of students in my study reported better understanding of the subject and expressed that they were more confident for exams. Similar, was the observations of Mohanakrishnan et al.⁷ Ranjan et al in their study on role of WhatsApp assisted learning for anatomy students found that students felt that it improved learning in 99.3%.²⁷

Ranjan et al as per student feedback found that WhatsApp boosted learning by group discussion in 96.6%; increased student teacher interaction by 98.6% and evoked analytic thinking in 96.6%.²⁷ Mohesh and Meerasa found 96.1% students agreed that WhatsApp was good for discussion and clearance of doubts.¹⁹ Gon and Rawekar studied that 90.49% of students could clear their doubts better.⁶ In this study it was observed that 94% of the students felt that it was a good platform for clearing doubts. In my study this is one of the questions which has a lower response rate. I think even in the WhatsApp group there are some students who are shy and hesitant to ask doubts and interact in the group discussion. During the study I experienced that few students would separately message their doubts to me on my WhatsApp number rather than in the group. Dyavarishetty and Patil while interviewing students could get a similar information where students expressed that the option for answering on an individual basis should be available rather than answering on the group.²⁶ Such hesitation by few students towards discussion is unavoidable and the teacher should be prepared for it and use this in positive way. Without revealing the name of the student who contacted for the doubt, the answer to the question or discussion can be put in the group so that all the participants can learn from the discussion. This philosophy is clearly reflected in the answer to the question- 'I could learn from the interaction from others'- which had 100% positive response in my study. In the study by Dyavarishetty and Patil all students felt that the discussion via case studies was informative and helped them to gain new knowledge and expand their learning.²⁶ Gon and Rawekar however in their question- 'Interaction between students and sharing of learning material' had only 70.55% positive response. There were 29.45% in the 'strongly disagree' response for this question.⁶ This is quite in contrast to my study, where I observed that 'the ability to interact and learn from others interaction and shared information' was cited as one of the main advantage of WhatsApp group teaching by the students. One reason for this disparity could be the lack of adequate internet connectivity, which Gon and Rawekar have expressed as one of the limitations in their study.⁶

The other question which had a relatively lower score in the questionnaire was- 'it motivated me for further reading'- which was 94%. Four students disagreed to it and two strongly disagreed. This may be the reflection of the general pattern of students in any batch who differ in motivation level and their interest and inclination towards the subject. Gon and Rawekar in their interview of the

students regarding WhatsApp teaching found that >70% learners agreed that there were no efforts by some students and some learners shared material only to impress the facilitator.⁶

A good number of students agreed that the introduction of WhatsApp teaching stimulated them to learn more (94%). In the study by Dyavarishetty and Patil- 91.4% students said that the case studies stimulated them to learn more.²⁶ This is a good trend and could help to generate interest among the students to read more and learn better. This is especially true for a subject like Pathology wherein the students fail to 'feel' and understand the interesting and specialized status of the speciality and its usefulness in the medical field.

There are few limitation of this study. It involved only one aspect of Pathology- Practical slides- which requires visual memory and could be improved by repeated visualization; where it was found to be very effective and acceptable to the students. Whether same response would be seen by sending bulky text material and chapters by WhatsApp is not clear. The time spent by the students on examining the slide or the number of times the students have seen the WhatsApp image was not included in the study and could have a complex influence on the result. Also, the number of students included in present study was only 100. However, my study provides a framework for studies to investigate use of WhatsApp learning amongst larger cohorts of students. Hence, further studies on a larger scale involving bigger sample size are needed for its adoption and responsible integration into medical education.

I believe that e-learning requires more self-motivation and dedication for learning than the conventional teaching as direct monitoring by the teacher is lacking. This may allow the less motivated and easy going students to remain out of the stream of teaching activities and fail to improve. This was observed in my study also. All the students who reported poorly on questionnaire also performed badly in the spotter test.

Unfortunately, most computer-assisted teaching of pathology does not encourage students to explore microscopic pathology, because of the limitation of fixed-field displays. These can provide an 'altas on screen' but the instructional value of such a design falls well short of what can be learnt by examining a real section of tissue.²⁸ Though m-learning cannot replace the conventional learning but it can definitely be a supplement for a learner to learn anything, anytime and anywhere.²⁹ Lack of face to face interaction is the greatest limitation of the e-learning.³⁰ The best possible teaching-learning methodology could be an appropriate combination of both, conventional face to face teaching plus innovative methods of E-learning - 'A Middle path'. As suggested by the e-learning expert Elliott Massie- "People are not single-method learners!" and "We are, as a species, blended learners."³¹ A "blended course" is the integration of online with face-to-face interaction.^{32,33} Blended learning offerings are gaining momentum, and with good reason.^{34,35}

The integration of E-learning in medical education is the need of the hour.³⁶⁻³⁷ Medical council of India (MCI) has

recognised the importance of technology and has included the use of electronic means in medical education.^{24,38} The United Nations and WHO have acknowledged e-learning as a useful tool in addressing educational needs in health care workers especially in developing countries.^{39,40} WhatsApp being a popular social network used by students routinely can serve as a readymade track to launch E-learning to the medical students in India. Recent literature and my study shows a significant positive effect of adding WhatsApp to the conventional teaching methodology as judged by the improved performance in the test. WhatsApp provides a great advantage of time management and ubiquitous learning. I found that students adore the at hand availability. They can ask and reply at their own time and ease. Students were found to be very excited about this new method of teaching as it allows them to learn at their own pace and allows interactions which is mutually beneficial. It is strongly recommended to introduce this simple method of teaching in our regular curriculum.

Conclusion

A uniformly positive response of the students towards introducing WhatsApp in the existing teaching methodology was observed. All students seemed to be very excited about this new change and happily welcomed it. They reported it to be of great advantage because of its at-hand availability, ease of use, possibility of discussion and interaction, reference for future and learning at their own speed and time. Moreover, it required no additional cost or logistics, as all the students were already using the WhatsApp for their social interaction and thus, it appears to be a ready-made track to introduce E-learning in current scenario. The positive response of the students towards this new method of teaching was paralleled by the objective assessment of their learning of the subject by the spotter test which showed a significant improvement over the control group. Based on the experience with this study it appears that WhatsApp is an easy way to launch E-learning in addition to conventional teaching in our education system and students are all ready for it.

Conflict of Interest: None.

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How to cite the article: Sharma C, Impact of adding E-learning to the conventional pathology practical teaching, *Arch Cytol Histopathol Res* 2019;4(1):1-10