

# Using Whiteboard Animation and Patient Narratives for Learning Clinical Ophthalmology: Student Perspectives

Chirag Patel , Joseph Snyder

College of Medicine and Public Health, Flinders University, Flinders Medical Centre, Bedford Park, SA, Australia

Correspondence: Chirag Patel, College of Medicine and Public Health, Flinders University, Flinders Medical Centre, Bedford Park, SA, Australia, Tel +61 431 773124, Email [chirag.patel@flinders.edu.au](mailto:chirag.patel@flinders.edu.au)

**Purpose:** In ophthalmology, an area that lacks teaching time in university, whiteboard animation and patient narratives may be untapped resources for learning. This research will seek student perspectives on both formats. The authors hypothesise that these formats would be a useful learning tool for clinical ophthalmology in the medical curriculum.

**Patients and Methods:** The principal aims were to report the prevalence of using whiteboard animation and patient narratives to learn clinical ophthalmology and determine medical students' perspectives on their satisfaction and value as a learning tool. A whiteboard animation and patient narrative video on an ophthalmological condition were provided to students attending two medical schools in South Australia. Following this, they were asked to provide feedback via an online questionnaire.

**Results:** A total of 121 wholly answered surveys were obtained. 70% of students use whiteboard animation for medicine, but only 28% use it for ophthalmology. There was a significant association between the qualities of the whiteboard animation and satisfaction ( $P < 0.001$ ). 25% of students use patient narratives for medicine, but only 10% use it for ophthalmology. Nonetheless, most of the students reported that patient narratives are engaging and improve memory.

**Conclusion:** The consensus is that these learning methods would be welcome in ophthalmology if more content like this were available. According to medical students, whiteboard animation and patient narratives are helpful methods of learning ophthalmology, and a continued effort should be made for their use.

**Keywords:** learning, ophthalmology, whiteboard animation, patient narratives, curriculum

## Introduction

Over the past 30 years, many studies have scrutinised and surveyed ophthalmology teaching in the medical curriculum.<sup>1-4</sup> There appears to be a collective theme in studies that there exists a lack of teaching time and sometimes a lack of interest within ophthalmology departments; generally consisting of a small number of lectures, possibly a workshop and a number of days in a clinic. Much of the teaching in Australian medical schools is delivered online and various methods of enhancing online learning have been suggested to improve ophthalmology teaching to medical students and thus improve clinical practice.<sup>4,5</sup> One format that is increasingly being adopted worldwide is whiteboard animation (WB). This format consists of hand-drawn illustrations with voice-over narration to explain complex and abstract ideas. Although WB is a format that has the potential to be used effectively for teaching, there are no studies to the best of the authors' knowledge that investigate the value of WB in medicine, let alone ophthalmology. Another method that could be valuable in ophthalmology for medical students is patient narratives (PN) in the form of storytelling - a method of learning that has not been frequently associated with learning ophthalmology. There is potential that PN can provide a unique insight into patients' feelings, attitudes, and presentations of eye diseases.<sup>6</sup>

The hypothesis made by the authors is that at present students are not using WB or PN to learn clinical ophthalmology but they are used successfully in other areas for medical student teaching. The study aims to examine if these

methods are feasible and helpful ways of teaching ophthalmology. This is conducted by examining the perspective of medical students through questionnaires into their use and perceived qualities using example videos provided on an ophthalmological condition.

## Materials and Methods

### Study Overview

This was a general exploratory study conducted between 2020–2021 involving students from medical schools in two universities based in South Australia. The principal aims of the project were to report the prevalence of the use of WB and PN to learn medicine and specifically clinical ophthalmology. A secondary aim was to determine medical students' attitudes and overall satisfaction with these as a learning tool for clinical ophthalmology. An audio-visual format for both was created, as this medium is easily accessible by students.

### Whiteboard Animation Video Creation

A WB video with a length of 4:03s was created on Giant Cell Arteritis (GCA).<sup>7,8</sup> A script was written detailing the critical components of the theory surrounding GCA (disease definition, pathogenesis, clinical evaluation and management) in a storyboard format, after which a graphic designer and a video production company were hired to create a WB video.<sup>9</sup> The WB video was created with Mayer's 12 principles of multimedia learning in mind.<sup>10</sup>

### Narrative Acquisition

Two PN were acquired for this study. Both narratives involved a patient who had been blinded by GCA and was captured in audio-video format to adhere to Covid-19 pandemic restrictions.<sup>11</sup> They were encouraged to detail their experience around symptoms, diagnosis, management, and the impact it had on their lives. Filming was conducted in a studio setting, and informed consent was obtained before filming.

### Student Perspectives Evaluation

Clinical-year medical students were recruited from undergraduate (UG) and postgraduate (PG) medical schools via email. A generic email was sent that detailed the purpose of the project and included a link to both videos and the survey. If the student was willing to participate, a consent form was signed and sent back to the author via email. It was anticipated that approximately 500 students would have received the email. The questionnaire design was based on a survey study of medical students' use of YouTube videos and key areas that WB and PN can potentially improve or increase in a learner.<sup>12</sup> The questionnaire contained three sections; the first included questions to identify the participants' demographic data, including gender, age, year of study and UG or PG. The second section consisted of 6 questions on students' general and ophthalmological use of WB and PN as well as their views on their availability. The third section consisted of mainly Yes or No questions on the videos they viewed, evaluating their value in learning clinical ophthalmology and overall satisfaction ([Appendix 1: Questionnaire](#)). The authors specifically chose these areas based on a study that concluded WB and PN can aid or improve these aspects in the learner.<sup>6,13,14</sup>

The collected data were numerically coded for statistical analysis. A positive answer was given code one, and a negative answer was coded zero. Statistical analysis was presented using Pearson's Chi-square test. In addition, statistical analysis was performed to look for any association between the qualities of the format of learning and student satisfaction in section 3. Differences were considered significant whenever the value was less than 0.05. The statistical analysis was performed using the Statistical Package for Social Sciences software (SPSS, Inc., Chicago, IL).<sup>15</sup> The study (number 8612) was approved by Flinders University Human Research Ethics Committee (HREC).

## Results

### Study Demographics

A total of 128 students answered the surveys, of which 7 (5%) failed to fully complete it. If questions were not answered in full for both videos, then this participant was excluded. Of the 121 (95%) students that completed fully the survey 59% were female, 62% were UG students and all students were within a mean age of  $25.6 \pm 3.6$  years. 17% were third-year

students, 29% were fourth-year students, 30% were fifth-year students and 22% were sixth-year students (Table 1.). For simplification, categories of early clinical years (4th UG and 3rd PG) and late clinical years (5th, 6th UG and 4th PG) were denoted.

## Prevalence of Use of WB

The results were illustrated concerning gender and level of study (Table 2). Statistical analysis revealed there were no significant differences related to gender. Over two-thirds of students use WB for learning medicine. There was minimal use of this format for learning ophthalmology (28%) and most of the students had not come across this format for learning ophthalmology (64%). There were no significant differences between students' demographics and the use of WB.

## Evaluation of the Utility of WB in Ophthalmic Teaching

Supplementary Table 1 (see Supplementary Material) details the students' responses regarding the perceived qualities and overall satisfaction of WB for their learning in clinical ophthalmology. More females felt this video was engaging compared to males and this was statistically significant. While there were no other significant associations between the given qualities of WB concerning gender and level of study, many of the responses were positive. For the three qualities of the video i.e engagement, understanding and recall, 103 students answered positively for all three (84%). Of those students who were aware of videos like this in ophthalmology but did not watch them for learning, 89% found the created

**Table 1** Student Characteristics by Clinical Year of Study

	Overall	Early Clinical Years	Late Clinical Years
Age, mean.	25	24	26
Gender (%)			
Male	50 (41)	18 (56)	32 (36)
Female	71 (59)	14 (44)	57 (64)
Undergraduate (UG) (%)	70 (58)	8 (25)	62 (70)
Postgraduate (PG) (%)	51 (42)	24 (75)	27 (30)
Total (%)	121 (100)	32 (26)	89 (74)

**Table 2** Measuring General, Ophthalmological Use and Availability of WB Among Medical Students in Relation to Age and Level of Study

Question	Positive Answers (%)	M	F	P value	Early Clinical Year	Late Clinical Year	P value	UG	PG	P value
Do you use WB in general for learning?	85 (70)	33 (66)	52 (73)	0.39	26 (81)	59 (66)	0.11	44 (63)	41 (80)	0.06
Have you come across WB for clinical ophthalmology?	43 (36)	21 (42)	22 (31)	0.21	15 (47)	28 (32)	0.12	23 (33)	20 (39)	0.47
Do you use WB for clinical ophthalmology learning?	34 (28)	15 (30)	19 (27)	0.70	13 (41)	21 (24)	0.07	17 (24)	17 (33)	0.27

**Abbreviations:** M, males; F, females; WB, whiteboard animation videos; UG, under-graduate; PG, post-graduate.

video engaging, 67% thought it helped with understanding, and 78% felt it would help with their memory and recall. Of the students who had not come across WB for ophthalmology, 87% reported they would use it as a revision tool if available and recommend it to other students for learning clinical ophthalmology. Analysis was performed to explore associations between the suggested qualities of the video and satisfaction towards WB for learning ophthalmology (Table 3). There were statistically significant associations between engagement, understanding, memory and recall with the use of WB in learning ophthalmology and overall satisfaction ( $P < 0.001$ ).

## Prevalence of Use of PN

The results were illustrated concerning gender and level of study (Table 4). Section 2 statistical analysis revealed there were no significant differences related to gender, year of study or whether UG or PG. 25% of students use PN for learning medicine. 14% reported they had come across PN for clinical ophthalmology and only 10% of them use this as a form of learning in clinical ophthalmology.

## Evaluation of Utility of PN in Ophthalmic Teaching

[Supplementary Table 2](#). (See [Supplementary Material](#)) details the potential perceived qualities and overall satisfaction of the students towards this teaching modality. There were no other significant associations between the value and satisfaction of PN concerning gender, clinical years, and level of study. Nonetheless, many of the responses were positive. Of those students who were aware of formats like this in ophthalmology but did not watch them for learning, 77% reported they find videos like this engaging, 69% felt they would improve their memory and recall, 38% felt they would improve their communication, 54% felt they would increase their empathy, and 77% felt they would increase their reflective thinking. Of the students who had not come

**Table 3** Association Between the Students' Views on the Perceived Qualities of WB and Satisfaction

	Level	N (%)	Y (%)	P value
<i>WB is Engaging</i>				
n		15	106	
Would you use WB like this as a revision tool for clinical ophthalmology?	N	7 (37)	12 (63)	<b>&lt;0.001</b>
	Y	8 (8)	94 (94)	
Would you recommend WB like this to other students for clinical ophthalmology learning?	N	6 (35)	11 (65)	<b>0.002</b>
	Y	9 (9)	95 (91)	
<i>WB helps with understanding.</i>				
n		20	101	
Would you use WB like this as a revision tool for clinical ophthalmology?	N	13 (68)	6 (32)	<b>&lt;0.001</b>
	Y	7 (7)	95 (93)	
Would you recommend WB like this to other students for clinical ophthalmology learning?	N	11 (65)	6 (35)	<b>&lt;0.001</b>
	Y	9 (9)	95 (91)	
<i>WB improves memory and recall.</i>				
n		21	100	
Would you use WB like this as a revision tool for clinical ophthalmology?	N	17 (89)	2 (11)	<b>&lt;0.001</b>
	Y	4 (4)	98 (96)	
Would you recommend WB like this to other students for clinical ophthalmology learning?	N	16 (94)	1 (6)	<b>&lt;0.001</b>
	Y	5 (5)	99 (95)	

**Notes:** Results are further broken down into students' perceptions on major impacts of the video and if they would accordingly recommend it or use it as a revision tool. For example, "WB is engaging" - 15 said no and 106 said yes. Of the ones who said no, 7 would not like to use it as a revision tool and 8 would. Of the ones who said yes 12 would not like to use it as a revision tool but 94 would. Bold: statistically significant results.

**Abbreviations:** WB, whiteboard animation videos; Y, yes; N, no; n, number of respondents.

**Table 4** Measuring General, Ophthalmological Use and Availability of PN Among Medical Students in Relation to Age and Level of Study

Question	Positive Answers (%)	M	F	P value	Early Clinical Year	Late Clinical Year	P value	UG	PG	P value
Do you use PN in medicine in general for your learning?	30 (25)	15 (21)	15 (30)	0.27	10 (31)	20 (23)	0.32	14 (20)	16 (31)	0.15
Have you come across any PN for clinical ophthalmology learning?	17 (14)	5 (10)	12 (17)	0.28	2 (6)	15 (17)	0.14	10 (14)	7 (14)	0.93
Do you use PN for clinical ophthalmology?	12 (10)	5 (10)	7 (10)	0.98	3 (9)	9 (10)	0.91	6 (9)	6 (12)	0.56

**Abbreviations:** M, males; F, females; PN, patient narratives; UG, under-graduate; PG, post-graduate.

across PN for ophthalmology and do not use them, 44% reported they would use it as a revision tool if available and 90% would recommend it to other students for learning clinical ophthalmology. Analysis was performed to explore associations between suggested qualities of PN in learning ophthalmology and overall satisfaction (Table 5.). Whilst many of the students agreed that the PN were valuable for their learning, they were not all statistically significant, especially concerning whether they would use them for revision. There were statistically significant associations between recommendations to others and the various suggested qualities ie, engagement, improvement in memory and recall, improvement in communication and development of empathy.

**Table 5** Association Between the Students' Views on the Perceived Qualities of PN and Satisfaction

	Level	N (%)	Y (%)	P value
<i>PN are engaging</i>				
n		22	99	
Would you use PN like this as a revision tool for clinical ophthalmology?	N Y	16 (73) 7 (27)	56 (57) 43 (43)	0.16
Would you recommend PN like this to other students for clinical ophthalmology learning?	N Y	5 (23) 17 (77)	8 (8) 91 (92)	<b>0.04</b>
<i>PN can improve memory and recall</i>				
n		29	92	
Would you use PN like this as a revision tool for clinical ophthalmology?	N Y	21 (72) 8 (28)	51 (55) 41 (45)	0.10
Would you recommend PN like this to other students for clinical ophthalmology learning?	N Y	7 (24) 22 (76)	6 (6) 86 (94)	<b>0.008</b>
<i>PN can improve communication</i>				
n		36	85	
Would you use PN like this as a revision tool for clinical ophthalmology?	N Y	21 (58) 15 (42)	51 (60) 34 (40)	0.86
Would you recommend PN like this to other students for	N	7 (19)	6 (7)	<b>0.04</b>

(Continued)

**Table 5** (Continued).

	Level	N (%)	Y (%)	P value
clinical ophthalmology learning?	Y	29 (81)	79 (73)	
<i>PN can increase empathy</i>				
n		28	93	
Would you use PN like this as a revision tool for clinical ophthalmology?	N Y	20 (71) 8 (29)	52 (72) 41 (56)	0.14
Would you recommend PN like this to other students for clinical ophthalmology learning?	N Y	9 (32) 19 (68)	4 (4) 89 (96)	<b>&lt;0.001</b>
<i>PN can increase reflective thinking</i>				
n		18	103	
Would you use PN like this as a revision tool for clinical ophthalmology?	N Y	12 (67) 6 (33)	60 (58) 43 (42)	0.50
Would you recommend PN like this to other students for clinical ophthalmology learning?	N Y	4 (22) 14 (78)	9 (9) 94 (91)	0.09

**Note:** Bold: statistically significant results.

**Abbreviations:** PN, patient narratives; Y, yes; N, no; n, number of respondents.

## Discussion

WB and PN combine auditory and visual information to improve students' engagement and cognition,<sup>16–18</sup> the content of which can range from demonstrating a procedure to communicating essential facts. Studies have shown that using audio-visual teaching in clinical education has a positive impact on learning.<sup>19</sup> WB have been shown to help acquire medical knowledge according to students' perspectives<sup>20–22</sup> and is frequently used as suggested in this study (70%). PN improve students' communication, empathy and reflective thinking by relaying patients' lived experiences and promoting patient-centred communication.<sup>6,13,23</sup> They have also been shown to promote memory formation and heighten learner engagement.<sup>14</sup> This is a potentially untapped method for learning an area of medicine that has an emotive component ie, the patient impact of low vision or blindness.

Responses indicate WB is commonly used as a study aid in medicine in general, however not many report using it for clinical ophthalmology (28%). The reason for the lack of uptake may be because little WB ophthalmology-related content is available which 64% of students attested to. It may also be that the quality of WB in this area is lacking or due to the minimal time given to ophthalmology teaching, students may not be searching for this type of content as much as other content that is given priority in the curriculum.<sup>21</sup> Students reported less use of PN (25%).

Most of the respondents thought that WB was engaging, aided their understanding and would improve their recall. Engagement from WB may be related to the qualities of the format, in that they guide, are simple by nature and are interactive.<sup>24–26</sup> This “first-person experience involvement” encourages knowledge construction.<sup>27</sup> A small non-validated study suggested a 15% increase in the retention of information and a 66% increase in the number of participants willing to share the information following the utilisation of WB animation.<sup>27</sup> A study investigating the learner experience of WB in advanced physics students showed improved retention compared to text and audio formats.<sup>28–34</sup> There are reasons students seem to learn better with these types of videos.<sup>10,28,35,36</sup> Ultimately, a specific theory seems to play a vital role in the WB format: the cognitive theory sometimes known as dual coding theory.<sup>37</sup> The dual coding theory proposes that words are processed in separate, limited-capacity channels of working memory before they are combined into a single coherent mental model.<sup>37</sup> This mental model results in organised information on the topic being taught. Text and graphics provide separate contributions to the mental model formation, with the former contributing to explanations of complex matter.<sup>37,38</sup> This theory is difficult to facilitate within tools such as PowerPoint, a format commonly used in university

teaching. Given that students have found limited teaching of ophthalmology from anatomy through to pathology,<sup>4,5,39</sup> WB seems ideally placed to overcome these barriers through the very nature of its construct.

The theory of PN is the engagement of the viewer through storytelling and the stimulation of emotion.<sup>14,40,41</sup> Engagement is a crucial component when it comes to learning.<sup>42</sup> This is reflected by the positive responses in relation to student engagement in these videos. There is evidence to show that engagement can also enhance memory function.<sup>43</sup> The four-step structure of narrative—beginning, problem, resolution, and ending—forms a mental map onto which new information can be laid.<sup>44,45</sup> PN can contain emotionally charged material, this is perhaps why students, overall, felt this format would help with memory and recall. Students may have felt that they tap into a type of “empathic memory” whose recall—either conscious or unconscious—may influence the students’ future approaches to patients and their medical care.<sup>46</sup> Concerning PN, most students reported they could help with their communication and increase their reflective thinking. A reasonable and practical exchange between the doctor and patient helps the former see what the other person thinks and how they feel.<sup>47</sup> It has been shown that patients’ stories can improve doctors’ knowledge and confidence and encourage them to think holistically and promote person-centred communication.<sup>48</sup> It was evident from this study that communication was an important quality that students felt could be improved with PN. Given that 60–80% of diagnoses and treatment decisions can be made only by eliciting a careful history, different methods to improve communication skills should be welcomed in medical school.<sup>49</sup> Better communication builds patient confidence and leads to better health outcomes.<sup>50</sup>

Logically, for someone to recommend anything to others they must find it beneficial themselves and there was a direct correlation between these. Students who found WB engaging, and felt it helped with their understanding, memory and recall were more likely to use it for revision and recommend it to others. Fewer students would opt to use PN for revision in comparison to recommending them to other students. This may suggest that the powerful nature of this type of content goes far beyond being used purely as a revision tool. It may have a deeper impact on the life of the learner, an impact that may continue in their future working clinical years.<sup>46</sup> This contrasts with WB, where the students may have felt that this format would be far more useful for exam revision and so equally, they may have recommended that other students use them for this purpose. Patient stories and narratives have already been effectively adopted in several settings such as cancer and trauma.<sup>47–50</sup> Trauma studies inform us of the importance of the survivor of trauma telling his or her story and of the listener acknowledging that suffering is real.<sup>28,29</sup> In conditions affecting vision loss, the emotional and life-changing aspect of this is recognised, like cancer journeys.<sup>32,33</sup> Some students may not have come across someone with GCA, but they may have read about and based their knowledge of it on reading a textbook. If they have come across GCA previously, this experience of watching someone talk through their illness may have cemented their knowledge and equally affected the way they would approach such a case.<sup>27,28</sup>

The results of this research have some limitations, the sample size of 121 fully completed surveys was able to provide some statistically significant results, however for further expansion on more specific findings a higher sample size would be ideal. This research also focuses on ophthalmology and a specific ophthalmological condition of significance, and whilst it could be deduced that this could be applied to other ophthalmological conditions broader research could be considered to support this. Nonetheless significantly significant data is obtained from this which can help guide teaching as well as points of further investigation and research.

## Conclusion

This is the first study to evaluate the use of WB and PN as a tool for learning ophthalmology in the clinical years of medical school. It provides a ubiquitous way of learning in that the learning opportunity is available at any time and anywhere (in the video format), allowing the student to learn at their own pace. It should not be a replacement for other methods of teaching but rather supplement them. The participants in this study were medical students in an advanced stage of their education and overall, their perception of PN and WB was positive. PN have the potential to share a patient journey and provide a reflective tool for students. With WB proving to be a valuable learning tool in other fields, combining it with PN would complement and incorporate a breadth of learning that would be useful for medical students and beyond in clinical ophthalmology practice. There should be a continued effort and encouragement by tutors to create

and utilise such content in their clinical teaching given that both formats may aid in different learning outcomes, improving recall, understanding and reflective thinking in ophthalmology.

## Data Sharing Statement

The data sets including all statistical analysis files are stored in a Flinders University password-protected computer. Data used in this paper can be requested using the correspondence details listed on the title page.

## Funding

No funding was required for this study.

## Disclosure

None of the authors has any financial or commercial conflict with the content of the manuscript.

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