



Different Types of 'Background' of Illustration-based PowerPoint Slides: Anatomy Postgraduate Students' Preferences and Perceived Influence on Learning

Shafinaz Gazi^{1*}, Khondker Manzare Shamim²

¹Assistant Professor,
Department of Anatomy,
Bangabandhu Sheikh Mujib Medical
University (BSMMU),
Dhaka, Bangladesh.
Email: shafinazgazi@bsmmu.edu.bd,
Orcid ID: 0000-0001-5157-3835

²Professor (retired),
Department of Anatomy,
Bangabandhu Sheikh Mujib Medical
University (BSMMU),
Dhaka, Bangladesh.
Email: manzareshamim@bsmmu.edu.bd,
Orcid ID: 0000-0003-2520-2250

*Corresponding author

Abstract

Background: 'Background' is an important visual element for creating multimedia (e.g., PowerPoint) slides on which text and illustrations are placed. Although some general guidelines for the background for textual materials on PowerPoint slides are available, detailed and specific guidelines on the background for illustrations are almost lacking. As part of a broader research, this qualitative study was designed to assess the preferences of Anatomy postgraduate students towards different types of background of illustration-based PowerPoint slides and their perceived influence on learning. **Material & Methods:** An FGD was conducted among eight Anatomy postgraduate students from two medical colleges of Bangladesh. Seven PowerPoint slides with one same pair of Neuroanatomy illustrations but seven different types of background dealing with the following characteristics were shown to them: White/light-coloured homogeneous/Dark-coloured homogeneous; Slightly decorated/Heavily decorated; Related to subject/Not related to subject. The discussion was on which background they liked most and why, and whether they think that the background would enhance students' learning. **Results and Conclusion:** Six broad 'themes' emerged from the FGD: 1. No single type of background yielded a unanimous preference. 2. Coloured homogeneous backgrounds seemed to be the most preferred type with no clear-cut difference between the light-coloured and dark-coloured ones. 3. Preferences for white or slightly decorated background was moderate. 4. Among the slightly decorated backgrounds, preference for those related to the subject was greater than for those not related. 5. No preference was shown for the heavily decorated background not related to the subject. 6. Despite some positive comments regarding the influence of slide background on learning, no definitive conclusion could be drawn. While these results provide some baseline answers to the research questions, further studies addressing more specific issues of background and viewer characteristics are recommended.

Received: 25 January 2022

Revised: 19 March 2022

Accepted: 31 March 2022

Published: 22 April 2022

Keywords:- Slide background, illustration, FGD, preferences, influence on learning.

INTRODUCTION

"How should we best teach anatomy?"^[1] Probably it is the most burning question that has been asked by anatomists over centuries.

Consequently, they have been constantly searching for its answer for conveying human anatomical information to students in effective ways. Anatomy is a visual subject. Thus, visual materials, especially illustrations (also called



pictures, figures, images etc.), play a vital role in teaching-learning for better understanding of this complex science. Multimedia software like PowerPoint has become an integral component of classroom teaching for projecting complex anatomical illustrations in time-saving and convenient ways. Generally, it seems that students like lectures with PowerPoint presentations.^[2-7] Ding and Liu^[5] think that “by presenting PowerPoint slides inserted with pictures, flow charts, schematics, animations, even video clips, the lecture may become vivid and attractive to students.” It is implied, then, that every slide has a ‘background’ as well. The visual impact of a slide must be that of a combined effect of the foreground material and the background. Unfortunately, while ‘backgrounds’ are an important element for creating an engaging presentation, they are often overlooked when designing PowerPoint slides.^[8] PowerPoint ‘backgrounds’ have been described as the images or design elements that are placed on slides behind whatever text, charts, images, or other objects are presenting.^[8] However, the background may also be just white or of a plain, solid, homogeneous colour. Although there are some instructional guidelines for the ‘background’ of textual material on PowerPoint slides, no such guidelines on the ‘background’ of illustrations have been available to the present researchers. It is understandable that populations and individuals may have different feelings regarding the colour and other design aspects of slide backgrounds. However, the feelings regarding such a culture-sensitive and individual taste-sensitive issue as the ‘background’ of illustration-based PowerPoint

presentations have not yet been examined among the medical students of Bangladesh.

The present research was designed to explore the feelings of Bangladeshi Anatomy postgraduate students about different types of ‘background’ of illustration-based PowerPoint slides, through a focus group discussion (FGD), and assess their preferences of different types of slide background and their perceptions regarding the influence of backgrounds on learning.

It may be mentioned that this research on slide background was part of a much broader study exploring different aspects of presenting illustrations in PowerPoint slides that included labelling, animation and emphasizing illustration as well. This article is also a part of a two-article series in which the next article deals with the results of a survey among Anatomy teachers of Bangladesh on the same issues as the present article.

MATERIAL AND METHODS

A focus group discussion (FGD) was carried out in the Department of Anatomy, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, among eight postgraduate (MPhil) Anatomy students, four from each of the two medical colleges in Dhaka where the MPhil Anatomy course is run. The participants, who were selected purposively, were well exposed to Neuroanatomy. They were accustomed to and showed special interest in PowerPoint presentations, were reasonably articulate and gave an informed written consent to participate in the research. Seven of them were females. It may be noted that in Bangladesh,

the MPhil Anatomy courses in most institutions have similar male-female ratios of students. For the present study, the term 'background' meant the appearance of the surface of a slide on which illustrations are placed in a PowerPoint slide. While a text material is commonly placed directly on the slide background, an illustration can be placed in two different ways: with its surrounding colour, that can be called the 'base colour' (Figure 1A), or directly on the slide without any surrounding 'base colour' (Figure 1B). Anatomy books usually place illustrations on white pages, and this makes a white 'base colour' for these illustrations. Most of the Anatomy illustrations available on the internet are also placed on a white 'base colour'. Keeping this in mind, one pair of coloured Neuroanatomy illustrations,^[9] each having a 'white base' were placed on the following seven 'types' of 'background' in PowerPoint slides (Figure 2) and were shown to the participants of the FGD:

- **Slide- a:** White background
- **Slide- b:** Light-coloured homogeneous background,
- **Slide- c:** Dark-coloured homogeneous background
- **Slide- d:** Slightly decorated background not related to the subject^[10]
- **Slide- e:** Heavily decorated background not related to the subject^[11]
- **Slide- f:** Slightly decorated background related to the subject^[12]

- **Slide- g:** Heavily decorated background related to the subject^[13]

Here, the term 'homogenous' indicated plain, solid backgrounds without any figure, texture or pattern. In contrast, the term 'decorated' indicated backgrounds with figurative graphics or other pattern or design, either related or not related to the subject of Neuroanatomy. For selecting the slide backgrounds, more than a hundred slide designs available in PowerPoint and other sources were examined.

The FGD was initiated by asking two basic questions to the participants in Bangla: "Which slide do you like/dislike the most, and why?" and "What do you think about their influence on learning?". In addition, complementary questions were used to get a better understanding of what the students were saying. The FGD was facilitated by two researchers. The whole discussion, occurring in Bangla, was recorded in three forms- in written- by taking notes, in audio- by using two digital tape recorders and in video- by using a digital video camera. The recorded discussion was transcribed into Bangla handwritten form and translated into English. The final transcript was typed in English by using Microsoft Word 2010. The transcript was then analysed thoroughly to identify the 'themes' emerging from it, considering each type of slide 'background'.

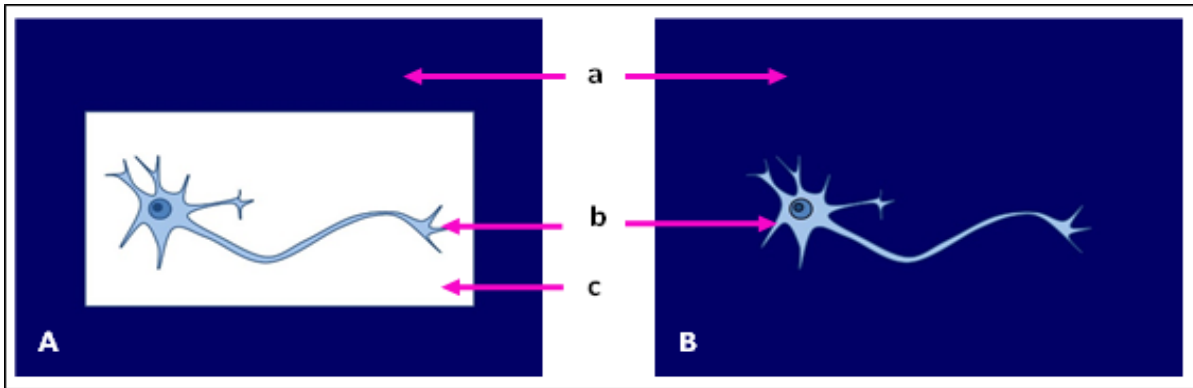


Figure 1: A hypothetical illustration in two hypothetical slides to show the different components of an illustration-based slide. Slide A: Illustration with a white 'base colour'. Slide B: Illustration without any 'base colour'. a: slide background; b: illustration; c: illustration's 'base colour'.

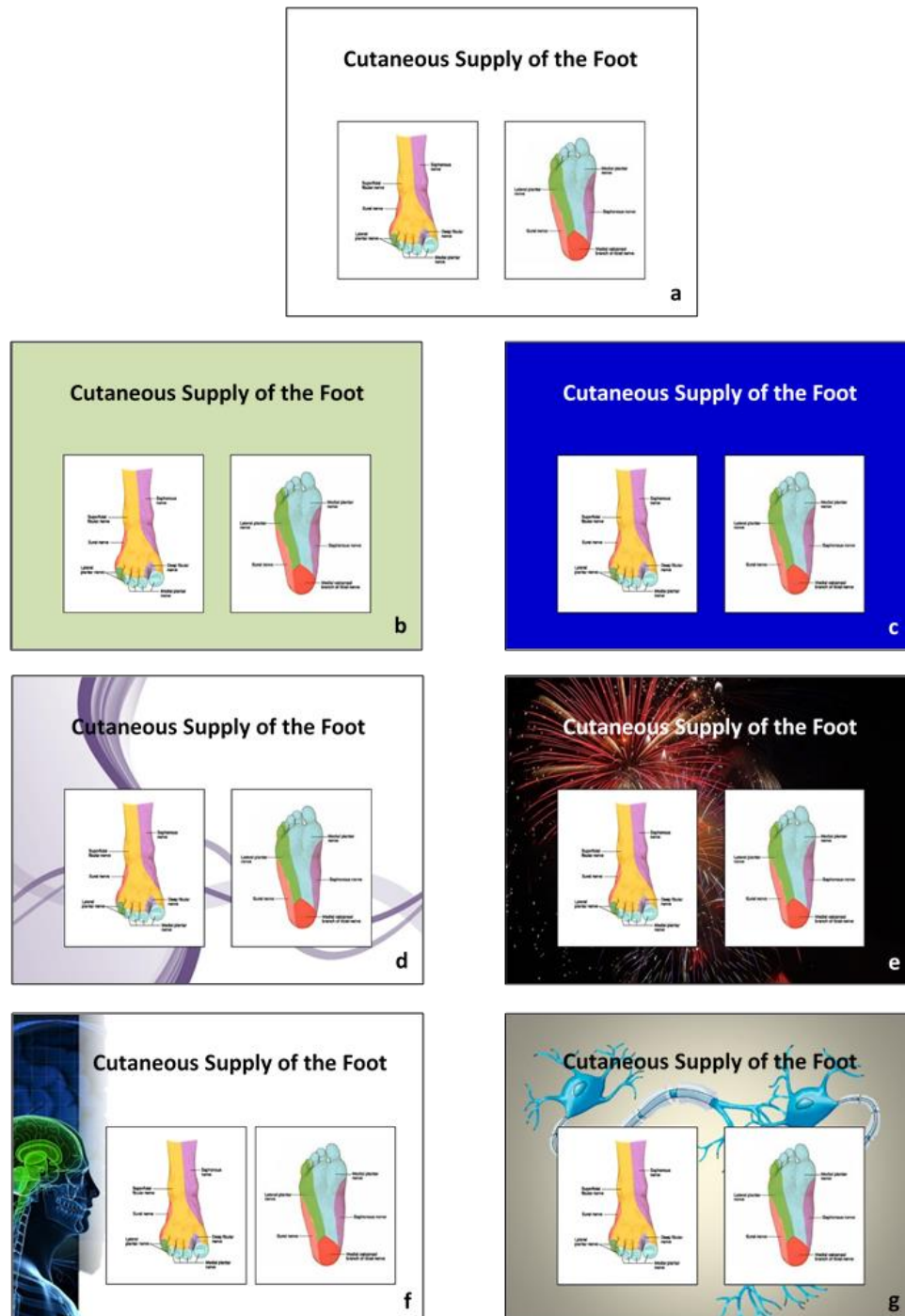


Figure 2: Different types of ‘background ‘of PowerPoint slides on which the same pair of coloured Neuroanatomy illustrations were placed to show to the Anatomy postgraduate students participating in the FGD.

RESULTS & DISCUSSION

From the analyses of the transcripts from both video and audio recordings of the FGD on the preferences and perceived influence of different 'backgrounds' in illustration-based PowerPoint slides on learning among eight Anatomy postgraduate students, six (6) 'themes' emerged:

- **Theme 1:** No single type of background yielded a unanimous preference.
- **Theme 2:** Coloured homogeneous backgrounds seemed to be the most preferred type with no clear-cut difference between the light-coloured and dark-coloured ones.
- **Theme 3:** Preference for white or slightly decorated background was moderate.
- **Theme 4:** Among the slightly decorated backgrounds, preference for those related to the subject was greater than for those not related.
- **Theme 5:** No preference was shown for the heavily decorated background not related to the subject.
- **Theme 6:** Despite some positive comments regarding the influence of slide background on learning, no definitive conclusion could be drawn.

The following are the results with discussions addressing these six themes that emerged from the present study:

Theme 1: No single type of background yielded a unanimous preference.

Looking at the use of each of the seven different types of slide backgrounds meticulously, and taking enough time to identify their individual preferences, the

Anatomy postgraduate students started the focus group discussion facilitated by the researchers. The students explained the reasons behind their choices to each other. At one point of the ongoing FGD, one of the researchers who was facilitating the discussion, intervened by saying:

"We should be careful here about whether our preference is general. This means, are we saying what we do (feel) in most cases? Actually, every choice would not fit every case. You may well say that it depends. One type would look good in one situation, another in other."

However, the students couldn't come to any consensus about which background they like the most and to the researchers.

Theme 2: 'Coloured homogeneous' backgrounds seemed to be the most preferred type with no clear-cut difference between the 'light-coloured' and 'dark-coloured' ones.

Four of the participants of the present study went for the coloured homogeneous backgrounds- light-coloured homogenous, dark-coloured homogeneous backgrounds or both. In their perception, such backgrounds were "less irritating" than the decorated backgrounds, unlike the decorated ones, according to them, these backgrounds did not take away their concentration on from the illustrations towards the background's design. Berk^[14] suggested choosing a solid colour background that will not distract from the image content. This "solid colour" is supposed to be any homogeneous colour of light or dark shade. Two of the FGD participants of the present study found a light-coloured

background “less contrasting” than the darker one and yet enough for highlighting an illustration. The survey^[15] results from Gazi and Shamim showed that the majority of the Bangladeshi Anatomy teachers (n = 39) preferred the light-coloured homogeneous background because they considered light colours as “less contrasting” but enough for highlighting the illustrations against the background. And therefore, students would easily concentrate, they added. Regarding this, Olurinola and Tayo^[16] suggested that instructional designers should choose colours wisely while designing courses considering audiences’ age, gender and culture.

However, another student in the present study found the dark-coloured homogeneous background “better contrasting” and, thus, helped her to focus on the illustrations. She then admitted that the dark blue colour (the colour used for the dark-coloured homogeneous background) was her favourite. Therefore, she was not sure whether the dark homogeneous nature of the background or the blue colour itself attracted her and made her focus on the illustrations. It may be noted that the rectangular white bases of the illustrations of the present study must have created a sense of framing more against the light- and dark-coloured homogeneous slide backgrounds. Each white base had a thin black border as well. One of the participants rightly noticed that if there were no such “framing”, the contrast effect would not have been as good. For example, in case of dark blue-coloured homogeneous background (slide- c), the multicoloured illustrations of the foot placed directly on the dark blue background would not have been that legible. But with the white

base colour on the dark blue background highlighting the illustration was better.

Theme 3: Preference for ‘white’ or ‘slightly decorated’ background was moderate.

White and slightly decorated backgrounds were moderately preferred by the students participating in the present study. Two of the eight FGD participants liked the white background (Slide-a). To them, white background was “simple” to focus on illustrations. They claimed that coloured/decorated backgrounds were “too attractive”, drawing all their attention away from the main illustrations. One of them further added that the dark-coloured background (Slide- c) was making her lose concentration. “Dark colour was too strong for my eyes”, she asserted. Another participant admitted that their teachers do not like using any background but white while preparing PowerPoint presentations. He said:

“According to our madams (teachers), the background of the presentation slides must be white. They do not like anything else; not any light or dark coloured background. We have learnt in that way and have seen our madams doing so.” [Participant 6]

So, in his perception, there cannot be any other colour but white as a slide background for PowerPoint presentations. The survey of Gazi and Shamim^[15] showed about half of the participating Bangladeshi Anatomy teachers (n = 39) preferred white background because they thought students can concentrate on the illustrations only when the background does not differ in colour from the colour of illustrations. One has to note here, though that



this proportion does not mean that these teachers didn't like any other slide type, because there were multiple options for their response. In another a survey, Chen, Zeng and Rao^[17] noted that among white-, black-, red-, yellow-, green-, cyan-, blue- and purple-coloured backgrounds, the white background was the most popular to the Agriculture and Forestry students of China they studied on. That is because, the authors suggested, white usually gives people "broad" and "bright" feelings and reduces people's sense of oppression. "White is very common in nature or artificial buildings, and is also a favourite background colour for people, such as most people like white snow, interior wall decoration with white, etc.",^[17] they further added.

On the other hand, one of the FGD participants of the present study found the white background "less attractive" and had a doubt that "white background may not attract the students that much" but an "attractive" (coloured/decorated) background might "possibly be of help". Another participant agreed with her by saying:

"In my opinion, the background of the slide (other than white) can be helpful for the inattentive students. Perhaps they will first notice the background, which will lead their attention to the main picture". [Participant 4]

One participant who liked the white background also liked the slightly decorated background that was not related to the subject (Slide-d) because it was more or less "adjustable" to her eyes. Despite having some designs, she found it more like a white background. Another found the slightly

decorated background much preferable because of their simple graphics and not making any "noise". Among the preferences of the majority of the Psychology students of Apperson, Law and Scepanky's Survey,^[18] who preferred any coloured background to a white background, there was "decorated" background as well.

It may be worth mentioning that the eight FGD participants of the present study were from two institutions of Bangladesh, four from each. They were sharply divided by institution into their opinions regarding the colour of the 'background'. Students belonging to one institution were predominantly exposed to white background by their teachers. They showed a clear-cut inclination towards the white background.

Theme 4: Among the 'decorated' backgrounds, preference for those related to the subject was greater than for those not related.

When it came to the 'decorated' backgrounds, the participants of the present study mostly preferred the ones related to the subject (Neuroanatomy) than those not related to the subject. They found the former "motivating" and "more logical". One FGD participant maintained that these backgrounds gave her a hint about the subject matter. The survey^[15] mentioned earlier showed that Bangladeshi Anatomy teachers (n = 39) also preferred background related the subject (Neuroanatomy) to those not related. According to them, this is because subject related backgrounds could create a relevant environment in the classroom.

In contrast, one of the participants of the present study argued that with a subject related background students may get confused whether to focus on the main illustrations or on the background's graphics. Berk,^[17] suggested to avoid "logos and other irrelevant graphics" or if necessary, minimise their size and Jones,^[19] also suggested to use graphics "where appropriate but not to overuse them". There are some suggestions to provide informative images or graphics that add understanding to the text,^[20] and supplement verbal information,^[21] and to avoid non-informative images or graphics that do not add any further understanding to the slide presentation.^[20,21] Similar may be the consideration while thinking about the illustration-only slides.

Theme 5: No preference was shown for 'heavily decorated background not related to the subject'.

The participants of the present study were not very enthusiastic about the heavily decorated backgrounds not related to the subject (Neuroanatomy). According to them, such a background is not necessary, it may catch the students' attention, one of them said:

"If I show this very slide (Slide- e) to my students, I think, they will keep on taking glances of one area after another of the slide. Therefore, they will lose their focus on the main illustration. It is better to use a white or light-coloured background instead." [Participant 6]

Most, however, wondered whether such backgrounds would be enjoyed by undergraduates or young students. It may be

mentioned that one of the participants was initially a bit inclined towards the heavily decorated background that was not related to the subject of Neuroanatomy (Slide- e), but during discussion, she changed her mind, and admitted:

"At first, I preferred this background, but having listened to others it now appears to me too attractive to divert my focus of attention from the illustration itself." [Participant 7]

Rather, she found the two heavily decorated backgrounds much "disturbing" whether related to the subject (Slides- g) or not (Slides- e). Regarding this, one participant suggested, if it is that necessary, to use decorated slides, then slides that have shown something like "a light blue wave" or "a pencil with a line by its sides" available in PowerPoint as design templates can be used. However, his suggestion clearly indicated for using 'slightly decorated' backgrounds, not for the 'heavily decorated' ones. The results of Gyem's survey,^[22] on Embryology illustration presentation on PowerPoint slides also showed that none of the Bangladeshi anatomy teachers (n = 40) preferred the heavily decorated slide background.

Theme 6: Despite some positive comments regarding the influence of slide background on learning, no definitive conclusion could be drawn.

The participating Anatomy postgraduate students of the present study felt that backgrounds do have an influence on learning. But there were some conflicting views among them regarding the effect- whether it was negative or positive. Most of the participants



thought that backgrounds may enhance learning, but heavily decorated backgrounds may have a negative influence on learning as they could drag out one's concentration from an illustration to the background. One Student asserted the unimportance of slide backgrounds in any sort of learning. In her words:

"I do not find the background of a slide that necessary for the students or for their studies. It is the main illustration that we need to make colourful and attractive; not the background." [Participant 5]

However, half of the FGD participants thought that coloured (homogeneous or decorated) PowerPoint slide backgrounds could influence learning in a positive way. They felt that such backgrounds are necessary to attract students' attention and can be helpful for inattentive students. According to them, a student may first notice the background, which can then lead his/her attention to the illustrations. One went further by saying:

"If we want to attract the attention of the maximum number of students, these 'attractive' backgrounds can play a vital role in doing so." [Participant 4]

Dzul kifli and Mustafar^[23] noticed that colours have the potential to attract attention and can play a role in learning. The more attention focused on certain stimuli, the more chances of the stimuli to be transferred to a more permanent memory storage, they further added. The authors cited Farley and Grant as two of the early workers in this field, who reported that coloured multimedia presentations resulted in better attention and

memory performance way back in 1976. Consequently, appropriate use of them can enhance the teaching and learning experience for both staff and students.^[19] However, irrelevant pictures can reduce learning comprehension.^[2] Pugsley,^[24] puts the purpose of PowerPoint or any other presentation as follows: to engage the learner, aid their understanding of the topic and enhance their ability to process, store and retrieve the information in order to act on it at a later stage.

At one point, the present researchers anticipated that the FGD participants may shift from the present issue- the influence of slide background on learning. Therefore, one of them asked:

Have we been able to separate the influence of the background on learning from our liking and disliking (of the background)? Does the background really have any influence on the students' learning? If it does, is it high or low?

Six out of eight participants agreed that it has a positive influence on learning to some extent (high or low). One of them said:

It seems to me that (the background) does have some influences- it enhances learning. [Participant 3]

Others agreed with her by saying "Yes, it's enhancing." The Psychology students in Apperson and colleagues' study,^[18] again, appreciated using lightly patterned backgrounds for their learning cues. It is also to be noted that in responding to the statement "The types of background used in illustration-based Neuroanatomy PowerPoint slides can influence learning", about 70% of the 39 Bangladeshi Anatomy teachers participating in



a survey done by Gazi and Shamim^[15] agreed and around 23% tended to agree.

The six 'themes' emerging from this qualitative study would provide some insight into the basics of the applied aspects of the background of illustration-based PowerPoint slides. Its exploratory nature can also inspire many aspects of further research. It is to be noted that although this study has used the term 'PowerPoint slides' as its principal material, it may be clarified that the findings can be extrapolated in the same way for presentations created by any similar slide-making software. Nevertheless, while interpreting the results of this research, a few limitations should be considered:

There is very little scholarly literature on the background of illustrations-based slides. So, no specific guidelines could be followed while developing the illustration-based slides with different types of background. The number of slides used in the study was only one per type of background, making the sampling for each type rather inadequate for high reliability or the comments from the participants. The slide backgrounds varied only as follows: White/light-coloured homogeneous/Dark-coloured homogeneous; slightly decorated/heavily decorated and related to subject/unrelated to subject. Thus, in terms of colour characteristics, the study has dealt with only the 'value' of colour (light/dark). The 'hue' or 'saturation (chroma)' of colours has not been addressed. 'Gradient', 'texture' or 'pattern' has not been used either. Further, possibilities of combined effects of 'decoration' and 'colour', or effects of decoration with different 'design' types have not been explored. Various terms regarding the

characteristics of the slide backgrounds are yet to be standardised. For example, meanings of terms like 'bright' and 'decorative' have not been explained by any author who has used them and no figure has been provided to make the readers understand what they meant. There may also be a possibility that even with a white 'base colour', different colours with which an illustration itself is made would have different interactions with the background, thus affecting the impact of the illustration on the viewer. Not all the potential factors of the participants like gender, age that may influence the preference of background type could be considered while selecting the participants or conducting the FGD. Colour blindness was not used as an exclusion criterion when selecting the participants. However, FGD results should not be weighed in terms of participants 'proportion. In addition, the background of slides, involve such attributes, the liking and disliking of which are very likely to be determined by personal factors. Generally, the colour perception may strongly depend on individual differences.^[25] Actually, the science of colour is a much more complex subject that has many layers and aspects. Colour is a perception^[26] that depends on vision, amount of light,^[26] individual taste interpretation,^[27] psychology'^[23] and even a person's culture^[27] and also emotion and feeling.^[23] In addition, disorders like colour blindness can understandably affect individuals' perception, and therefore, liking and disliking of specific colours. Last but not the least, one should keep in mind that it is very difficult to generalise the findings of the present study across learning topics. Thus, all the results from PowerPoint slide- backgrounds with, for example,



semirealistic neuroanatomical drawings 'may not be equally valid for those from 'electron micrographs of kidney'. The question of learners' 'learning styles' is also a debatable issue. Mixed responses came from the Anatomy postgraduate students in the FGD on several issues. These warrant deeper evaluation. Furthermore, it is difficult to distinguish between liking a presentation or being attracted by a presentation and achieving successful learning or even understanding whether it would lead to effective learning. Therefore, empirical evidence regarding these two aspects has to be looked for separately, not taking one granted for the other.

CONCLUSIONS

While the six 'themes' emerging from the present study do provide some baseline answers to the research questions, essential

explorations into specific issues regarding variations in slide background on wider and deeper scopes of slide characteristics are also warranted, looking for their possible preferences in students and for their influence on learning. The issue of viewer characteristics should also be addressed in this regard. The FGD participants were not well exposed or much oriented to different types of slide backgrounds. Moreover, the participants were from only two institutions.

Acknowledgments

We would like to thank all the postgraduate students who had participated in the FGD and had given their valuable 'study' hours and opinions for the research.

REFERENCES

1. Mclachlan JC. New path for teaching Anatomy: living Anatomy and medical imaging vs. dissection [Internet]. The Anatomical Records. 2004 [cited 2019 Jul 21];281B(1):4-5. Available from: <http://onlinelibrary.wiley.com/doi/10.1002/ar.b.20040/pdf>
2. Bartsch RA, Cobern KM. Effectiveness of PowerPoint presentations in lectures [Internet]. Computers & Education. 2003 [cited 2019 Jan 11];41(1):77-86. Available from: doi: 10.1016/S03601315(03)00027-7
3. Szabo A, Hastings N. Using IT in the undergraduate classroom: should we replace the blackboard with PowerPoint? [Internet] Computers & Education. 2000 [cited 2019 Aug 2];35(3):175-87. Available from: doi:10.1016/S0360-1315(00)00030-0
4. Apperson JM, Laws EL, Scepanky JA. The impact of presentation graphics on students' experience in the classroom. Computers & Education [Internet]. 2004 [cited 2019 Jun 22]; 47(2006):116-126. Available from: doi: 10.1016/j.compedu.2004.09.003
5. Ding X, Liu J. Research on five stakeholders & five relationships of higher engineering education in China [Internet] . Int J Educ Manag Eng. 2012 [cited 2019 Mar 29];2(9):61-5. Available from: doi: 10.5815/ijeme.2012.09.10
6. Shirazi AS, Rezaei NM, Akbari M. Slide designing by "Microsoft Power Point Software" in a dental school of Iran [Internet]. Indian Journal of Dental Education. 2013[cited 2020 Feb 21];6(3). Available from: <https://www.researchgate.net/publication/260110014>
7. Hadiyanti KM, Widya. Analyzing the values and effects of PowerPoint presentations [Internet]. LLT Journal. 2018 [cited 2021 May 12]; 21 (2579-9533):1410-7201. Available from: doi: doi.org/10.24071/llt.2018.Supp12108
8. PowerPoint backgrounds (everything you need to get started) [Internet]. Nuts & Bolts. Date unknown [cited 2022 Jan 10]. Available from: <https://nutsandboltspeedtraining.com/powerpoint-tutorials/powerpoint-backgrounds/>
9. Tank PW, Gest TR. The Lower Limb. Lippincott Williams & Wilkins. Atlas of Anatomy [image on internet]. 2009 [cited 2019 Sep 2]; Chapter 3. p.130,134.



- Available from: http://web.uniplovdiv.bg/stu1104541018/docs/res/anatomy_atlas_Patrick_W._Tank/3%20%20The%20Lower%20Limb.htm
10. Side purple free PowerPoint templates [image on internet]. PPTGROUNDS. 2012 [cited 2019 May 16]. Available from: <https://www.pptgrounds.com/abstract/926-side-purple-free-powerpoint-template-backgrounds>
11. Sullivan J. Great fireworks night [photograph on internet]. Wikimedia Commons. 2013 [cited 2019 Aug 18]. Available from: https://commons.wikimedia.org/wiki/File:Great_fireworks_night.jpg
12. Anatomy of a healthy brain of the human body [image on internet]. CrystalGraphics. Date unknown [cited 2019 Oct 5]. Available from: <https://powerpoint.crystalgraphics.com/templates/view/16738/anatomy-of-a-healthy-brain-of-the-human-body#largeimage>
13. Schroeder M. Neuron with healthy myelin sheath [image on internet]. FineArtAmerica.com. 2019 [cited 2019 Nov 13]. Available from: <https://fineartamerica.com/featured/5-neuron-with-healthy-myelin-sheath-monica-schroeder.html>
14. Berk RA. Research on PowerPoint: From basic features to multimedia [Internet]. International Journal of Technology in Teaching and Learning. 2011 [cited 2020 Jul 9]; 7(1): 24-35. Available from: <https://pdf4pro.com/amp/view/research-on-powerpoint-from-basic-features-to-multimedia-57153f.html>
15. Gazi S, Shamim KM. Different types of 'background' of illustration-based PowerPoint slides: Anatomy teachers' preferences and perceived influence on learning. Unpublished. 2022.
16. Olurinola O, Tayo O. Colour in learning: It's effect on the retention rate of graduate students [Internet]. J Educ Pract. 2015 [cited 2021 Apr 20];6(14):1-6. Available from: <https://eric.ed.gov/?id=EJ1080132>
17. Chen NR, Zeng QZ, Rao JP. Students' preference for color combination of PPT courseware [Internet]. 5th International Conference on Economics and Management. 2019 [cited 2021 Feb 5]; 978-1-60595-634-3. Available from: doi: 10.12783/dtem/icem2019/31206
18. Apperson JM, Laws EL, Scepanky JA. An assessment of student preferences for PowerPoint [Internet]. Computers & Education. 2008 [cited 2019 Dec 4]; 50(1): 148-153. Available from: <https://doi.org/10.1016/j.compedu.2006.04.003>
19. Jones AM. The use and abuse of PowerPoint in teaching and learning in the life sciences: A personal overview [Internet]. Bioscience Education 2003 [cited 2020 Jul 5]; 2(1):1-13. Available from: <https://doi.org/10.3108/beej.2003.02000004>
20. Hammond KM. Experiential learning and peer teaching to develop PowerPoint slide formatting skills [Internet]. Journal of Effective Teaching in Higher Education. 2019 [cited 2021 Oct 10]; 2(2): 23-41. Available from: doi: <https://doi.org/10.36021/jethe.v2i2.42>
21. Schmaltz RM, Enström R. Death to weak PowerPoint: strategies to create effective visual presentations [Internet]. Front. Psychol. 2014 [cited 2019 May 26]; 5:1-5. Available from: <https://doi.org/10.3389/fpsyg.2014.01138>
22. Gyem D. Acceptability and effectiveness of different ways of presenting illustrations in multi-media slides: a PowerPoint experience with Embryology [MS Thesis]. Bangabandhu Sheikh Mujib Medical University; 2015.
23. Dzulkipli MA, Mustafar MF. The influence of colour on memory performance: a review [Internet]. Malays J Med Sci. 2013 [cited 2019 Mar 15];20(2):3-9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23983571%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC3743993>
24. Pugsley L. How to design an effective power point presentation [Internet]. Education for Primary Care. 2010 [cited 2019 Apr 2]; 21(1):51-53. Available from: <https://doi.org/10.1080/14739879.2010.11493876>
25. Ganguly PK. Teaching and learning of Anatomy in the 21st century: Direction and the strategies [Internet]. Open Med Educ J. 2010 [cited 2019 Jan 16];7(ISSN: 1876-519X):5-10. Available from: <https://benthamopen.com/ABSTRACT/TOMEDEJU-3-5>
26. Decker K. The fundamentals of understanding color theory. 99designs. 2016 [cited 2020 Jul 26]. Available from: <https://99designs.com/blog/tips/the-7-step-guide-to-understanding-color-theory/>
27. Chang B, Xu R, Watt T. The impact of colors on learning [Internet]. Adult Education Research Conference 2018. University of Victoria, Canada, June 7-10. 2018 [cited 2021 Sep 23];(10). Available from: <https://newprairiepress.org/aerc>

Source of Support: Nil, Conflict of Interest: None declared