Effects of cueing and signalling on change blindness in multimedia learning environment

Duygu Mutlu-Bayraktar*, Besim Omer Pasa Cad. Hasan Ali Yucel Egitim Fakultesi B Blok, Istanbul University, Istanbul, Turkey

Servet Bayram, Yeditepe Universitesi Egitim Fakultesi, Yeditepe University, Istanbul, Turkey

Abstract

In this study, it was aimed to investigate the change blindness that may occur in multimedia learning environments used cueing and signaling effects. For this purpose, a multimedia animation which had some changes about computer parts was designed. Twenty-one undergraduate students participated in the experiment voluntarily. Eye and mouse movements were recorded and analysed with eye-tracking method, and participants were asked to say when they noticed the changes; their voices were simultaneously recorded. The results show that the participants were more focused on the objects being signaled, and less detected the changes in other areas. It is seen that the percentage of detecting the change occurring on the most focused object is low, except for the object using the signaling and visual cueing. The change in the object that was used the signaling and the visual cueing is the most detected change.

Keywords: Multimedia learning, change blindness, eye tracking.

*.ADDRESS FOR CORRESPONDENCE: **Duygu Mutlu-Bayraktar**, Besim Omer Pasa C. Hasan Ali Yucel Egitim Fakultesi B Blok, Istanbul University, Istanbul, Turkey. *E-mail address*: dmutlu@istanbul.edu.tr / Tel.: +090-212-440 00 00/13200

1. Introduction

In rich visual environments, when moved from one scene to another, the details of the scenes or objects cannot be perceived. In such a case, an observer can miss the changes that occur in visual scenes. Human beings generally fail to recognise major differences in visual scenes. This phenomenon is called 'change blindness' (Henderson, 1997; Simons & Ambinder, 2005; Smith & Henderson, 2008). In the process of change blindness, we often fail to detect major and important changes although we are subject to experience in the enriched areas (Smith & Henderson, 2008).

Rensink, O'Regan and Clark (1997) emphasised the attention factor in causing change blindness. It was found that the participants realised the changes in the objects as a result of devoting their attention to the changes, yet they could not detect the differences in the objects they did not focus. O'Regan, Deubel, Clark and Rensink (2000), in their study, found that the participants (40% of the participants) could not recognise that the objects under change even though they were directly looking at the objects. In terms of learning content, it can be seen that performance is low in the areas that are not adequately focused (Ayres & Sweller, 2005; Cierniak, Scheiter & Gerjets, 2009; Jamet, Gavota & Quaireau, 2008; Mayer, 2009; 2014a; Mutlu-Bayraktar & Bayram, 2013).

When compared to the pictures, it is considered that it is more difficult to detect the changes in multimedia environments, where changes are abundant. Although it is acknowledged that visual objects can foster learners' performance (Moreno & Park, 2010; Plass, Heidig, Hayward, Homer & Um, 2014; Plass, Moreno & Brunken, 2010; Tchoubar, 2014), if they are not properly designed, visual objects can have neglecting influences (Agostinho, Tindall-Ford & Roodenrys, 2013; Liu, Lin, Tsai & Paas, 2012; Siranovic, 2007; Sorden, 2005; Sweller, 2010). Especially, important information is often presented with visual scene changes. These changes can include more stimuli than we can pick up at once in our limited visual perception area (Cater, Chalmers & Ledda, 2002). Due to the limited visual coding, a failure of the detection of the changes may emerge even though one focuses on the changes (Saiki & Holcombe, 2012). This situation results in the change blindness.

In multimedia learning process, the emphasise is placed on the need to include differently coded external representations such as texts, formulas, shapes and sounds to encourage learning in various ways (Ainsworth, 2006; Mayer, 2014b; Ozcelik, Arslan-Ari & Cagiltay, 2010; Plass et al., 2014; Rusanganwa, 2013). While presenting information to the learners, it is found effective to diversify the stimuli in terms of attracting the learners' attention (Hui-Yu, 2016; Soemer, 2016). Attention is important as the starting point for the three types of cognitive processes which are tied to the multimedia learning process. These cognitive processes are named as selection, organising and integrating. Selection can be defined as the process in which learners select words and pictures presented in a multimedia environment by choosing the ones related to the topic with the help of attention and transferring these into their short-term memory (Mayer, 2009; 2014a).

Materials designed according to the multimedia learning principles proposed by Mayer (2009) were proved to greatly contribute learning in several studies (Crooks, Inan, Cheon, Ari & Flores, 2012; Harskamp, Mayer & Suhre, 2007; Hyona, 2010; van Genuchten, Scheiter & Schuler, 2012). Also, several suggestions regarding the design of the multimedia learning were offered to eliminate circumstances that cause cognitive load (Kalyuga, 2009; Mayer & Moreno, 2010; Moreno & Park, 2010). In addition to this, the effects of change blindness, which were put forward in several studies, should be examined in multimedia environments.

By utilising signalling and cueing techniques and drawing attention to important points, it is aimed to increase performance (Hui-Yu, 2016; Jamet, 2014; Mautone & Mayer, 2001; Ozcelik et al., 2010; Richter, Scheiter & Eitel, 2016). With the same methods, it is seen that the rate of successful change detection can be enhanced (Aginsky & Tarr, 2000; Lin, Atkinson, Savenye & Nelson, 2016). In light of these findings, it is important to investigate the possible effects of signalling and cueing techniques used in multimedia environments on change detection.

Based on the studies of Bergman (2015) and Rensink (2009), it can be stated that change blindness has both positive and negative effects. Besides, it can be argued that change blindness, which manifests itself in many areas of our daily lives, will inevitably influence the learning process in an educational environment. To illustrate, if materials used in the educational process are not prepared according to the multimedia design principles, these materials can create confusion and cause students to have difficulty in determining the change in the visual materials prepared and as a result cause change blindness.

1.1. Purpose

In this study, it is aimed to investigate the change blindness process in multimedia learning environment using signalling and visual cueing. For this purpose, the eye movements were examined during the process of detecting the changes in multimedia.

2. Method

In this study, the research model was defined as a case study. The case study is a qualitative research method that the researcher examines the case in detail by means of data collection tools such as observations, interviews, audio-visuals, documents and reports rather than examining the limited number of variables and observing one or more cases over a certain period (Coskun & Erdin, 2014; Creswell, 2007; Davey, 1991; Karasar, 2015). Within the scope of the small group case study method with the participants, it was aimed to investigate the situation of change blindness in multimedia environment through eye-tracking. The multimedia environment, where the changes occur, was studied by the participants and the change detection process was recorded with eye-tracking method. Eye movements were recorded and analysed by eye-tracking method, and at the same time, in-depth information was gathered through thinking aloud technique.

2.1. Participants

Overall, 21 students from a state university voluntarily participated in this study. All of the participants were undergraduate students in the Department of Science Education. They voluntarily took part in the experiment for extra course credits. Their mean of age is 19.4. Participants were 13 females and 8 males.

2.2. Data collection tools

Within the scope of the research, eye-tracking and interview data were collected. The devices in Human–Computer Interaction Laboratory were used to collect eye-tracking data.

Participants were invited to the Human–Computer Interaction Laboratory according to their appointment times. Participants were then taken into the laboratory one by one to participate in the process of the experiment. Before the experiment started, the participants were asked to follow the points that appeared on the scene with his/her eyes in order to calibrate the eye-tracking device. If the screen calibration was at an appropriate level, the participant was asked to study on the multimedia animation and to think aloud by specifying the changes she/he noticed. In this process, participants' eye and mouse movements, voice, and the number of correct answers were recorded.

2.3. Multimedia

In this study, an animation, which describes components of a computer with supported narration, was used. In some scenes, there were changes on the computer components. In order to ease the process of change detection, signalling and cueing techniques were used.

2.4. Eye-tracking devices

Eye-tracking data can provide valuable information about the attention processes of the learners. The participants studied this material and they were then tested individually at the Human–Computer Interaction Laboratory.

In this study, researchers used an eye-tracking device (experimental—test computer), an observer computer and some software.

2.4.1. Eye-tracking device (test-experimental computer)

It is a device that provides data about where, what, how long and how many times the participant looks at the screen and records eye movements during the time that the user performs the experiment. The device is also connected to the observer computer that records screen image of the user.

2.4.2. Observer computer

The experiment was prepared, and the experimental processes were carried out in the Human–Computer Interaction Lab, and data were recorded and analysed using the observer computer.

2.4.3. Software

iView X is the software that provides connection between eye-tracking device and observer computer.

Experiment Center is the software that enables to form eye-tracking test, manage and control the test. The experiments created with Experiment Center software is connected to the user's computer via iViewX software. Then, recording is performed with BeGaze software. BeGaze is the software that keeps the records for evaluation of stored data.

2.5. Process

First, meetings were arranged to invite the participants to the Human–Computer Interaction Laboratory. Then, participants individually took part in the experiment process. The participants were asked to study the multimedia material that describes computer components and to indicate the changes they realised. The participants' voice, eye, and mouse movements were recorded.

2.6. Data analysis

The records about eye and mouse movements recorded with the Experiment program were analysed through the Be Gaze program. In the analysis, the fixation numbers, duration, and heat map data were obtained, and heat maps of the screens were analysed.

3. Findings

In the animation that was prepared within the multimedia environment for the purposes of this study, it was realised that the participants mostly focused on the biggest object. Later on, it was seen that the participants concentrated on each component that was signalled and cued.

The frequency and percentages of change detection during the animation were shown in Table 1.

Table 1. The descriptive statistics of change detection

Change	f	%
In central object	5	41.66
In signalled Object	10	83.33
Object addition	8	66.66

In the scene, in which change occurred, when the keyboard was being described, five participants out of 12 (41.66%) detected the change on the screen (Table 1). In this phase, the eye movement results show that the participants first focused on the keyboard and some of them focused on the monitor in the moment of change and consequently detected the change (Figure 1).


Figure 1. The heat map of the changed occurred in the major object

It was found that the most detected change was on the object being verbally described and 10 participants out of 12 (83.33%) were found to detect the change (See Table 1). The participants easily detected changes on the objects that were verbally described and signalled (Figure 2). In addition to this, it was seen that out of two objects with the same signalling, the participants focused more on the object that was cued with an arrow, and they focused on the other object at the moment of change.

Figure 2. The heat map of the moment of change on the signalled object

In the multimedia-learning environment, where there were fewer objects, it is seen that the changes were easily detected. Eight participants (66.66%) more easily managed to detect the change in the screen where there were fewer objects (See Table 1). It is also found that the fact that participants could focus more easily on the change when there were fewer objects was put forward through eye movements (Figure 3).
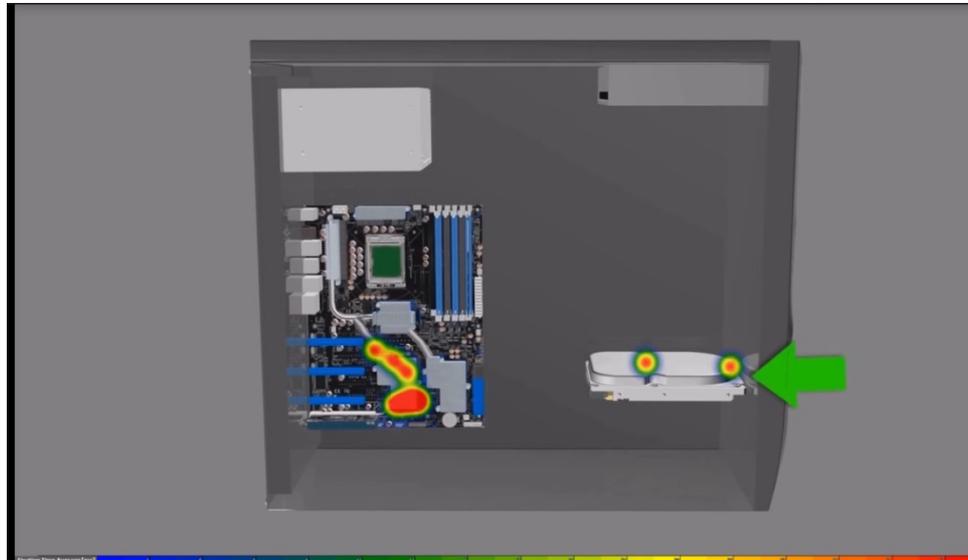
Figure 3. The heat map of the screen that presented fewer objects

4. Conclusion

In this study, it was aimed to investigate change blindness which possibly emerges in multimedia learning environments. For this purpose, a multimedia animation was created, and the participants, whose eye movements were recorded in the process of the study, were asked to detect the changes in the multimedia environment.

In multimedia learning environments, many studies have shown that using signalling and visual cueing has an effect on learning (Mautone & Mayer, 2001; Ozcelik et al., 2010; Richter et al., 2016). In this study, the change detection occurring in a multimedia which designed using signalling has been investigated. It appears that the participants focused more on the objects being signalled and less detected the changes in other areas of the screen. In studies conducted with eye tracking, signalling effects have shown that attention can focus more on the area of interest (Alemdag & Cagiltay, 2018; Desiron, Betrancourt & de Vries, 2018; van Gog, 2014). Eye tracking showed that attention has been directed towards area of high interest, where attention has been found to be faster and stronger than in the area of low interest. The change where occurs on the area of high interest was detected easily than the area of low interest (Hollingworth & Henderson, 2000).

Except for the object that was signalled and visually cued, it was seen that the percentage of the change detection in the most focused object was lower. When the heat map of the participants' eye movements was analysed, the participants focused on the most central and major object, apart from the signalled object. If there is a signal or the importance of the changing object is high (central change), the change is easily detected (Rensink et al., 1997; Simons & Rensink, 2005).

It was seen that the changes, which occurred in signalled and visually cued areas, were the most detected changes. In order to visually perceive the changes in the object on the screen, the existence of the focus is necessary. The signalling and cueing techniques create such an environment that leads

one's attention to the objects. Without focused attention, visual memory cannot compare the images (the original and the changed one) and change detection becomes impossible (Rensink et al., 1997).

In the multimedia, when the speaker was being described, there were two distinct signalling on both parts of the speaker yet visual cue was directed to only one part of the speaker. It was found that the participants, at first, focused on the cued object. The change took place in the un-cued object and when the change occurred, the participants focused on the previously un-cued object. It can be said that it is the most detected change and it is due to the effects of signalling and cueing. In multimedia learning environment, cueing has a positive effect on learning outcomes because of the reduction in total cognitive load and avoidance of cognitive overload (Lin et al., 2016; Xie et al., 2017). Many studies show that cueing and signalling help focus attention. Jamet (2014) stated that cueing is related to the attention guiding effect. Hui-Yu (2016) indicated that attention cueing helped reduce the learners' mental load. In a meta-analysis study, comprised 46 years of signalling research in learning with media, it was found that signalling is beneficial for retention and transfer performance (Schneider, Beege, Nebel & Rey, 2018).

On a scene with fewer objects, participants seem to be able to focus more easily on the change. At the same time, addition or omission of the object (presence/absence) and location change are the most detected change type (Aginsky & Tarr, 2000).

According to these results, it is suggested to use signalling and cueing techniques that were designed in the light of multimedia learning principles in order to emphasise the change. It is thought that especially the redundancy principle and split attention effect (Mayer, 2009) can cause change blindness more. It is recommended to use signalling and cueing at the same time in learning environments designed according to the multimedia learning principles so that change can be recognised more easily.

In multimedia environments, where change blindness will be investigated, it is also suggested to look for cognitive process like attention, perception and memory. It can be showed how individuals in different cognitive characteristics are affected by cueing and signalling effect. In addition, the effect of cueing and signalling on change blindness occurred on text and image can be examined.

References

Aginsky, V. & Tarr, M. J. (2000). How are different properties of a scene encoded in visual memory? *Visual Cognition, 7*, 147–162.

Agostinho, S., Tindall-Ford, S. & Roodenrys, K. (2013). Adaptive diagrams: handing control over to the learner to manage split-attention online. *Computers & Education, 64*, 52–62.

Ainsworth, S. (2006). DeFT: a conceptual framework for considering learning with multiple representations. *Learning and Instruction, 16*(3), 183–198.

Alemdag, E. & Cagiltay, K. (2018). A systematic review of eye tracking research on multimedia learning. *Computers & Education, 125*, 413–428.

Ayres, P. & Sweller, J. (2005). The split-attention principle in multimedia. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning*. Cambridge University Press.

Bergman, K. V. (2015). *Individual differences in change blindness* (PhD thesis). The Faculty of Behavioural and Cultural Studies, Heidelberg University.

Cater, K., Chalmers, A. & Ledda, P. (2002). *Selective quality rendering by exploiting human inattentional blindness: looking but not seeing*. In Proceedings of the ACM Symposium on Virtual Reality Software and Technology, pp. 17–24.

Cierniak, G., Scheiter, K. & Gerjets, P. (2009). Explaining the split-attention effect: Is the reduction of extraneous cognitive load accompanied by an increase in germane cognitive load? *Computers in Human Behavior, 25*(2), 315–324.

Coskun, I. & Erdin, G. (2014). Hafif duzeyde zihinsel yetersizligi olan kaynastirma ogrencilerinin dinledigini anlama becerilerinin incelenmesi. *Uluslararasi Hakemli Sosyal Bilimler E-Dergisi, 41*.

Creswell, J. W. (2007). Five qualitative approaches to inquiry. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches, 2*, 53–80.

Crooks, S., Inan, F., Cheon, J., Ari, F. & Flores, R. (2012). Modality and cueing in multimedia learning: examining cognitive and perceptual explanations for the modality effect. *Computers in Human Behavior, 28*(3), 1063–1071.

Davey, L. (1991). The application of case study evaluations. Practical assessment. *Research & Evaluation, 2*(9), 1.

Desiron, J. C., Betrancourt, M. & de Vries, E. (2018). *How cross-representational signaling affects learning from text and picture: an eye-tracking study*. In International Conference on Theory and Application of Diagrams, Springer, Cham, pp. 725–728.

Harskamp, E. G., Mayer, R. E. & Suhre, C. (2007). Does the modality principle for multimedia learning apply to science classroom. *Learning and Instruction, 17*, 465–477.

Henderson, J. M. (1997). Transsaccadic memory and integration during real-world object perception. *Psychological Science, 8*(1), 51–55.

Hui-Yu, Y. (2016). The effects of attention cueing on visualizers' multimedia learning. *Educational Technology & Society, 19*(1), 249–262.

Hyona, J. (2010). The use of eye movements in the study of multimedia learning. *Learning and Instruction, 20*(2), 172–176.

Jamet, E. (2014). An eye-tracking study of cueing effects in multimedia learning. *Computers in Human Behavior, 32*, 47–53.

Jamet, E., Gavota, M. & Quaireau, C. (2008). Attention guiding in multimedia learning. *Learning and Instruction, 18*, 135–145.

Kalyuga, S. (2009). *Cognitive load factors in instructional design for advanced learners*. NY: Nova Science Publishers, Inc.

Karasar, N. (2015). *Bilimsel arastırma yontemi*. Ankara, Turkey: Nobel.

Lin, L., Atkinson, R. K., Savenye, W. C. & Nelson, B. C. (2016). Effects of visual cues and self-explanation prompts: empirical evidence in a multimedia environment. *Interactive Learning Environments*.

Liu, T., Lin, Y., Tsai, M. & Paas, F. (2012). Split-attention and redundancy effects on mobile learning in physical environment. *Computers & Education, 58*(1), 172–180.

Mautone, P. D. & Mayer, R. E. (2001). Signaling as a cognitive guide in multimedia learning. *Journal of Educational Psychology, 93*(2), 377.

Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). New York, NY: Cambridge University Press.

Mayer, R. E. (2014a). Multimedia instruction. In *Handbook of research on educational communications and technology* (pp. 385–399). New York, NY: Springer.

Mayer, R. E. (2014b). Incorporating motivation into multimedia learning. *Learning and Instruction, 29*, 171–173.

Mayer, R. E. & Moreno, R. (2010). Techniques that reduce extraneous cognitive load and manage intrinsic cognitive load during multimedia learning. In J. L. Plass, R. Moreno & R. Brunken (Eds.), *Cognitive load theory* (pp. 131–153). New York, NY: Cambridge University Press.

Moreno, R. & Park, B. (2010). Cognitive load theory: Historical development and relation to other theories. In J. L. Plass, R. Moreno & R. Brunken (Eds.), *Cognitive load theory*. Cambridge, UK: Cambridge University Press.

Mutlu-Bayraktar, D. & Bayram, S. (2013). Using eye tracking to investigate the relationship between attention and change blindness. *World Journal on Educational Technology, 2*, 257–266.

Ozcelik, E., Arslan-Ari, I. & Cagiltay, K. (2010). Why does signaling enhance multimedia learning? Evidence from eye movements. *Computers in Human Behavior, 26*(1), 110–117.

O'Regan, J. K., Deubel, H., Clark, J. J. & Rensink, R. A. (2000). Picture changes during blinks: looking without seeing and seeing without looking. *Visual Cognition, 7*(1–3), 191–212.

Plass, J. L., Heidig, S., Hayward, E. O., Homer, B. D. & Um, E. (2014). Emotional design in multimedia learning: effects of shape and color on affect and learning. *Learning and Instruction, 29*, 128–140.

Plass, J. L., Moreno, R. & Brunken, R. (Eds.) (2010). *Cognitive load theory*. New York, NY: Cambridge.

Rensink, R. A. (2009). Attention: change blindness and inattentional blindness. In W. Banks (Ed.), *Encyclopedia of consciousness* (Vol. 1, pp. 47–59). New York, NY: Elsevier.

Rensink, R. A., O'Regan, J. K. & Clark, J. J. (1997). To see or not to see: The need for attention to perceive changes in scenes. *Psychological Science, 8*(5), 368–373.

Richter, J., Scheiter, K. & Eitel, A. (2016). Signaling text-picture relations in multimedia learning: a comprehensive meta-analysis. *Educational Research Review, 17*, 19–36.

Rusanganwa, J. (2013). Multimedia as a means to enhance teaching technical vocabulary to physics undergraduates in Rwanda. *English for Specific Purposes, 32*(1), 36–44.

Saiki, J. & Holcombe, A. O. (2012). Blindness to a simultaneous change of all elements in a scene, unless there is a change in summary statistics. *Journal of Vision, 12*(3), 2.

Schneider, S., Beege, M., Nebel, S. & Rey, G. D. (2018). A meta-analysis of how signaling affects learning with media. *Educational Research Review, 23*, 1–24.

Simons, D. J. & Ambinder, M. S. (2005). Change blindness theory and consequences. *Current Directions in Psychological Science, 14*(1), 44–48.

Smith, T. J. & Henderson, J. M. (2008). Edit blindness: the relationship between attention and global change blindness in dynamic scenes. *Journal of Eye Movement Research, 2*(2), 1–17.

Soemer, A. (2016). The multicomponent working memory model, attention, and long-term memory in multimedia learning: a comment on Schweppe and Rummer (2014). *Educational Psychology Review, 28*(1), 197–200.

Sorden, S. D. (2005). A cognitive approach to instructional design for multimedia learning. *Informing Science Journal, 8*.

Sweller, J. (2010). Element interactivity and intrinsic, extraneous, and germane cognitive load. *Educational Psychology Review, 22*(2), 123–138.

Siranovic, Z. (2007). *Guidelines for designing multimedia learning materials.* Varazdin, Croatia: University of Zagreb.

Tchoubar, T. (2014). Effective use of multimedia explanations in open e-learning environment fosters student success. *International Journal of Information and Education Technology, 4*(1), 63.

van Genuchten, E., Scheiter, K. & Schuler, A. (2012). Examining learning from text and pictures for different task types: Does the multimedia effect differ for conceptual, causal, and procedural tasks? *Computers in Human Behavior, 28*(6), 2209–2218.

van Gog, T. (2014). The signaling (or cueing) principle in multimedia learning. *The Cambridge Handbook of Multimedia Learning, 263*.

Xie, H., Wang, F., Hao, Y., Chen, J., An, J., Wang, Y. & Liu, H. (2017). The more total cognitive load is reduced by cues, the better retention and transfer of multimedia learning: a meta-analysis and two meta-regression analyses. *PLoS One, 12*(8), e0183884.

5. Nomenclature

A	radius of
B	position of
C	further nomenclature continues down the page inside the text box

5.1. Structure

Files should be in MS Word format only and should be formatted for direct printing. Figures and tables should be embedded and not supplied separately. Please make sure that you use as much as possible normal fonts in your documents. Special fonts, such as fonts used in the Far East (Japanese, Chinese, Korean, etc.) may cause problems during processing. To avoid unnecessary errors you are strongly advised to use the 'spellchecker' function of MS Word. Follow this order when typing manuscripts: Title, Authors, Affiliations, Abstract, Keywords, Main text (including figures and tables),

Acknowledgements, References, Appendix. Collate acknowledgements in a separate section at the end of the article and do not include them on the title page, as a footnote to the title or otherwise.

Bulleted lists may be included and should look like this:

• First point
• Second point
• And so on

Please do not alter the formatting and style layouts which have been set up in this template document. As indicated in the template, papers should be prepared in single column format suitable for direct printing onto A4 paper (192 mm × 262 mm). Do not put number pages on the first page, as page numbers will be added separately for the next pages and the articles. Leave one line space between paragraphs.

5.2. Tables

All tables should be numbered with Arabic numerals. Headings should be placed above tables, left justified. Leave one line space between the heading and the table. Only horizontal lines should be used within a table, to distinguish the column headings from the body of the table, and immediately above and below the table. Tables must be embedded into the text and not supplied separately. Below is an example which authors may find useful.

Table 1. An example of a table

An example of a column heading	Column A (t)	Column B (T)
And an entry	1	2
And another entry	3	4
And another entry	5	6

5.3. Section headings

Section headings should be left justified, with the first letter capitalised and numbered consecutively, starting with the Introduction. Sub-section headings should be in capital and lower-case italic letters, numbered 1.1, 1.2, etc, and left justified, with second and subsequent lines indented. You may need to insert a page break to keep a heading with its text.

5.4. General guidelines for the preparation of your text

Avoid hyphenation at the end of a line. Symbols denoting vectors and matrices should be indicated in bold type. Scalar variable names should normally be expressed using italics. Weights and measures should be expressed in SI units.

5.5. Footnotes

Footnotes should be avoided if possible. Necessary footnotes should be denoted in the text by consecutive superscript letters. The footnotes should be typed single spaced, and in smaller type size (8 point), at the foot of the page in which they are mentioned, and separated from the main text by a short line extending at the foot of the column.

Figures

All figures should be numbered with Arabic numerals (1, 2, ..., n). All photographs, schemas, graphs and diagrams are to be referred to as figures. Line drawings should be good quality scans or true electronic output. Low-quality scans are not acceptable. Figures must be embedded into the text and

not supplied separately. Lettering and symbols should be clearly defined either in the caption or in a legend provided as part of the figure. Figures should be placed at the top or bottom of a column wherever possible, and as close as possible to the first reference to them in the paper. Leave one line space between the heading and the figure.

Lettering and symbols should be clearly defined either in the caption or in a legend provided as part of the figure. Figures should be placed at the top or bottom of a column wherever possible, and as close as possible to the first reference to them in the paper. Leave one line space between the heading and the figure.

The figure number and caption should be typed as provided for you below the illustration and left justified.
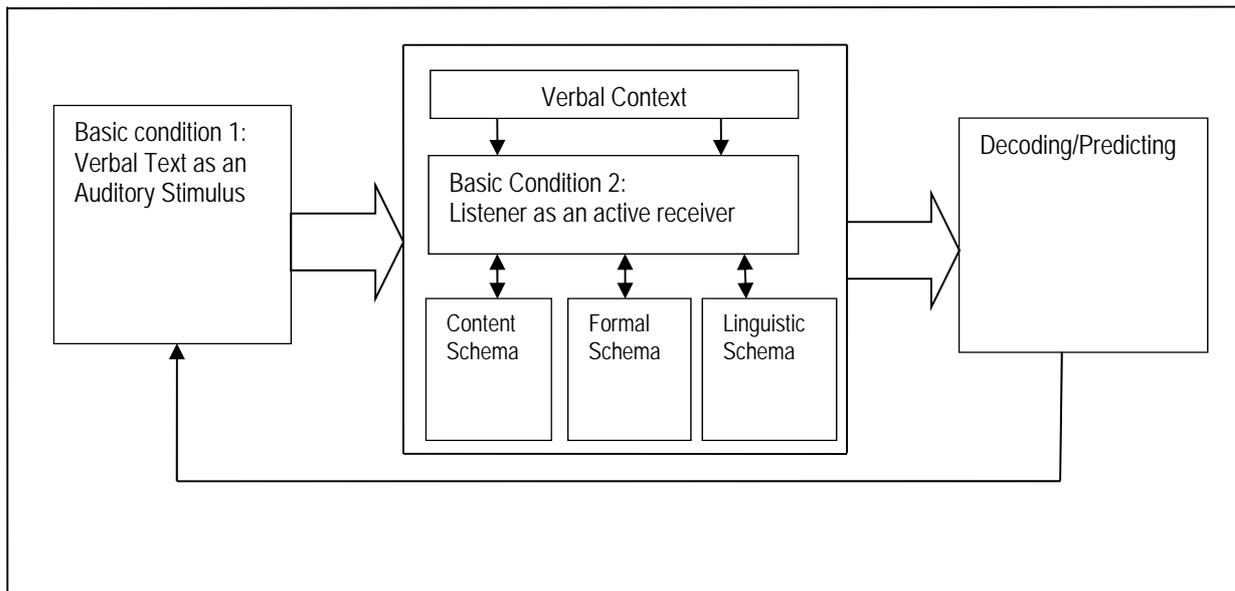

Figure 1. Name of the figure

Figure 2. Name of the figure

6. Copyright

All authors must sign the Transfer of Copyright agreement before the article can be published. This transfer agreement enables Science Park Research Organization and Counseling (SPROC) to protect the copyrighted material for the authors but does not relinquish the authors' proprietary rights. The

Acknowledgements
Acknowledgements and Reference heading should be left justified, bold, with the first letter capitalised but have no numbers. Text below continues as normal.

References

References are listed in alphabetical order. Each listed reference is cited in text, and each text citation is listed in the References. References should be in line with APA 6 (American Psychological Association) style. You can reach to APA 6 standard from following link: http://owl.english.purdue.edu/owl/resource/560/01/

A. An example appendix
   Authors including an appendix section should do so after References section. Multiple appendices should all have headings in the style used above. They will automatically be ordered A, B, C etc.

A.1. Example of a sub-heading within an appendix
   There is also the option to include a subheading within the Appendix if you wish.