



A multi-sensory approach for higher education business students: Using colour in the reading process to analyse academic writing

Susie Marriott

Edge Hill University, UK

Email: Susie.Marriott@edgehill.ac.uk

Abstract

The paper shows a simple approach used to help with reading and analysing academic papers. Initially used with dyslexic students, its use with business students new to researching in higher education proved highly effective and should be applicable to wider subjects. While there is much in the literature about students completing their own academic writing, and good support from books and videos showing them how to do this, there is little published research which outlines or helps students to read, analyse or understand academic resources and then use them effectively. This can be particularly problematic for students new to research as academic journals present a wide range of topics using different styles and methods. This article demonstrates how a multi-sensory approach to reading used with dyslexic students also helps other students to highlight, consolidate, and organise information by the careful use of colour-coding. It has proved particularly useful to students doing their first literature review. The multi-sensory method uses colours to enhance black and white text found in academic journal articles for better organisation of information, to highlight words, sentences, figures, and other information of significance and to navigate longer or more complicated texts to enhance the quality of their own work. The process of using coloured highlighters for coding and organisation is demonstrated here to help incorporate academic information into written assignments.

Keywords

Colours, coding, journal articles, highlighting, themes, multi-sensory

Link to article

<https://educationstudies.org.uk/?p=17337>

Introduction

This article outlines a method that allows undergraduate business students to engage with and build confidence when using academic literature. This is seen as part of the mastery of fundamental academic skills as students commence their university careers (Tinto, 1993). There seems to be a general reluctance amongst business students to begin using academic literature as part of their reading and academic writing (Mann, 2000). This is because they find academic journals in business have a broad range of topics, different styles and diverse methods that they find overwhelming (Spahr, 2015). These reflect comments from my own students. It therefore seems appropriate to explore pedagogical methods to make the engagement with journal articles easier and more accessible for all business students. This article advocates a practical process to encourage and enhance their wider reading and knowledge in order to support assessed work better academically.

By drawing on experiences employed to support dyslexic students this article outlines a method to help navigate complex and text-dense articles. This approach uses colour as suggested by Fernando (2018) and is primarily based upon the multi-sensory learning techniques outlined by Kelly and Phillips (2015). Multi-sensory techniques involve using visual, auditory, and kinesthetic approaches to help support and enrich the learning processes involving research. Introducing colour to navigate journal articles has been particularly useful in preparing students to write literature reviews for dissertations and other assignments requiring an academic underpinning. In my classes, showing students how to use colour with academic articles was observed by non-dyslexic students who subsequently expressed an interest in using it.

This method is now demonstrated to all business students in study skills sessions (see Appendix 1) and presented here as a transformative approach (Lillis *et al.*, 2016) to help build their confidence and skill in reading academic journals in their sessions and independent study time. The session outlined here includes a task to try the concept out with a specific text (see Appendix 2). By introducing and using colour and coding, students engage more fully with their academic reading (Hardy and Clughen, 2012; Wingate, 2015) as introducing colour results in a more focused approach.

Good reading, whether academic or otherwise, is dependent upon prior experience of the reader's background (Hunt, 2004). Students entering university come from a range of educational backgrounds and often need supporting in their initial use of academic materials. A student should be invested in the academic reading process as they commence their undergraduate journey and have an associated outcome with it. Through introducing this method and asking them to use it to help interpret the context, background, environment and circumstances of the academic articles they are asked to read enriches and enhances their learning and develops academic writing style.

Review of literature

A review of the literature shows much written on student academic writing (van Blankenstein *et al.*, 2019; Dafouz, 2020) and there is a lot on showing students how to write academically (Jegade, 2020; Bailey, 2021). There is also substantial body of work examining pedagogic techniques for teaching academic writing (Coffin *et al.*, 2005; Wallbank, 2018). However, a review of books in the UK Universities combined database system identified few articles or books on how to teach academic analytical reading at undergraduate level, or even how students should read and analyse academic texts at undergraduate level. Of the ones listed, St. Clair-Thompson, 2018, explores the approaches of full-time undergraduate students, but reports the sparsity of their reading with just 14.1 hours per week dedicated to academic study. The importance of academic reading is identified by Pritchard (2008: 28) who notes the 'crucial' need for effective reading by students in higher education.

Kristinson *et al.* (2018) reports that there have been various strategies trialled to increase the engagement in academic reading through student participation. These included work with weekly journal reading in groups. This article, however, does not

emphasise techniques for helping to absorb and recall the information, which this article sets out to do. What is fully acknowledged is that good academic reading from disciplinary or subject experts, who write in academic journals and texts, does help students to immerse themselves into the culture of the subject through its conventions, discourse, skills and knowledge (Erikson *et al.*, 2006: 122) and is a necessity to success in higher education. This process of engagement with academic materials promotes a deep level of learning through higher-order cognitive skills, showing an ability to analyse, synthesise, solve problems and think meta-cognitively, helping student to make connections and signify the meaning of the text (Bowden and Marton, 2000: 49).

Techniques

Use of colour in coding in reading and analysing the journal article

This section outlines the techniques used which is summarised in Table 1 below. These were advocated by Dobson, *et al.*, (2021) for helping dyslexic students who often rely on multi-sensory techniques in their learning. The same processes were demonstrated to help first-year business students as a foundational skill to navigate and effectively read academic materials (see Appendix 1 and Table 1 for the process). Using a set journal article, this is divided into sections as shown in Appendix 2. This helps the students understand the main areas of a paper, for example: the title, abstract, keywords and their meaning. Building from this 'unpacked' journal article, the process of reading the content and introducing colour to capture and highlight significant information is introduced so students learn to navigate and utilise the information for their own written work. This can be done with paper or electronic articles.

Colour is seen as the one of the most important multi-sensory visual experiences we encounter (Adams *et al.*, 1973). Colour-coding helps with navigating the information and providing a framework to interpret the textual composition (Chan *et al.*, 2015). By using a series of stages from initial skim reading, creating a colour-coded pallet of highlighter colours and organising the key information (or themes) by specific colour, students had a series of stages which broke down the body of a text into a series of simple areas to understand, analyse and use. The demonstration in a teaching session

with students shows them how to navigate through a paper to identify key information and themes relevant to development of their own assessments. In the first session with a group I used an electronic PDF document and the colour highlighter from within the menu; but a physical print out and different colour highlighter pens can achieve the same effect.

The use of colour-coding is organised so each colour represents a different theme or aspect from the text. The process the students are advised to adopt is to skim read the article initially to identify where areas of interest lie, and then review it in more depth to identify the key claims. These are then highlighted in green, which provides a key prompt showing an area of significance which may then be used in their own written work. They will then repeat a similar process using different highlighter colours for different themes. This breaks down the text for the student, is visible according to theme and helps to organise the flow of information which is then drafted into the literature review.

The process: Doing it / Using it

The process adopted using this visual multi-sensory technique and a variety of highlighter colours.

Process	Action	Outcome
Review document as Appendix 2 sample	Read the Title, Abstract, Keywords, Headings, Diagrams etc	This provides a good overview of what the document is for and what it covers.
Skim Read	Review the key content through the headings, sub-headings, summaries	This provides an indication that there is material that is relevant to the student
Colour code #1	Re-read the key content and prioritise using Highlighter Pen 1 (ie green) the key claims	This identifies for the student what the author is discussing, arguing and claiming in the document.

Colour code #2	Review the key claims and supporting information and using Highlighter Pen 2 (ie yellow) indicate the reasoning behind the argument being made	This helps the student to identify the background information and why the discussion/argument is significant
Colour code #3	Review the evidence and supporting facts using Highlighter Pen 3 (ie blue)	This provides the student with the evidence to scaffold the development of the discussion and argument and the foundation for the argument in the document
Colour code #4	Review the strengths and weaknesses in the discussion/argument and evidence to support this using Highlighter Pen 4 (ie pink)	This shows the student where the evidence is supportive to the argument and where there are weaknesses or gaps (that can be illustrated)
Colour code #5	Areas of conclusion using Highlighter Pen 5 (ie red)	This helps the student establish what has been found and conclusions made that can then be discussed.

Table 1: Steps in the colour-coding process

- Step One requires the student to skim read to identify key information related to themes that are relevant to the development of the literature review. To support this process, students were shown how to break down the key features of the journal article as per the example sourced from *How to Read a Scientific Paper* as an exemplar (see Appendix 2, Slide 1).

- Step Two: Having identified the key component parts to a journal article under review and the most significant features, students were asked to create a colour-key (using different highlighter pens to represent a different theme) see in Table 1.
- Step Three: Once completed the students were advised to check their colour-coding but then set aside the article and return to it later to ensure that the key areas included in the colour-coding had meaning, and that they understood the context in relation to the subject area being reviewed.

Learning outcomes and advantages

The key advantages of using this process of highlighting with colour are highlighted here and align with the findings of Farley and Grant (1976). It can help to improve the attention span when reading as the action of colour-coding areas of the text demands greater concentration. The use of the colour-coding process helps in organising text-based information into a format or sequence that makes it easier to review and aids understanding on a second or third view. Highlighting features for use on documents has become more commonplace in recent years, as this functionality has been developed as part of the software improvements and can now be found on most modern devices (Fisher *et al.*, 1989).

I found the cognitive activity of reading a paragraph, deciding its conceptual significance and highlighting the relevant words and/or sections, helps students to perform better than those who simply read the material with no highlighting, a method supported by Leutner *et al.*, (2007). When revisiting the article again the effectiveness and memory, or cued recall and longer-term retention of the article, proved far better amongst students that had used the colour-highlighter process, than a non-highlighted version (Yue *et al.*, 2015).

The benefits for students of this technique are that it: helps to initiate deep learning that in turn becomes more evaluative, it improves the range of sources and literature used, and in turn provides better academic support for assignments, rather than simply passively reading the text (Nist and Hogrebe, 1987; Bowden and Marton, 2000). Furthermore, identification and isolation of information using text marking as an

organisation tool helps to ensure material is better understood, connections between themes are made and students retain key aspects of the material longer.

Concluding statements

Whilst highly effective, the technique does need careful application. When demonstrating it with students care must be taken to ensure that in using the skim reading approach the students do colour-code with a clear purpose to identify key links and patterns in the text that are meaningful. Since introducing the technique students have adopted other strategies, for example using a photocopied version of the article blown up to A3 size to help separate the text. They reported this also gave them the option to write items in the margins to help assimilate the text further. When using electronic PDFs, students have opted to download PDF articles, save them and colour-code and enhance the materials using the same technique but in an electronic format. Both versions have proved successful. Dyslexic students involved in the initial trials of this process also found this approach helped to break down large amounts of text so that they can develop a mental picture of the information and how to include it in their writing.

What this staged process shows is that it makes reading more accessible and much easier for the student. Breaking down often complex academic texts, and making them more visually appealing with a clear purpose, was reported by students to have helped them by making their reading time more productive. Using an initial skim-reading approach and then organising the key areas with the colour-coding process made them feel they had something immediate to show for their effort. Students reported that these staged approaches, and the use of colour-coding, made their reading more relatable to their assessments and understandable both on initial read through and subsequent re-reads.

While literature reports a low level of reading of academic journals by undergraduate students, in general this process is a way to begin to encourage and enthuse students by making it initially simpler for them to see immediate results and help apply readings effectively to assessments. The process is transitional, and not simply remedial to support dyslexic students (Chen *et al.*, 2015), but could be used by all students early in their studies. Those that have tried it, like it! A broader dissemination of the

technique through a wider research project could help all students in learning simple techniques to break down the journal articles into sections that embeds deeper learning.

References

Adams, F.M. and Osgood, C.E. (1973) A cross-cultural study of the affective meaning of color. *Journal of Cross Cultural Psychology*, **4**(2), pp. 135–156.

Association of Plant Biologists (2022) (www.aspb.org) Blog post. 2022, <https://blog.aspb.org/how-to-read-a-scientific-paper-and-case-study-reading-a-plant-physiology-article/> (Accessed 5 April 2022).

Bailey, S. (2021) *Academic Writing: A handbook for international students*. Abingdon: Routledge.

Bell, K.E. and Limber, J E. (2010) Reading skill, textbook marking, and course performance. *Literacy Research and Instruction*, **49**, pp. 56–67.

Chan, S., Inoue, C. and Taylor, L. (2015) Developing rubrics to assess the reading-into-writing skills: A case study, *Assessing Writing*, **26**, pp. 20-37.

Coffin, C., Curry, M.J., Goodman, S., Lillis, T. and Swan, J. (2005) *Teaching Academic Writing: A toolkit for higher education*. Abingdon: Routledge.

Dafouz, E. (2020) Undergraduate student academic writing in English-medium higher education: Explorations through the ROAD-MAPPING lens. *Journal of English for Academic Purposes*, **46**. pp. 141-159.

Davis, B.T. and Davey, H.B. (2014) *Tech Tools For Improving Student Literacy*. New York: Routledge.

Dobson Waters, S, and Torgeson, C.J. (2021) Dyslexia in higher education: A systematic review of interventions used to promote learning. *Journal of Further and Higher Education*, **45**(2) pp. 226-256.

Farley, F.H. and Grant, A.P. (1976) Arousal and cognition: Memory for color versus black and white multimedia presentation. *Journal of Psychology*, **94**(1), pp.147-150.

Fernando, W. (2018) Show me your true colours: Scaffolding formative academic literacy assessment through an online learning platform, *Assessing Writing*, **36**, pp. 63-76.

Fisher, L., Coury, B.G., Tengs, T.O. and Duffey, S.A. (1989). Minimizing the time to search visual displays: the role of highlighting. *Human Factors*, **31**(2), pp. 167-82.

Hardy, C. and Clughen, L, (2012) Writing at university: student and staff expectations and experiences. In L. Clughen, C. Hardy (Eds), *Writing in the disciplines: Building supportive cultures for student writing in UK higher education*, , Bingley: Emerald Group Publishing Limited.

Hermida, J. (2009) The importance of teaching academic reading skills in first-year university courses. Available at SSRN: <https://ssrn.com/abstract=1419247> or <http://dx.doi.org/10.2139/ssrn.1419247> (Accessed 11 June 2022).

Jegade, F. (2020) *Writing Successful Undergraduate Dissertations in Social Sciences: A student's handbook* Paperback. Abingdon: Routledge.

Kelly, K. and Phillips, S. (2015) *Teaching Literacy to Learners with Dyslexia: A Multi-sensory Approach*. London: Sage Publication Limited.

Kristinsson, A. 1994. Journal reading in an undergraduate curriculum. *The New England Journal of Medicine*, **330**(24), pp 1762.

Leutner, D., Leopold, C., and Den Elzen-Rump, V. (2007) Self-regulated learning with a text-highlighting strategy: A training experiment. *Journal of Psychology*, **215**(3), pp. 174–182.

Mann, S.J. (2000) The students' experience of reading. *Higher Education*, **39**, pp. 297-317

Nist, S.L., and Hoglebe, M.C. (1987) The role of underlining and annotating in remembering textual information. *Reading Research and Instruction*, **27**, pp.12–25.

Pritchard, A. (2008) *Studying and Learning at University: Vital skills for success in your degree*. London: Sage Publications Limited.

Spahr, K. (2015) Influences on undergraduate business students' perceptions about the adequacy of library information resources, *Behavioral and Social Sciences Librarian*, **34**(4), pp. 214-229

St Clair-Thompson, H., Graham, A. and Marsham, S. (2017) Exploring the reading practices of undergraduate students. *Education Inquiry*, **9**(3), pp. 284-298.

Tinto, V. (1993) *Leaving College: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

Van Blankenstein, F.M., Saab, N., van der Rijst, R.M., Dael, M.S., Bakker-van den Berg, A.S. and van den Broek, P.W. (2019) How do self-efficacy beliefs for academic writing and collaboration and intrinsic motivation for academic writing and research develop during an undergraduate research project? *Educational Studies* **45**(2), pp. 409-425.

Wallbank, A.J. (2018) *Academic Writing and Dyslexia: A visual guide to writing at university*. Abingdon: Routledge.

Wingate, U. (2015) *Academic Literacy and Student Diversity: The case for inclusive practice*. Bristol: Multilingual Matters, .

Yue, C.L., Storm, B.C., Kornell, N. and Ligon Bjork, E. (2015) Highlighting and Its Relation to Distributed Study and Students' Metacognitive Beliefs. *Education Psychology Review*, **27**, pp. 69–78.

APPENDIX 1

Outline lesson plan

Learning objectives

By end of session a student will be able to:

1. Know the importance of meeting academic standards when engaging with literature.
2. Use simple processes to begin engaging and reading the relevant literature.
3. Know the learning styles that can be applied to catalogue and store the important information for use in submissions.
4. Check systems to ensure that statements are all fully supported.
5. Know the forms of technology that can be used and samples and examples to help.
6. Independent Study: Put these techniques into practice using a Journal Article from a session.

APPENDIX 2

What are simple processes to begin engaging and reading the relevant literature?

Slide

One:

S = Survey text

S = Skim the material.

Look at

- the contents,
- blurb,
- introduction,
- summaries.

Examine the structure of the material.

What have you learned?

Case study: Reading a Primary Research Article from *Plant Physiology*

This case study examines a recent article published in the journal *Plant Physiology*. The full article is appended to this PDF. Because of space constraints, only the major points from the paper are covered in the case study, and the biochemical pathway is presented in simplified form.

Title The *b* Gene of Pea Encodes a Defective Flavonoid 3',5'-Hydroxylase, and Confers Pink Flower Color

Authors and author information Carol Mues, Mike J. Ambrose, Lyndi Turner, Louise Hill, T.H. Neal Ellis, and Julie M.J. Baker

Abstract A summary written by the authors

Introduction Not all journals mark it with a subheading

Footnotes, including contact information for corresponding author and funding sources

Citation for this paper

In-text citation Full citation is found at the end of the article

The first page of a typical article from *Plant Physiology*. (See text for more information about each section)

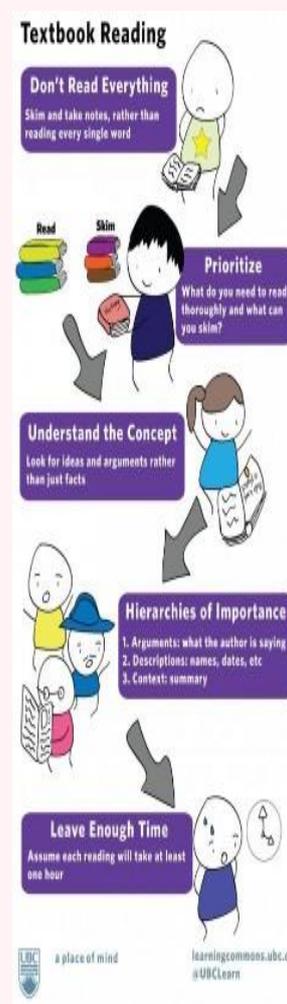
Copyright (2013) American Society of Plant Biologists. www.aspb.org

Slide Two:



Top Tips?

1. **Be critical about what you read from the start** – read the overview to evaluate its suitability.
2. **Be selective** – how much do you need to read in the journal article? Learn to scan the article to find the relevant information:
 - Abstract
 - Introduction
 - Discussion & Conclusion
3. **Look for clues/signposts** – pick out key elements and colour code.



This Photo, by Unknown Author is licensed under [CC BY](#).