Science Writing Centre
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How to . . .

. . . write a response paper

This session will address:

1. Reading
2. What is a response paper?
3. Elements of a response paper
4. Writing the introduction

Reading

Reading articles is part of your academic journey. It is expected of you to engage critically with what you read, moving beyond the information in the text you engaged with. As an active reader you have to create meaning from the text, not simply absorb the information and move on. There are various reading strategies that you can employ while reading. One of these techniques is called the SQ3R.

Survey	**Question**	**Read**	**Recite**	**Review**
Scan through the text. Look at: • Headings & sub-headings • Visual material • Note anything printed in bold or italicised • Read the abstract • Read the first sentence of each paragraph.	Based on your survey, create questions that you hope the text will answer.	While reading the text look for answers to your questions. If you find the answers, mark them in the text. If anything else in the text catches your attention, mark that as well. Make notes in the margins.	Think about what you have found in your reading. Reflect on whether you understand it and whether you need any further information.	Look over your findings in the text and review your notes.

Possible ways to approach your reading

- Closely examine and analyse the text (look at the detail the author includes as well as the language use in the text)
- Find the aspects / points in the text that most intrigues you
- Identify the strengths and weaknesses of the author's argument (or contradictions) in the text

Tip
Try to move beyond simply agree or disagree with arguments in the text. Go a step deeper. Why do you agree/disagree? Is your point slightly different? Are you adding something to what the author said? Or are you modifying something the author said?

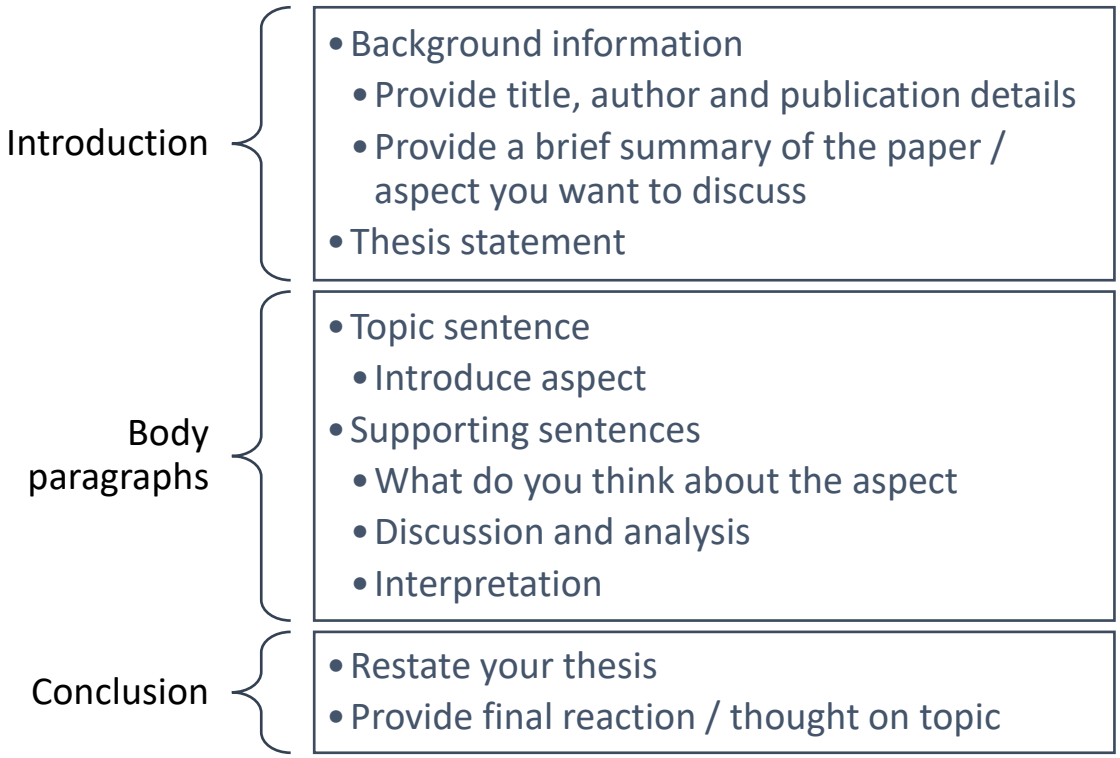
What is a response paper?

In a response paper you need to critically engage with the text you are reading in some way. A response paper can be used as a first exploratory step in establishing a field of interest for an assignment / further research since it helps you to examine and begin to formulate the questions that you would like to address in a more formal analytical piece of writing. Ultimately, in your university career, you will be asked to devise your own research question rather than responding to a specific set question. A response paper will help you begin to see how to pinpoint and assess the kinds of issues that most interest you in the texts you read.

In a response paper you might choose to respond to a paper as a whole, or to a specific aspect or point that the author is making. The most important rule is: your response should be critical – it shouldn't just be a summary or description of the text you read.

Elements of a response paper

If a response paper is handed in for formal assessment[1] it usually follows the same structure as an essay:



[1] For less formal writing it might consist of two sections, a summary of the paper and then your response thereto.

Writing task

Read the following excerpt from; Linda J. S. Allen, Sophia R. Jang & Lih-Ing Roeger (2017) Predicting population extinction or disease outbreaks with stochastic models, Letters in Biomathematics, 4:1, 1-22, DOI: 10.1080/23737867.2016.1264870.

- Identify the most intriguing or confusing aspects of the excerpt.
- Identify the information that you would like to use to shortly summarise what the text is about.

5. Cell populations

A cell divides and reproduces two daughter cells. During the cell cycle, mutations may occur, so that the daughter cells are not identical to the parent cell. The mutation can be neutral meaning the genetic sequences passed on to a daughter cell are neither beneficial nor detrimental to survival or reproduction. However, if the mutation impacts survival or reproduction then 'fitness' has been altered. In an advantageous mutation, fitness is increased and either the reproduction cycle is shortened or the survival time is lengthened. On the other hand, in a deleterious mutation, fitness is decreased and the cell line does not survive. Most acquired mutations that occur in somatic stem cells (not egg or sperm) are neutral or deleterious. However, mutations that lead to cancer or tumour cells are generally advantageous, reproducing more rapidly than healthy cells. Cancer cells have the ability to renew and regenerate, a property typical of normal stem cells (Hardavella, George, & Sethi, 2016). These features of cancer cells have led to what is known as the cancer stem cell hypothesis: the existence of cancer stem cells that may be 'responsible for cancer initiation, progression, metastasis, recurrence and drug resistance' (Hardavella et al., 2016).

The simple birth and death process is directly applicable to cellular reproduction, where birth is cell division; two cells are reproduced from one via cell division, $p_{i,i+1}(\Delta t) = bi\Delta t$. Cell death is the transition $p_{i,i-1}(\Delta t) = di\Delta t$ (Equation (2)). Additional reasons that the birth and death process is a good approximation for cellular reproduction are that cell lines reproduce independently and the fitness of individual cell lines is constant, not frequency-dependent or density-dependent (Iwasa, Michor, & Nowak, 2004). Here, we consider the simple birth and death process as a model for two distinct cell lines, that is, normal healthy cells and cancer cells under chemotherapy treatment. The birth and death rates differ between the two cell lines when chemotherapy treatment targets the cancer cells (Sehl, Zhou, Sinsheimer, & Lange, 2011).

5.1. Example 3: cancer therapy

Suppose there are two cell lines: a normal healthy cell population H and a cancer cell population C. Healthy cells divide into two daughter cells at rate b_h or die at a rate d_h, whereas cancer cells divide at rate b_c or die at rate d_c. With chemotherapy treatment, both healthy cells and cancer cells are affected, but the treatment is designed to target the cancer cells. Therefore, we consider the case that with targeted treatment, the death rate for cancer cells is greater than for normal healthy cells.

In a recent model for cancer stem cell therapy, Sehl et al. (2011), apply a simple birth and death process to study the effects of treatment on cancer stem cells. The following birth and death rates were assumed in two examples for treatment of chronic leukaemia, $b_h = .02$/week, $b_c = b_h$, $d_h = .08$/week, with two different death rates for cancer stem cells: $d_c = .31$/week and $d_c = .59$/week (Sehl et al., 2011). In the absence of treatment, the death rate of healthy stem cells is about .002/day (Sehl et al., 2011). At the beginning of therapy, the number of cancer cells in the population is large, $X_h(0) = 4,400$ and $X_c(0) = 17,600$ (Sehl et al., 2011). Because $b_h < d_h$ and $b_c < d_c$, the probability of extinction approaches one (Equation (8)),

$$\lim_{t\to\infty} p_0(t) = 1,$$

for both healthy and cancer stem cells. The rate of convergence depends on $e^{(b-d)t}$. During treatment, an important question is the time to stop treatment. If chemotherapy treatment is prolonged, both healthy and cancer stem cells will be eliminated. Chemotherapy must be continued until most of the cancer stem cells are eliminated, but should cease before the healthy cell population has decreased to dangerously low levels. With cessation of treatment, the hope is that the healthy cells will resume normal growth with $b_h > d_h$.

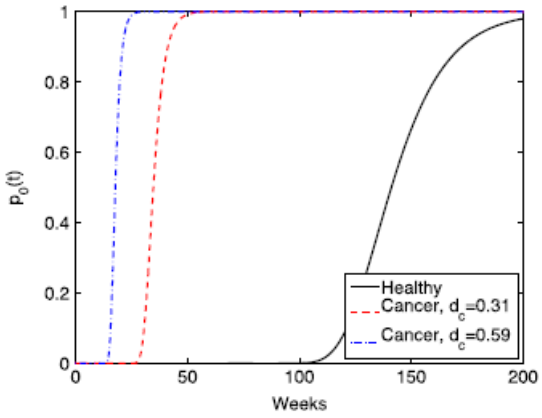


Figure 6. The cumulative distribution for the time to extinction for healthy cells H and cancer stem cells C under chemotherapy treatment.
Notes: Parameters for the birth and death rates (per week) are $b_h = .02 = b_c$, $d_h = .08$ and two different cancer cell death rates $d_c = .31$ and $d_c = .59$. The initial number of cells for each population is $X_h(0) = 4,400$ and $X_c(0) = 17,600$ (Sehl et al., 2011).

In a simple birth and death process, when the death rate exceeds the birth rate, $d > b$, the expression for the probability of extinction $p_0(t)$ in (7) is the cumulative distribution for the time to extinction. For the particular parameter values in the preceding examples, Figure 6 is a plot of $p_0(t)$ for healthy cells and for two cancer cell lines with different death rates. There is a distinct difference in time to extinction. Since $d_c \gg d_h$, most of the cancer stem cells are eliminated before the healthy cells are damaged (while $p_0(t)$ for the healthy cells is still small). The timing of treatment is a crucial part of chemotherapy. A higher death rate d_h of cancer cells shortens the time of treatment and reduces the damage to healthy cells. Increased understanding of these processes and the effects of treatment have been obtained by applying more complex stochastic models along with methods from multitype branching processes (see, e.g. Durrett, 2015; Kimmel & Axelrod, 2002).

Write your introductory paragraph: