An Experiment to Determine if IB Psychology Students Can Follow Directions. (I'm finding that they can, IF they read them!)

(Note to students. The title should give a clear indication of the experimental method and the specific topic of the study. The hypothesis will determine how the title is constructed. For example, if the operationalized research hypothesis is 'The mean number of words correctly recalled by a group using a list with category headings will be greater than the mean number of words correctly recalled by a group not using category headings", then an appropriate title could be "An experiment to investigate the effect of category headings on the recall of a list of words". A title such as "An experiment on memory" is not specific and is therefore insufficient The title must indicate the method used (experiment), the topic under investigation (recall), and the variables (category headings and their impact on word recall).

Mr. Hanson (*Put your name here!*)
Candidate #
IB Psychology Higher Level
May 2011

Word Count: 1,500 to 2,000 Words. Not a word More!
(Note: Put your actual word count here; Only count from the introduction to the conclusion)

Completed in partial fulfillment of the International Baccalaureate Diploma Program

Some basic guidelines for this entire internal assessment report:

- Although you may work in groups of up to four people to gather the raw data, no part of this report may be written as a group. **Each student must write up this report completely independently! Any papers that closely resemble one another will be reported and treated as plagiarism.**
- Everything must be typed up in paragraph form. Only your work for your statistical equations may be hand written. They must go into the appendices. They do not go in the body of this report.
- Do not use bullets or numbered lists. Write everything in paragraph form using complete sentences. (Do as I say, not as I do!)
- Write in the past tense, third person. Refer to yourself as the experimenter and as if you have already completed the experiment. When you turn this in you will have completed it.
- As you turn in each section one at a time, present it to me as if it were your final product. I will grade it as such. You will get one chance for feedback from me. The IBO will not allow me to write it for you, which in essence I have done if I allow you to continually revise it and receive more feedback. This is Your project!
- You cannot compare boys versus girls, or old people versus young people, or any other type of quasi-experiment. You must manipulate the independent variable and randomly assign participants to groups. If you can't, then it is not a real experiment.
- **Read this entire paper before you start working!**

Abstract

An abstract is a mini summary of your entire paper. You can find good examples of them at the front of many of the Journal Articles that I will give you throughout the year. In fact, the IA format is the same for HL students as the APA publication guidelines for any researcher that wants to get published. Some of the older papers that we read do not follow what is now the standard format.

An abstract of a report of an empirical study should describe;

- The problem under investigation, in one sentence if possible.
- The subjects, specifying pertinent characteristics, such as number, type, age, and sex.
- The experimental method, including the apparatus, data- gathering procedures, and complete test names.
- The findings, including statistical significance levels.
- The conclusions and the implications or applications.
- It should be around 200 words long.

Contents

(***Note: Start your word count here!***)

Introduction

Read this entire section before you start working!

The Introduction should include background theory and research which logically leads into the research question and hypothesis of your study. This will be one of the longer sections. The APA says that before writing the introduction, consider:

• What is the point of the study?
• How do the hypothesis and the experimental design relate to the problem?
• What are the theoretical implications of the study (how does this study relate to us as humans, or the study of psychology), and how does the study relate to previous work in the area?
• What are the theoretical hypothesis tested, and how were they derived? (APA, 1994)

You must actually read the studies to be able to answer these questions! It seems like common sense but many students try to write their IA without ever having completely read the background studies!

First

Start out broad. Identify the particular aspect of the discipline of psychology in which your study took place. (Example; Cognitive Psychology) Start with a brief statement about the nature of the general category of psychology that your study falls into. Include a definition if meaningful. Then briefly get more specific. (Example; The study of memory) And then even more specific. (Example; Working Memory) (APA, 1994)

Second

Introduce the Theory. What is the theory and who came up with it. Take some time to develop this well, and present it here as fully but concisely as possible. **If you don't talk about the theory behind the research you will lose points!** Cite your references properly. Example : (Hanson, 2010) Every researcher cited in your paper needs to be listed in your references. Only list researchers in your references if you cited them. Use good psychological sources, such as journal articles. DO NOT use dictionary.com, Wikipedia, Etc.

Next, talk about the research that has been done in the area that you intend to study. Use two or three studies that are directly related to your study. Develop the background. Discuss the literature but do not include an exhaustive historical review. Assume that the reader has knowledge in the field for which you are writing and does not require a complete digest. A scholarly review of earlier work provides an appropriate history and recognizes the priority of the work of others. Citation of and specific credit to relevant earlier works is part of the author's scientific and scholarly responsibility. At the same time, cite and reference only works pertinent to the specific issue and not works of only tangential or general significance. You must cite all of your sources and list them all on the reference page. ***Use two studies that are directly related to your study, in addition to the study you plan to base your study on.*** When you summarize earlier works, avoid nonessential details; instead, emphasize pertinent findings, relevant methodological issues, and major conclusions. Refer the reader to general surveys or reviews of

the topic if they are available. Make sure you discuss the theory that the researchers were testing. **Be certain that you tie this earlier work to your study. Explain how these are relevant to your study!**

Third

Outline the precise problem that you chose to investigate and describe the way that you choose to investigate it. **State "The aim of this research is to ....." If you do not do this, you may receive a 0 out of 5 points on this section!**
Your Aim is **not** to test whether or not this previous research applies to Suncoast students, it should be to test if the theory is true or not.

Tell me what you intend to do in this study. If there is one particular study that you are replicating or partially replicating then you should talk abut this here. Do not support your position or justify your research by citing established authorities out of context. State the purpose and rationale. After you have introduced the problem and developed the background material, you are in a position to tell what you did. Make this statement in the closing paragraphs of the introduction. At this point, a definition of the variables and a formal statement of your hypotheses give clarity to the paper. Bear in mind the following questions in closing the introduction: What variables did I plan to manipulate? What results did I expect and why did I expect them? The logic behind "Why did I expect them?" should be made explicit. Clearly develop the rationale for your hypothesis.

Outline the results predicted by your research hypothesis.

Last

The hypothesis is a statement of the predicted outcome. The independent and dependent variables are easily identified in the hypothesis. Your hypothesis will be the last thing in your intro. Start a new paragraph for each hypothesis, start each one with either H_1 or H_0, and follow the format below.

For example;
H_1: Participants that receive words in an organized hierarchy will correctly recall a higher number of words when tested than participants that receive the words in an unorganized list.

Notice how this hypothesis includes the two parts of the independent variable, the unorganized list and the organized hierarchy, as well as the dependant variable, will correctly recall a higher number of words. **Yours *must* do the same!**

This hypothesis is one-tailed. It predicts the direction of the expected findings. It says, "will recall more words". A hypothesis is two tailed if it merely suggests that there will be a difference between the two groups. This is important to know when you do your inferential statistics. ***You need to make a one tailed hypothesis and state that here.***

A null hypothesis is a statement saying that there is little to no difference between the samples tested in the experiment (Coolican, 2004). Researchers try to reject the null within a reasonable margin of error. There is no proof that scientific theories are 100% true. The largest level of acceptable error in the social sciences is 5%. Inferential tests examine if the null can be

rejected, not if the research hypothesis is true.
The null hypothesis is not the opposite of the experimental hypothesis. (Jamison, 2006)

For Example;
Wrong: Participants that receive words in an organized hierarchy will recall fewer words when tested than participants that receive the words in an unorganized list.

Right: H_0: There will be no significant difference between participants that receive words an organized hierarchy and participants that receive the words in an unorganized list on their ability to recall the words when tested.

The following examples are how your hypotheses need to be stated and formatted.

Format your hypothesis just like this!

H_1: Students that read this carefully will receive a higher number of marks than will students who do not read this paper.
H_0: There will be little to no difference in the number of marks received by students who read this paper and students who do not read this paper.

You must include both the experimental and null hypotheses and format them as I have here, or you will receive a "0" out of five points for this section.

Methods

Design

The Method section describes in detail how the study was conducted. Such a description enables the reader to evaluate the appropriateness of your methods and the reliability and the validity of your results. It also permits experienced investigators to replicate the study if they so desire. (APA, 1994)

State which type of design was used and explain why. You need to explain why you used the type of design that you used. Don't just say that it was the best choice for your experiment, tell me why this design was used in a way the makes it clear why this was the best choice and other designs wouldn't have worked as well. If you do not do this here you will get a "0" on this section.

You must provide proof that you have followed the Ethical guidelines. If you don't do this you will receive a "0" on this section. You will not have any Ethical concerns in your experiment. If you do, you will not be allowed to do it. However, to demonstrate that you are following the ethical guidelines you must mention the following;

- No one can be coerced to participate.
- Consent forms were signed by all Participants.
- Anyone can withdraw at any time for any reason.
- Participants will be debriefed after the study.

- Participants can withdraw their results.

Do Not write this word for word! Paraphrase! Do not use bullets!
You must also actually do these things as you perform your experiment. ***Include these statements in your instruction and debriefing scripts as well.***

You must also state what your Independent and Dependant Variables are! They must be clearly and accurately identified, and must be operationalized. There are ***two*** conditions to your Independent variable, make sure that ***both*** are clearly stated.

Make sure that this is written in the past tense!

Participants

You should have between twenty and thirty participants. State the number of participants in each condition or group. State the range of ages and the mean. Include the number of each sex in each group. You may NOT split the groups up by gender. You can not compare boys versus girls, or old people versus young people, or any other type of quasi-experiment. Give a brief description of your participants. For example, "There were 23 participants. They were from a fifth period SL IB Biology class at Suncoast Community High School. There were ten boys and thirteen girls. Their ages ranged from 16 to 18."

You must state your method of sampling and justify the use of this method. Why did you do it this way? 99% of you will use an opportunity sample. The reason why you must use this method is that it is not within your power to randomly sample students in the whole school. Your access to participants is limited to a single class for a limited amount of time and is subject to the desires of the teacher of that class. **Paraphrase this reason!** You may not plagiarize, and this includes this document! You also need to explain how you did your opportunity sample. Explain how you got them.

Last, make sure you identify the target population. This is the population that you feel your sample represents and to whom you can generalize the results of your experiment. If you use an opportunity sample, and nearly everyone will, then you cannot generalize your results to a larger population and you should just say that your target population is limited to your sample.

Make sure that this is written in the past tense!

Apparatus *or* Materials

An apparatus would be something like a computer, LCD Projector, or lab equipment. Materials would be things like paper, pens, pencils, and other small things that you may be using for your experiment. You might be using one, or the other, or both. Label this section accordingly.

Example;

Materials

- Paper with list of words to be memorized (see appendix iv)
- Pencils

- Black sheets of paper for recall
- Stop watch

This should be *very* short.

Procedure

The point of this is to allow someone to replicate your study if they wanted to. If they are not able to do it exactly the same way you did your study, your study will be found to be unreliable.

This should be a step by step guide how to do your study. If I can not replicate your study EXACTLY the same way you did it by reading this section, then you have not done your job here. Using bullet points is acceptable.

Start your procedure with a description of how you got your sample. Then talk about informing your participants of the nature of the study, asking them if they will participate, and having them sign a consent form. You should mention how you randomly assigned your participants to groups. Then go step by step through your experiment. You must inform the students of the nature of your experiment ***before*** you ask them to sign the consent forms.

You do not need to put your instructions or debriefing in here, that will take up valuable space. Instead, at the appropriate place, you should say something like, "The participants were then read the instructions, see appendix iv". Don't forget to include all of the ethical guidelines in your procedure.

When your experiment is complete, ask if your participants would like to withdraw their results from the study. Again, reference your debriefing script in the appendices. Ex: (See appendix vii)

In addition to the procedure for your experiment, make sure you include the steps you took to insure that the ethical guidelines were followed! Failure to do this results in a "0". Also, if you forget to reference your materials in the appendices, you will be docked points twice, once in the procedure and once in report format.

Make sure that this is written in the past tense!

Results

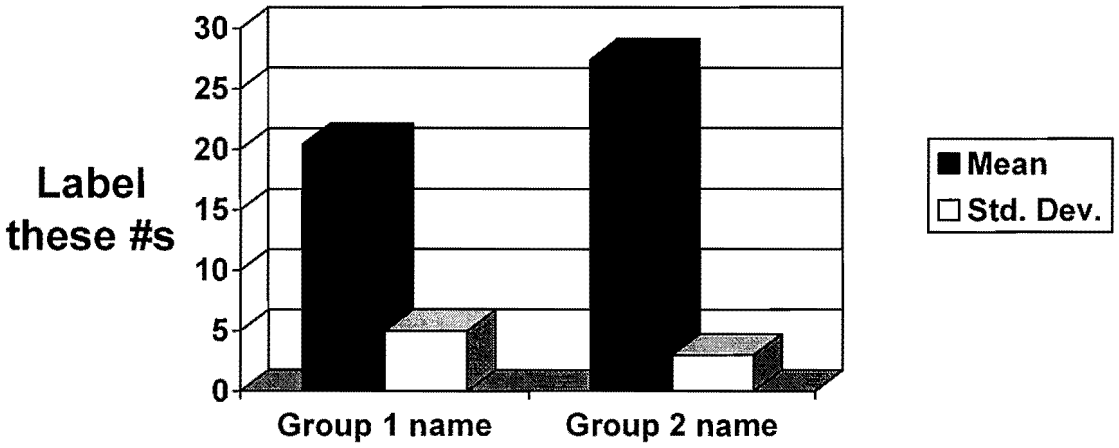
Description of Results.

In this section you will have a paragraph describing your results, a table of your summary data, and a graph. You should state in the table what the mean, or mode, or median, and standard deviation was for your data, if they apply to your study. For the paragraph you should pick only the most appropriate measure of central tendency and explain why this one best describes your data. It will most likely be the median, but not always. The mean is the best choice if you have interval data and there are no large outliers. If this is true for you, then use the mean and explain this. However, most of you have ordinal data and should use the median and interquartile range. Write a paragraph, do not make a list or use bullets. **Make sure that you report the numbers for each of the groups in the body of your description of results.** It is not enough that it is in the graph.

Be sure to label both axes and all other important information in your graph. Explain what all numbers are and what each axis represents. **Do not just say group one or group two! Use descriptive names for your groups!**

This is all that you put here. It is a short section. **Do not discuss what these numbers mean here, that goes in the discussion section. <u>Do not put raw data in here!</u>** Raw data, the individual participant's scores, goes in a table in the appendix.

Even if you worked in a group you must each individually type up this entire report. Although you will have the same numbers, your report and graphs should be different.



Notice how I made one bar a very light color and the other bar a very dark color. This is so that when it is printed in black and white they show up as two different shades and not just two indistinguishable grey bars. Keep in mind that I may need to photocopy your report if it gets selected by the IBO to be sent in to them, so it will end up being in black and white even if you print it in color. I will send them the original, but I need a good copy in case they get lost. It happens! These things get sent all over the world.

<u>Analysis of Results</u>

This is where you report the statistical significance of your data. These are inferential statistics. You must do one of the below tests.

Level of Measurement	*Independent Samples*	*Repeated Measures or Matched Pairs*
Nominal	Chi Square	N/A
Ordinal	Mann-Whitney U	Wilcoxon
Interval/Ratio	Unrelated T-test	Related T-test

You must explain why you used the test that you choose. You will decide which based on what type of data you have and what the design of your study is. For example, as can be seen in the above chart, you will use a Mann-Whitney U test if you have ordinal data, which is non-parametric, and your experiment is of an independent samples design. You must state whether the data is parametric or non-parametric. Unless you are certain that your data is parametric, you should assume that it is non-parametric. Also report the critical value, the calculated value and the degrees of freedom if these apply to the test that you are doing. For the Mann-Whitney U test you need to include whichever is smaller, U_1, or U_2, and the critical value. **Explicitly state your level of measurement, the design of your study, and whether the data is parametric or non-parametric.**

If you think that you should do the T-test, you need to talk with me first. Your data must meet three criteria, and you must explain that it does or you will lose points.

When you perform the test and look up the numbers on the appropriate chart you will get the level of significance. The minimum level of significance that you can have and still claim that your research hypothesis has been supported is "$P < 0.05$". This means that there is less than a 5% probability that your results have occurred by chance. State this in your paper. This is what they mean by a statement of statistical significance.

You <u>must</u> accept or reject your *<u>null</u>* hypothesis. If you are able to reject your null hypothesis then you may claim that your research hypothesis has been supported. If P is not at least < 0.05, you must accept the possibility that the null hypothesis may be true and you can make no determination as to the validity of your research hypothesis. This is OK. Most students are disappointed if this happens, but you will not lose any points. The purpose of this is to conduct and write up an experiment. You do not have to prove anything. There are no points for creativity or for making some exciting new discovery.

This is also a short section. It will most likely be just one paragraph. All discussion of the importance of your experiment or why it went as it did will go in the next section. Do not include your mathematical work here. You must include that in the appendices. Do ***<u>Not</u>*** include a photocopy of someone else's work! You must do the work by hand, but of course you may use a calculator to help you do the work, but do not run the test on your calculator or a computer. If you do it will be obvious and you will lose points.

There is one other possibility that you may need to consider. There may be a statistically significant difference between the groups, but it may be in the opposite directions that you predicted. In this case, you can still reject the null hypothesis, but you cannot say that your findings demonstrated your hypothesis. Be very clear about this in this section, or you will lose points.

<u>Discussion</u>

This section is worth the most points, and should be your longest section. If you go over the word count, and you will, try cutting from everywhere else first, then the intro, and last in the discussion. Be careful to not cut out anything that is on the grading rubric. Many paragraphs can be cut in half just by carefully and concisely rewording what you re trying to say,

In the first paragraph you will need to explain your findings. Were your results significant? Did you reject the null hypothesis? Why or why not? Comment on any unusual results. ***You must put the numbers in here. Restate the measure of central tendency and your statement of statistical significance.***

In the second paragraph you should discuss your findings and their relationship to the theory being tested. Did you support the theory with your research? Make sure that you discuss the theory that the original researcher was testing and whether or not your research supports this theory.

Next discuss if your findings consistent with the background research. Be specific and name the researchers that you are referring to and briefly state whether your results are similar or different. Do not repeat information in the introduction, but rather link you information to it. Why do you think that your participants performed the way that they did? ***Make sure that you cite the original researchers properly!***

In the next section of the discussion you should evaluate your methodology and discuss the limitations of your study. Discuss any factors that were out of your control. Consider any confounding variables that might have impacted your results. Once you identify some weaknesses, discuss how you would fix them in the future. You may NOT use the commonly mentioned "the sample size was too small to represent the population." This is not an acceptable limitation. The IBO graders have stated that even 10 is a sufficient number of participants and is not a limitation. Do not blame the participant for your problems. If they performed poorly, or did not follow the instructions, or did not understand the instructions, you may mention this, but the problem is that your instructions were not clear enough. You can mention this as a limitation and again as something that you would change if you were to conduct further research.

Suggest further areas of study that might shed more light on the subject. Be explicit about your modifications or improvements for further research and your limitations. Modifications need to go beyond merely correcting your limitations. Again, do NOT mention merely increasing the sample size. Think of new directions that your research could take. What questions came up during your experiment? How could you answer these questions with future research? If these are not clearly identified you will lose 20% of the total points for the whole IA! **State everything explicitly!**

Finally, you will have a conclusion. This is not a new section or subsection, and there is no need to label it. It should come at the end of the discussion section. It is very brief. Restate the results of your inferential test, mention if you accepted or rejected your null hypothesis, and clearly indicate the outcome of your investigation.

(Note: For the References section you should start a new page. Do not include the rest of your paper in your word count)

References

Coolican, H. (2004). *Introduction to Research methods and Statistics in Psychology. (4th ed.).* London: Hodder & Stoughton.

Jamison, J. (2006). *Research Methods in Psychology for High School Students.* New York. iUniverse.

Publication Manual of the APA. (1994). Washington, DC. American Psychological Association.

Use the following format. This is APA style. The author's name always goes first.

Put your references in alphabetical order!

Every researcher cited in your paper needs to be listed in your references. Only list researchers in your references if you cited them.

Journal Articles;

Name. (Date). Title of Article. Journal Title. Volume number. Page # - Page #

Books;

Names. (Date). Title of Book. Edition. Place of Publication: Publishers.

You can get more help on APA format at;

http://owl.english.purdue.edu/owl/resource/560/1/

Content of Appendices

(Note: The appendices are labeled using small case roman numerals.)

** These two Items are included in my appendices for your use.
Do **not** include them in **your** appendices!

Description of Appendices

You will need at least the following items; Instruction Script, Debriefing Script Examples of Materials used, a Table of Raw Data, Math Work for Inferential Statistics and most importantly, a sample of your informed consent form.

Do NOT include all of your consent forms. Just include one example of a blank one. You will need to keep all of your signed consent forms in case there is ever a suspicion that you did not actually do your experiment and just made up to data. The IBO can ask for this proof at any time up to when your IB diploma is issued.

Label all of your appendices with small case roman numerals.

Nothing in your appendices is included in your word count, so all of your scripts and other long documents that do not have to be in your report can be placed here and referred to in the appropriate places in your report.

Participant Informed Consent

(Note: Informed consent is an integral and required part of the internal assessment process. All candidates must ensure all participants who are 16 years or older sign an informed consent statement. For experiments with participants under the age of 16, parental consent must be obtained. If you anticipate that you will need parental consent, write a short description of your study at the top of this page.
Candidates should include one blank copy of their informed consent statement as an appendix. Below is a sample consent form that could be modified and used by candidates.)

Sample Consent Form

- I have been informed about the nature of the research. (Make sure you do inform them before you ask them to sign this. You could just put the information at the top of this form)
- I understand that my participation is voluntary.
- I understand that I have the right to withdraw from the research at any time, and that any information/data about me will remain confidential.
- My anonymity will be protected as my name will not be identifiable.
- The research will be conducted so that I will not be demeaned in any way.
- I will be debriefed at the end, and have the opportunity to find out the results at a later date if I wish.

I give my informed consent to participating in this research.

Name (printed): _____

Signature of participant: _____

Signature of parent (If under 16): _____

Contact number: _____

Date: _____

Note;

You may need to modify this form or include other statements based on your experiment.

Paraphrase this! DO NOT PLAGERIZE THIS CONSENT FORM!

IB Psychology HL Internal Assessment Rubric

Introduction

1–3 Background theories and/or studies are identified but are limited in number, not well explained and/or not highly relevant to the hypotheses. The aim of the study is clearly stated. The experimental and/or null hypotheses are stated but are unclear or not operationalized. The prediction made in the experimental hypothesis is not clearly justified by the background studies and/or theories.

4–5 Background theories and/or studies are adequately explained and highly relevant to the hypotheses. The aim of the study is clearly stated. The experimental and null hypotheses are appropriately stated and operationalized. The prediction made in the experimental hypothesis is justified by the background studies and/or theories.

Method: Design

1 The independent variable and dependent variable are accurately identified but are not operationalized. The experimental design is appropriate to the aim of the research but its selection has not been appropriately justified. There is clear indication and documentation of how ethical guidelines were followed.

2 The independent variable and dependent variable are accurately identified and operationalized. The experimental design is appropriate to the aim and its use is appropriately justified. There is clear indication and documentation of how ethical guidelines were followed.

Method: Participants

1 Some characteristics of the participants are identified but not all are relevant. Some relevant participant characteristics have been omitted. The sample is selected using an appropriate method but the use of this method is not explained. The target population has been identified and is appropriate.

2 Relevant characteristics of the participants are identified. The sample is selected using an appropriate method and the use of this method is explained. The target population has been identified and is appropriate.

Method: Procedure

1 The procedural information is relevant but not clearly described, so that the study is not easily replicable. Details of how the ethical guidelines were applied are included. Necessary materials have not been included and referenced in the appendices.

2 The procedural information is relevant and clearly described, so that the study is easily replicable. Details of how the ethical guidelines were applied are included. Necessary materials have been included and referenced in the appendices.

Results: Descriptive

1 Results are stated and accurate and reflect the hypotheses of the research. Descriptive statistics (one measure of central tendency and one measure of dispersion) are applied to the data, but their use is not explained. The graph of results is not accurate, is unclear or is not sufficiently related to the hypotheses of the study. Results are not presented in both words and tabular form.

2 Results are clearly stated and accurate and reflect the hypotheses of the research. Appropriate descriptive statistics (one measure of central tendency and one measure of dispersion) are applied to the data and their use is explained. The graph of results is accurate, clear and directly relevant to the hypotheses of the study. Results are presented in both words and tabular form.

Results: Inferential

1 An appropriate inferential statistical test has been chosen, but not properly applied.

2 An appropriate inferential statistical test has been chosen and explicitly justified. Results of the inferential statistical test are not complete or may be poorly stated.

3 An appropriate inferential statistical test has been chosen and explicitly justified. Results of the inferential statistical test are accurately stated. The null hypothesis has been accepted or rejected appropriately according to the results of the statistical test. A statement of statistical significance is appropriate and clear.

Discussion

1–2 Discussion of the results is very superficial. The findings of the student's experimental study are not compared to those of the study being replicated. Limitations of the design and procedure are not accurately identified. No modifications are suggested and there is no conclusion.

3–5 Discussion of the results is not well developed or is incomplete (for example, discussion of either the descriptive or inferential statistics is missing). The findings of the student's experimental study are mentioned with reference to relevant background studies and/or theories. Some relevant limitations of the design and procedure have been identified, but a rigorous analysis of method is not achieved. Some modifications are suggested. The conclusion is appropriate.

6–8 Discussion of results is well developed and complete (for example, descriptive and inferential statistics are discussed). The findings of the student's experimental study are discussed with reference to relevant background studies and/or theories. Limitations of the design and procedure are highly relevant and have been rigorously analysed. Modifications are suggested and ideas for further research are mentioned. The conclusion is appropriate.

Citation of sources

1 The references are incomplete or a standard citation method is not used consistently.

2 All in-text citations and references are provided. A standard citation method is used consistently throughout the body of the report and in the references section.

Report format

1 The report is within the word limit of 1,500–2,000 words. The report is complete but not in the required format. Appendices are not labeled appropriately and/or are not referenced in the body of the report. The abstract is poorly written and does not include a summary overview of the student's experimental study, including the results.

2 The report is within the word limit of 1,500–2,000 words. The report is complete and in the required format. Appendices are labeled appropriately and are referenced in the body of the report. The abstract is clearly written and includes a summary overview of the student's experimental study, including the results.