Coming up with good hypotheses

Recall, the characteristics of a good hypothesis are

- It is testable.
- It has very specific and unambiguous dependent and independent variables
- It makes a clear prediction – i.e. it not just says that the independent variable affects the dependent variable, but also specifies *how* it affects it

In the following hypotheses, one or more of these characteristics are missing. Identify the missing characteristic in the table and rewrite the hypothesis. The first one has been done for you.

Hypothesis	**Not testable**	**Unspecific independent variable**	**Unspecific dependent variable**	**Unclear prediction**	**Corrected Hypothesis**
Too much coffee causes loss in energy		✔ "too much"	✔ "energy"		Drinking more than 4 cups of coffee makes people report lower energy levels than people who don't.
There is an invisible fairy in my garden					

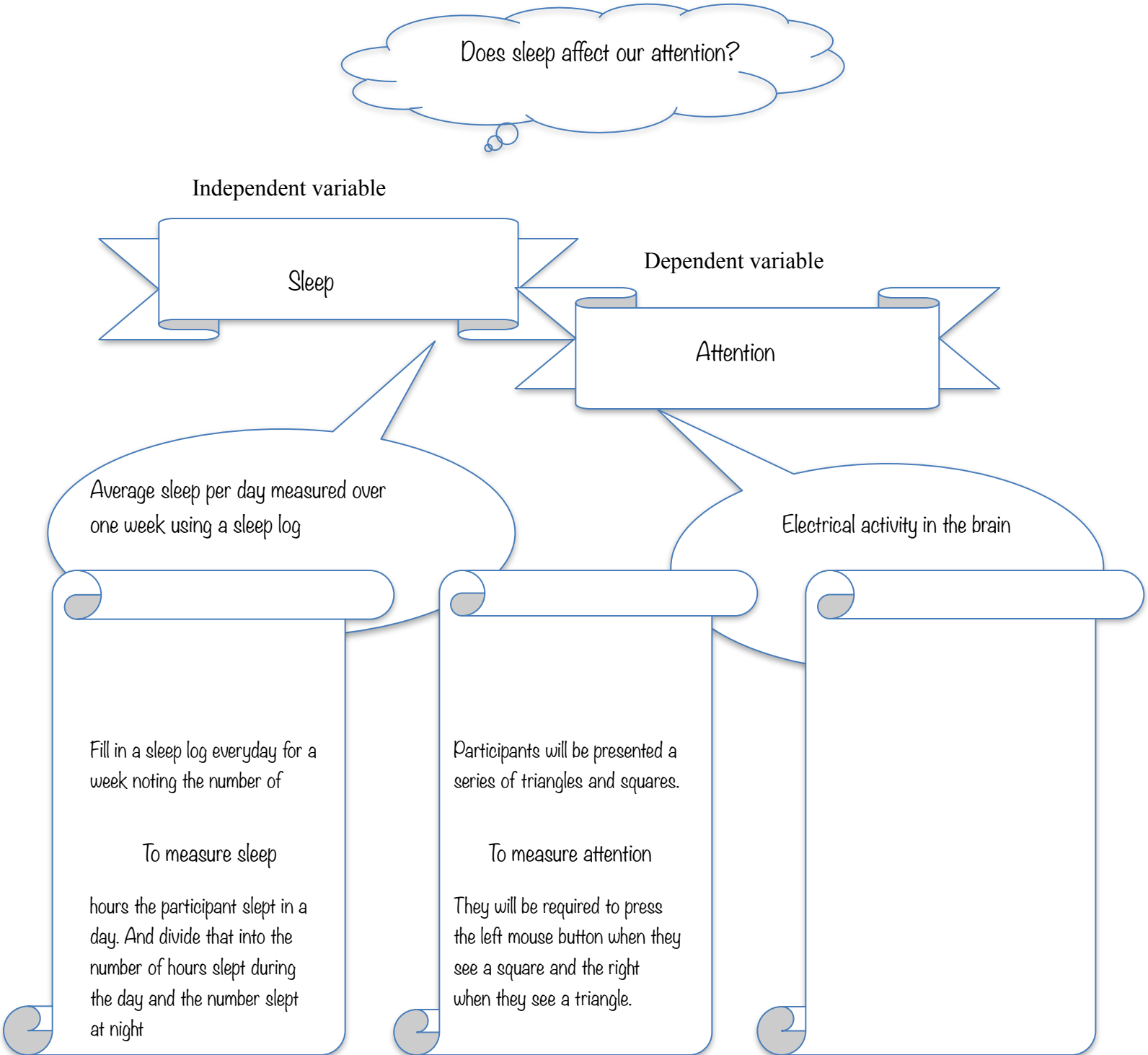
Being involved in MUNs in school has an effect on student's grades					
Watching more than five hours of television a day negatively affects one's life					
Exercise improves student performance on standardized tests.					
Eating too much chocolate is bad for your teeth					

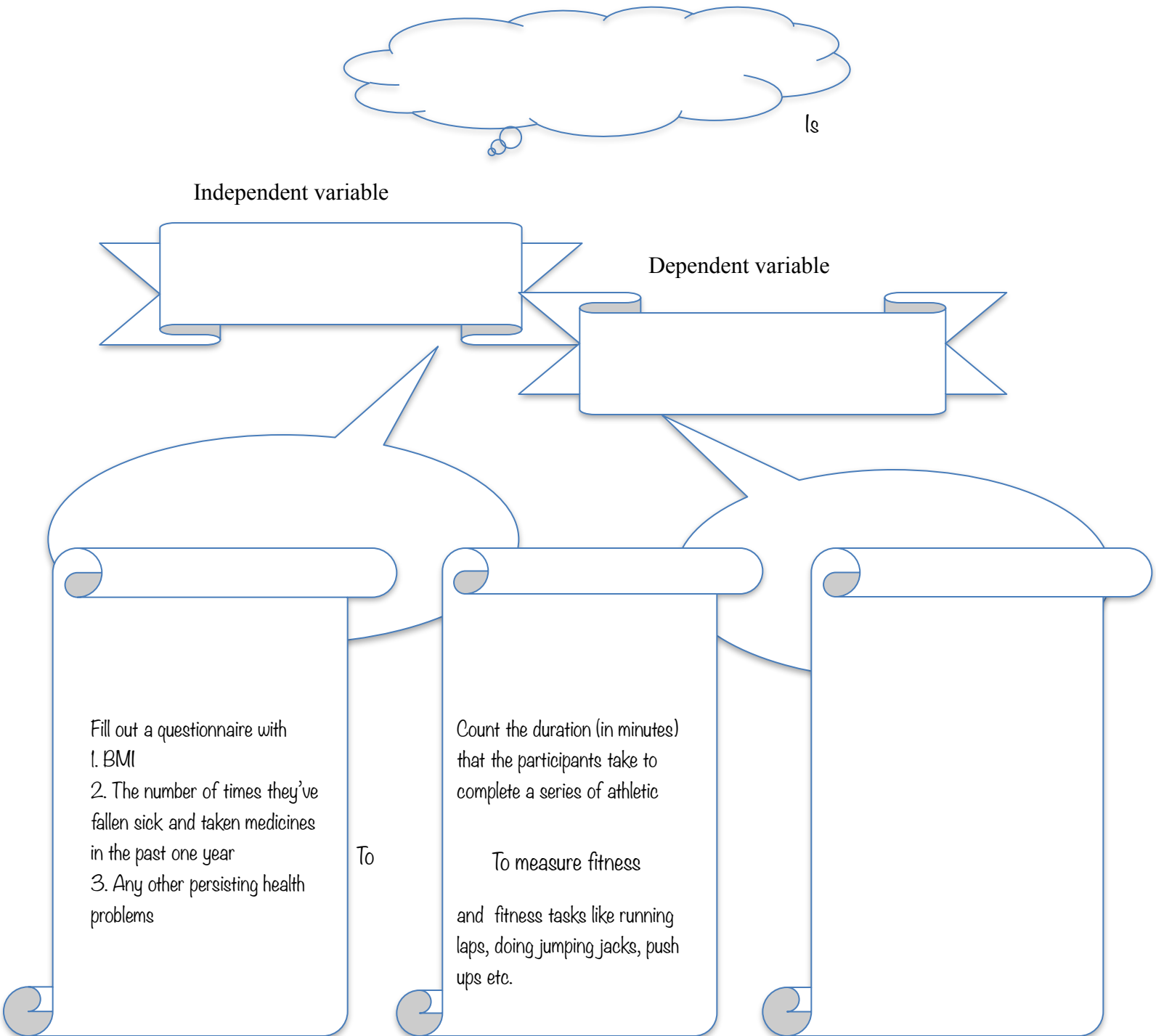
Designing experiments:

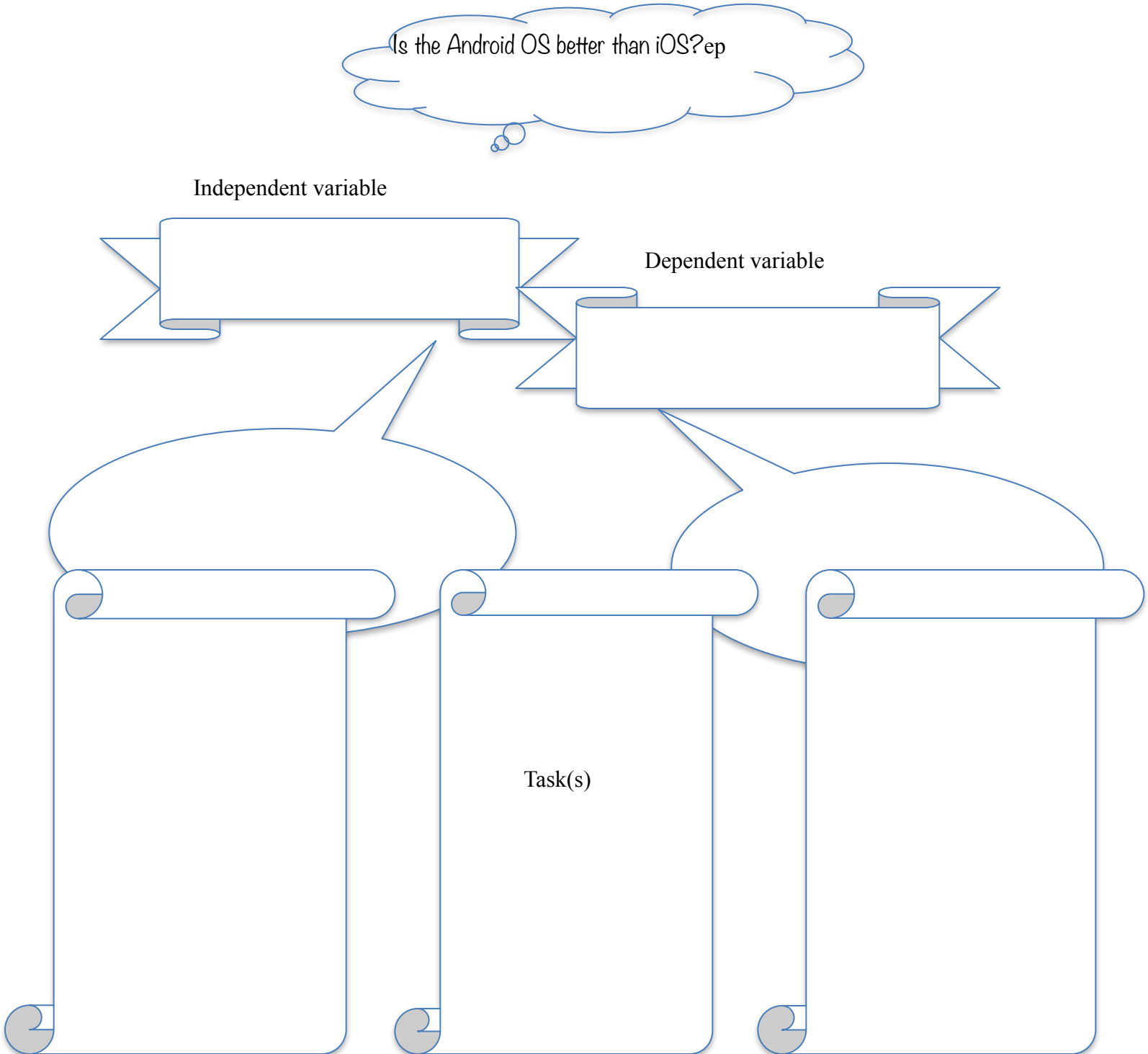
Recall the steps involved in designing an experiment once you have a question:

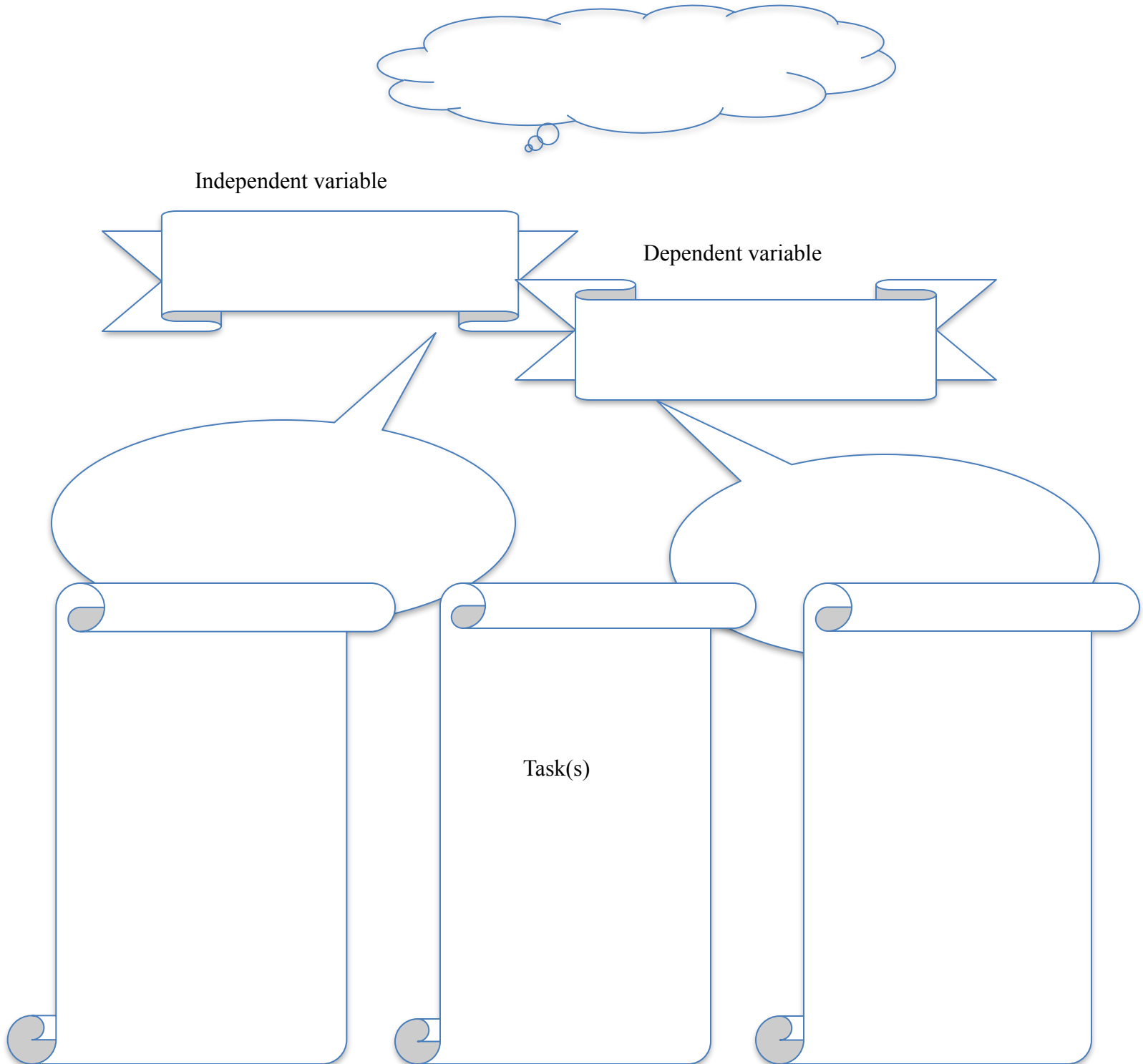
1. Identify the dependent variable in your question
2. Identify independent variable in your question
3. If the independent variable is too broad, define it more specifically in the context of the experiment. Similarly if it is not clear how you would measure the dependent variable, then specify that. These are your operational definitions
4. Come up with the actual task or tasks that the participant will perform

In the following pages, you will find an example of the experiment we designed in class with all these steps specified. You will also find other questions for which some steps are missing. Fill in these missing steps. Finally on the last page, come up with a question and complete all the four steps. Note every experiment that is designed must have at least one task. You can feel free to have more than three tasks in the experiment. You can just draw more boxes on a separate sheet and attach it.


Does sleep affect our attention?
Independent variable
Sleep
Dependent variable
Attention
Average sleep per day measured over one week using a sleep log
Electrical activity in the brain
Fill in a sleep log everyday for a week noting the number of
To measure sleep
hours the participant slept in a day. And divide that into the number of hours slept during the day and the number slept at night
Participants will be presented a series of triangles and squares.
To measure attention
They will be required to press the left mouse button when they see a square and the right when they see a triangle.


Is
Independent variable
Dependent variable
Fill out a questionnaire with
1. BMI
2. The number of times they've fallen sick and taken medicines in the past one year
3. Any other persisting health problems
To
Count the duration (in minutes) that the participants take to complete a series of athletic
To measure fitness
and fitness tasks like running laps, doing jumping jacks, push ups etc.


Is the Android OS better than iOS?ep
Independent variable
Dependent variable
Task(s)


Independent variable
Dependent variable
Task(s)

Benefits of portable and accessible technology

List the different ways in which Electroencephalograms (or EEGs) can be used. Discuss to what extent using low cost commercial systems (like the Emotiv system we are using in class) can be comparable to the more sophisticated and expensive EEG systems for all these different uses. Refer to excerpts about EEG, brain machine interfaces and the two research articles attached with the homework.

In most of the current EEG systems that are being used, the participants or the patients are connected to wires and cannot move. However the participants' movement need not be restricted when using wireless EEG devices like Emotiv. How does this influence the kinds of questions we are able to answer using EEG? What are some of the questions that can't be answered using the current EEG systems that we might be able to answer using devices like Emotiv?

If systems like Emotiv can successfully replace the more expensive systems that are currently being used in the fields of science and medicine, then EEG becomes more accessible to people who could earlier not afford EEG systems. For example, it would be possible for even schools to have an EEG system. How do you think schools will benefit from having an EEG system? Apart from schools, what other groups of people will benefit from more affordable EEG systems? How? Remember to take into consideration all the possible uses of an EEG system.