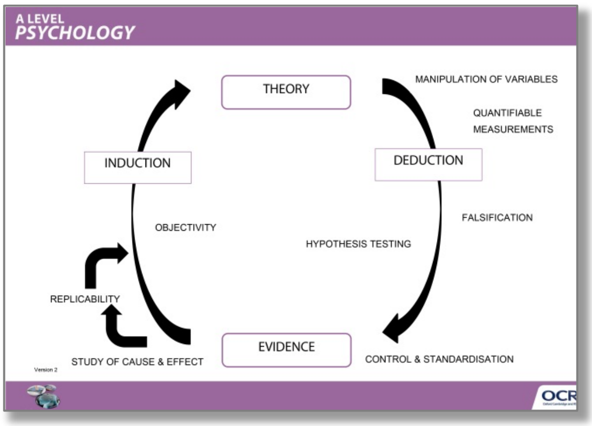
Lesson Element

Research Methods Activity 2

Instructions and answers for teachers

***These instructions should accompany the OCR resource* ‘Activity title’ *activity** *which supports OCR A Level Psychology.*



The Activity:

The aim of this task is for the students to develop their knowledge and understanding of the nature and principles of science through carrying out a piece of experimental research, which will also help them to understand the research process more generally.

The objectives are for students to:

- Know and understand the key principles of science,
- Develop their awareness of the relationship between these principles and how they contribute to the process of ‘doing science’,
- Develop practical skills associated with carrying out scientific research in psychology,
- Recognise scientific principles and processes within psychological research.

This activity offers an opportunity for English skills development.

This activity offers an opportunity for maths skills development.

Associated materials:

'Research Methods Activity 2' student sheet.

Introduction to Task

The nature and principles of science are very abstract concepts to deal with. Students often have a sense of what it means to be scientific or to 'do science' but often find it hard to articulate or do not have the language to help them to articulate it. The idea here is that students don't simply learn what the language of science is but also get to apply and reflect on it in a concrete way by actually carrying out an experiment.

Suggestions for Delivery

This task should be delivered over a number of weeks, and may be best run alongside another topic or component to make space for the research that needs to happen in between lessons. Although it is a major task, it can do much more than illustrate the scientific process. By its very nature, it addresses many other ideas and processes in component 1.

The task has been designed to be delivered close to completion of component 1 as it does assume a high level of prior knowledge and understanding of concepts such as hypotheses, experimental method, variables, sampling and ethical considerations.

The task relies on one key material resource which is a diagram which illustrates the scientific process. At least one lesson should be used to allow students to familiarise themselves with the diagram (and therefore process). One idea is to build up the diagram with a class, with the teacher explaining key ideas as they go along – as indicated overleaf.

The lesson could start by asking students to share what they understand by 'science' or 'being scientific'. They may find this hard to do in the context of Psychology depending where they are at in the course, so could be advised to think about other sciences they are studying, or think back to traditional sciences at GCSE.

The chances are that students will suggest ideas that match some of the key concepts on the specification. Even if students do not use the exact words, the teacher can make the match for them e.g. if a student talks about ‘finding out facts’ this may be linked to ‘objectivity’, or ‘testing’ may be narrowed down to ‘testing hypotheses’. If the teacher has each key concept already typed onto a card, they can stick that on the board as and when it is raised by the class.

At the end of the introductory discussion, the teacher sticks all key concepts on the board (if there are any left unidentified). The aim now is to build the diagram using these key concept cards. An active way of doing this is to share the cards out amongst the class so small groups of students are responsible for different cards. Then the outline of the diagram is drawn or projected onto the board. In a staged and structured way, the diagram is then built up by students coming up to the front and placing their concepts where they think they fit. For example, the teacher might start by asking which students think they have one of the four main concepts that make up the centre of the diagram. Once there are four volunteers (which may need to be negotiated up or down) they come to the front with their cards. At the board, they may need to debate what goes where until four are in place. It is best if the teacher does not supervise this – better still they turn their back to the board and put themselves in a position where they cannot really hear, so that the students don’t feel too monitored and exercise some autonomy. When they are ready, the teacher assesses the situation and encourages changes where necessary e.g. he/she may say one should not be there and gets the class to vote on which one, or he/she says that two need to be swapped – would any of the students that came up like the opportunity to swap theirs and so on. The exercise can continue very much in this vein so that the building of the diagram is truly interactive, supporting *all* students’ learning at the same time.

Once the finished article is on the board, the students can be given their own copy ready for the forthcoming lessons.

Task Instructions

The main task as a whole takes students through the process of experimental psychological research in a staged way. At each stage, students recognise and explain where they are at in relation to the process of 'doing science'. The idea is that by the end of the activity they have completed the cycle of scientific investigation, and can also see how this would continue to follow the same cyclical process.

Given the challenge of the task, this is best completed in groups of two or three where possible.

Stage 1: Induction

As individuals, students are asked to complete a homework task where they observe other students' behaviour around the school or college. Students can choose to observe any aspect of behaviour but may find it useful to have some guidance. For example, they could focus on territorial behaviour, use of personal space, body language, study habits, fashion, group behaviour, and so on. The important point at this stage is that it should be an observable behaviour although students may have an opportunity to ask questions about it further into the investigation. The observation is purposefully very unstructured.

The students' brief is to reflect on their chosen behaviour, and identify how it may differ between individuals and groups. They also need to reflect on these differences and ask themselves *why* they exist. For example, they may observe that some students seem to defend their territory more assertively than others. They may then theorise that this is linked to year group.

When students gather to share their observations, this may be a basis for grouping them – grouping students who have a similar 'research interest'. However students are grouped, the idea is that they agree on one behaviour on which to focus in their continuing research, and they agree on a theory to explain that behaviour. They have now formed a research team.

At this point, students can refer to the diagram that illustrates the nature and principles of science. They need to identify where they have started in the cycle. Students could first discuss this in their groups and then feedback to the whole class.

The objective is that students recognise that they have gone through the process of induction. In other words, they have made some general observations and from this generated a theory that they will go on to test. Using the diagram, they can make notes on their experience of this part of scientific enquiry.

Once students have established and understood what stage of the scientific process they are at, the following stages become predictable from the diagram. Now the tasks are different because they will deduce what they need to do next to take them through their scientific investigation.

At this point, students should be able to work relatively independently in their groups and at their own pace. The teacher's role would be to offer guidance by moving between the groups.

Stage 2: Deduction

Using their theory, students should now be able to go through the deductive process of making a prediction, for example, that younger students will defend their territory more assertively than older students.

To begin with, the prediction can be broad but the aim is for research teams to 'fine tune' this prediction so that variables become operationalized and that there is a statement which can be refuted.

The questions that students should be asking themselves at this stage are:

1. What is our independent variable? (It is advisable that students only deal with two conditions.) How do we distinguish between the two conditions? How do we do this reliably? For example, how do students distinguish between younger and older students, and how do they identify the age or year group of a student reliably?

2. What is our dependent variable? How are we going to measure it? How do we do this reliably? For example, how do we measure level of assertiveness in relation to territory. (Students may find it useful to have some examples of tools for measurement in psychology eg rating scales, criterion checklists, etc.)

3. Are we predicting a difference or no difference based on our initial observations?

4. Is our hypothesis refutable? (Here students could be encouraged to put themselves into the 'other camp'. If someone wanted to challenge their hypothesis, then would they easily be able to do this and how.)

Once students have constructed their hypothesis and this has been checked by the teacher, they are in a position to make notes on this stage of enquiry using their diagrams. In other words, they can relate their experiences to:

- The process of deduction,
- Manipulation of variables (IV),
- Quantifiable measures (DV),
- Falsification (refutability factor).

Stage 3: The study of cause and effect

At this stage, research teams collectively plan their investigation. As all will be doing experiments, they may benefit from a review of the features and value of experiments as a research method. This is, of course, an opportunity to emphasise the process of cause and effect, and the role this plays in prediction and control.

Students will already have begun to prepare to investigate cause and effect in their research by operationalizing the IV and DV, and it may be worth establishing this through questioning of students.

Students then need to consider the extraneous variables that they will need to standardise, or control by some other means, to reliably establish cause and effect. For example, territorial behaviour may need to be tested in the same environment each time, or territory should be threatened in the same way each time.

Control and standardisation will form a major part of their planning but it is also opportunity to make decisions on other key features such as sample, experimental design and ethical considerations.
At the end of planning, students should again make notes on their diagram to show how they aim to investigate cause and effect, and what control and standardisation they have planned for to make their research more reliable.

Stage 4: Hypothesis Testing

After the planning stage, and with their designs checked by the teacher, students are now in a position to run their experiments and collect the data to put the hypothesis to the test. This is an obvious homework task and, of course, the teacher or the students need to make decisions on how the experiment is run e.g. do they do it collectively as a team possibly with individual roles, or do they test a certain number of participants each and then pool their data.

Of course, part of hypothesis testing is analysing the data to see whether the research hypothesis is supported or refuted. The analysis is probably best done in lessons where the teacher can support students and assess their mathematical skills at the same time. Whether students use descriptive or inferential statistics to analyse data depends on where there are in the course but, if left late enough, it is obviously an ideal way of putting statistical tests into action.

At this point, it also makes sense that research teams share their investigation and findings with their peers. An obvious way to do this would be through presentation giving students an opportunity to develop another key set of skills. However, it may be appropriate to summarise the research on a poster, or a blog or similar.

At the end of this stage, students should be in a position to return to their diagrams and add notes on hypothesis testing.

Stage 5: Replicability and Objectivity

At this penultimate stage, students should reflect on how objective their investigation and its findings were. It might be useful for the teacher to start from the other perspective, and ask the research teams to consider ways in which they may have biased their experiment.

What students should understand from evaluating their own research is that objectivity can be partially judged by replicating an investigation, and that this is what leads to reliability. This may need to be teased out through careful questioning by the teacher.

If there is time, it would be an interesting exercise to get research teams to run another team's experiment, even if only on a smaller scale. Not only does this neatly demonstrate the idea of replicability, but also allows teams to establish the objectivity, and therefore reliability, of their own results. Whether research is actually replicated or not, students need to finish this stage by making appropriate notes on their diagram.

Stage 6: Conclusion

At this final stage, research teams need to draw a conclusion from their investigation, including any findings from replicated experiments.

Was their hypothesis (and therefore theory) supported? To what degree e.g. was the sample representative enough? Was the measure broad enough? Were results replicated?

Or was their hypothesis refuted - in which case do they need to re-think their theory? Or do they need to adjust their theory at least?

Whatever the outcome of their evaluation, students should be supported to see that they have gone full circle, and are now using evidence (albeit more empirical than first time round) to influence their theory. In other words, once again they are going through a process of induction.

They could add more notes to their diagram at this stage and, in doing so, could note that the scientific process is on-going and that more research would normally take place – especially if the theory has shifted as a result of the first investigation.

Differentiation of Task

The groups could be organised by ability to allow certain groups to carry out more challenging experiments, or could be organised to ensure a mixed ability to allow the less able to learn from the more able as they plan, run and evaluate an experiment together. The more able would also clearly gain by having to articulate their learning to peers whom require more support.

If groups are organised by ability, it would be feasible to differentiate that part of the investigation where data is analysed. Only some groups may use inferential statistics, or all may use inferential statistics but level of support may be differentiated.

Rather than do a presentation or poster of the investigation, there may be an opportunity for students to write a report of the experiment using the conventions in the specification. This could be done by individuals as a homework, or be written collectively. It might even be appropriate to give students different sections to write up, especially in a mixed ability group.

Preparation

Depending on the nature and ability of students, teacher may need to give some guidance on the kind of behaviours that can be initially observed. It might also be appropriate to think through the ethics of this part of the activity – even if it is largely public behaviour that is going to be observed.

It would be prudent to either take in students' planning work, or keep a record of what they are doing or where they are at with their investigation, so that appropriate support and guidance can be targeted in each lesson.

Whether students are creating a poster, putting together a presentation, or writing a report in order to share their research with others; they may find it useful to have a model example on which to base their own.

Students are prone to confuse the processes of induction and deduction, and so it is important to make a clear distinction between them. It might be worth students understanding that deduction reflects scientific practice more effectively. For example, it is much more impressive if someone is able to accurately predict who will win a contest before it happens (reflecting the deductive process) compared to someone who tries to explain the why the winner won after the event (reflecting the inductive process).