Health and movement science Stage 6 (Year 11)

Investigation and research support booklet

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This resource has been developed to assist teachers in NSW Department of Education schools to create learning that is contextualised to their classroom. It can be used as a basis for the teacher’s own program, assessment, or scope and sequence, or be used as an example of how the new curriculum could be implemented. The resource has suggested timeframes that may need to be adjusted by the teacher to meet the needs of their students.

# Overview

Research is a key feature of the Health and Movement Science 11–12 Syllabus.

The skill of research is an outcome in Year 11 **(HM-11-10)** and 12 **(HM-11-10)**, with a range of opportunities for students to research, investigate and delve deep into health and movement concepts.

In Year 11, students engage in a Collaborative Investigation. They work collaboratively to investigate an agreed topic aligned with content and concepts explored throughout coursework. Completion of the investigation forms a component of the mandatory coursework for Year 11 health and movement science.

The process used for the collaborative investigation reflects a research process. The focus of the collaborative investigation is on the knowledge and understanding, skills and processes involved, and the findings of the investigation.

For a credible conclusion to be drawn, the researcher must implement the principles of conducting an investigation.

This includes demonstrating ethical behaviour and designing and documenting the data in reliable and valid ways. Without understanding and implementing these principles of conducting an investigation, any data that is collected can be compromised, leading to wrong, questionable or invalid conclusions.

# Purpose

This document provides the following guidance on key considerations, processes and terminology used in research and investigation. This guidance should be used alongside the department’s support for collaboration and collaborative investigation published on the [PDHPE 11–12 webpages](https://education.nsw.gov.au/teaching-and-learning/curriculum/pdhpe/planning-programming-and-assessing-pdhpe-k-12/planning-programming-and-assessing-pdhpe-11-12).

1. Ethical considerations in research
2. RAFTER model – a framework for designing and evaluating research questions
3. Collecting, presenting and analysing data
4. Research methodology overview
5. Research glossary

# Ethical considerations in research

## Defining ethics

Ethics is defined as:

‘a system of moral principles, by which human actions and proposals may be judged…’ Macquarie Dictionary

The common theme is that ethics is about:

* doing what is considered the right or most acceptable thing in a situation
* being able to justify the suitability of decisions made and actions taken.

Ethical considerations are the guidelines that ensure responsible conduct of research. These assist the researcher(s) to monitor all stages of the research process including planning, conducting and reporting, to ensure a high ethical standard of behaviours are followed.

At its essence ethical behaviours ensure the protection of all people involved in the research. However, it also covers:

* informing, accessing and protecting research participants
* collecting, using and interpreting research data
* methods for reporting and reviewing research findings
* relationships among researchers with one another.

For health and movement science the overarching ethical behaviours when completing the collaborative investigation process include informed consent, integrity, privacy and respect.

## Informed consent

Informed consent involves providing clear information to all people participating in the research. This allows them to make an informed decision about whether or not to be involved in the research. Information should include:

* study purpose
* time commitment required, including duration and frequency
* research methods that will be used and any protocol information, for example safety, equipment, venue
* potential risks involved
* contact information for members of the research team.

Consent should be recorded in the following ways:

* written – the person signs a consent document
* verbal – record their response in writing or on an audio device.

Or it may also be:

* implied – the person gives consent by completing an online questionnaire.

## Integrity

Acting with integrity means doing what is morally right. It means being truthful and honest when conducting all forms of research. Integrity is often linked closely with the other ethical behaviours.

**Primary data collection**

When conducting primary research methodologies, all data must be treated with respect and fairness. Clear records must be maintained that outline the research methods used and procedures. This also supports the reliability and validity of the research. Passwords should be used on documents to ensure the safety and integrity of primary data.

**Secondary data collection**

Acknowledging the work of other researchers that has been completed previously is essential in this phase of the research. A bibliography and referencing throughout the research project can ensure integrity is maintained around the work of others. There are a number of methods used to cite the work of others, each school will have their own policies and processes.

## Privacy

To ensure successful outcomes for a research project, all participants need to feel safe.

Safety comes when people are confident and trusting that their identity and information will remain private. Confidentiality and anonymity are 2 ways that a researcher can work towards maintaining the privacy of those involved in research projects.

To maintain confidentiality, researchers should ensure that no personal information is shared or made publicly available to anyone who is not directly linked to the research team.

Anonymity can protect the identity and ensure the privacy of research participants. However, this is not always an option as data may be gathered through face-to-face interviews or observations. While it is possible that research participants may be hurt in some way if the data collection methods used are somehow insensitive, there may be danger that harm can be caused once data has been collected. This occurs when data is not treated confidentially, whether in terms of the storage of data, its analysis or during the publication process. Unless required, not collecting names or other personal details will ensure the privacy of all participants.

## Respect

Respect is an important ethical behaviour that needs to be considered at all stages of the research process. Respecting all people involved in the research process helps to avoid researchers making judgements about others. Showing respect for all people involved in the research (participants and other researchers) increases the opportunity for success in the overall process. Researchers need to acknowledge that perceptions are subjective to a person’s interpretation of things, which is based on previous experiences, emotions and beliefs.

To show respect, it is important not to judge anyone based on their identity, lifestyle or the way they approach a situation, make decisions or behave. The wording of questions in methodologies should be carefully considered so as not to offend or upset individuals. Respect is communicated through empathy. Empathy is the capacity to understand or feel what another person is experiencing from their perspective. That is, through an attitude that shows them that we know, accept and respect who they are, even if we do not necessarily agree with their opinions, behaviours or decisions.

## Considerations

As a starting point researcher(s) might use the [RAFTER model](#_RAFTER_model_–_1) as guidance when designing and developing their research question.

* Does the research question or focus have components of sensitivity, for example the content, the focus group, the application of the process?
* Are there aspects of safety which need to be considered and planned for before finalising the research question?
* How will informed consent from participants be collected? Will this impact completion of the research in the time frame?
* Could the way the group conducts their research and reports on their findings be questioned?

# RAFTER model – a framework for designing and evaluating research questions

Through the process of a collaborative investigation, students are required to collaborate to design their research question. Like the setting of goals, the collaborative investigation is a research goal that the group will work towards.

A research question:

* gives clear direction, focus and purpose to the investigation
* guides the path through the investigation, research and writing process
* can take the form of a problem statement, hypothesis or question.

Developing a research question in a group will involve initial pre-research, negotiation and collaboration. For the purpose of the collaborative investigation, the research question should include variables to promote authentic collaboration.

A variable is any condition that can vary or change in:

* quantity, for example dosage, intensity, level, amount, size
* quality, for example type of training, health behaviour, initiative or strategy, age.

One way to formulate a research question, problem statement or hypothesis is to use the Relevant, Answerable, Focused, Timed, Ethical, Resourced (RAFTER) model.

A ‘rafter’ is a series of structural pieces used to support and frame a roof. We can look to use the RAFTER model to help support and frame a research question. This model will assist in making the question more specific allowing a clear direction to be taken.

As students use the considerations provided for each part of the model, their research question may evolve or change.

Table – RAFTER model overview

|  |  |  |
| --- | --- | --- |
| Part of model | Definition | Considerations |
| R – relevant | Relevant to an area of syllabus content  Relevant to your chosen interest  Relevant to the collaborative investigation process | Is there a direct link to the Health and Movement Science Syllabus content?  Does this question link to specific content from Core 1 or Core 2?  Has the group selected something linked to content that sparks their interest?  Does the question allow for genuine collaboration in the group and input from each group member? |
| A – answerable | Answerable by collecting quantitative and/or qualitative data in a valid and reliable way  Answerable by reading credible secondary sources on the topic | Can this research question be measured and answered?  Do the variables in the question allow for data collection and analysis in a valid and reliable way?  Can primary and secondary data (qualitative or quantitative) used to answer this question be accessed and collected?  Does the question need to be narrowed further to make it easier to collect data?  Do the variables in the question allow for data collection and analysis in a collaborative way within the group?  Is this research question going to accurately test or measure what it is intended to test or measure (validity)?  Would a group get similar results if they repeated the process under the same conditions (reliability?) |
| F – focused | Focused on a particular population, age or characteristic  Focused on specific concepts rather than general or broad areas | Is the research question or focus specific for example age, gender or characteristic?  Does the question have a variable?  Do the variables in the question promote focus and specificity?  Are terms within the question focused with a clear meaning? |
| T – timed | Time to complete the data collection and research required  Time frames and periods align to complete research | Is there enough time to collaboratively conduct the research required to answer the question?  Does the research require a specific time frame or period, for example sporting season, start of school year, holiday period?  Is the data and resources accessible within the allocated time frame?  Does the question need to be narrowed further or changed if the required time and resources to answer the question are difficult to access? |
| E – ethical | Nature of the research focus requires further consideration around ethical behaviours, for example informed consent, integrity, privacy and respect | Does the research question or focus have components of sensitivity, for example the content, the focus group, the application of the process?  Are there aspects of safety which need to be considered and planned for before finalising the research question?  How will informed consent from participants be collected? Will this impact completion of the research in the time frame?  Could the way the group conducts their research and reports on their findings be questioned? |
| R – resourced | Required resources available and accessible to answer the question | Is the type and number of resources needed to collect and analyse primary and secondary data to answer the question accessible?  Is all required specialist equipment or software accessible to complete the research and answer the question?  Can reliable and credible primary and secondary sources be accessed to answer this question? |

**Differentiation:** some students may find answering a research question difficult as the answer is not defined. The pathway to answer the question will rely on students’ ability to identify themes in the data or set predetermined themes to help with the analysis. This can be especially difficult when the data is qualitative in nature and broad responses are given. A research question allows for a wide range of outcomes, meaning resources such as time and analytical skills are essential.

Using a research hypothesis will follow the same research or investigation process, however, to answer the hypothesis, students are seeking to either prove or disprove the statement, therefore the pathway to analyse the data is simplified. It therefore does not allow for a wide range of outcomes, simplifying the analysis and drawing conclusions steps of the investigation process.

A hypothesis can still allow for authentic collaboration.

# Data for research

Researchers rely on data to help solve a problem or answer a research question. There are many different types of data, and different ways to represent data once it has been collected. Researchers take information and organise it to make sense of it and make recommendations. If data is not collected ethically, reliably and validly, it will impact the credibility of the conclusion drawn.

## What is data?

Data is information collected by a researcher. Data is facts, observations or experiences on which an argument, theory or investigation is based. It can be numerical, descriptive or visual.

## Types of data

There are 2 main types of data that can be collected when conducting research, **quantitative** and **qualitative**. They are often used together to help the researcher get a full picture of the issue, population or problem being researched.

**Quantitative** data relates to quantities. Measures are expressed as numbers, for example how many, how much or how often.

Examples of quantitative data may include age, height, speed, distance, times, hours and heart rates.

Table – advantages and disadvantages of quantitative data

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| It is relatively quick and easy to collect | Does not always tell the full story |
| Interpreting the data can be straightforward | Unable to follow up interesting findings |
| It is easy to replicate (reliable) | Limited to closed responses (already defined answers) |
| Easy to access a large sample size |  |
| Easy to put into graphs and tables to identify trends |  |

**Qualitative** data relates to language and descriptions of attitudes, opinions or behaviours. Qualitative data is data that is not easily reduced to numbers. It tends to answer questions about the ‘what,’ ‘how’ and ‘why’ of an investigation, rather than questions of ‘how many’ or ‘how much’. It can be collected through the observations and recordings of the 5 senses of the researcher.

Examples of qualitative data may include observations, diary entries, video and audio recordings, transcriptions and photographs.

Table – advantages and disadvantages of qualitative data

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Can gain deeper understanding | Can be time consuming to gather and interpret |
| Allows for flexibility | Privacy and anonymity can be an issue |
| Can help explain quantitative data | Interpretation can be open to bias |
| Can capture a change in attitudes within a target group | Can lack precise controls |
|  | The large amounts of data can be overwhelming for the researcher to make sense of |

## Collecting data

[Data collection](https://www.youtube.com/watch?v=q17s84ADGfA&list=RDLVq17s84ADGfA) (5:16) involves 2 methods, **primary** and **secondary**.

**Primary** data collection is firsthand data that the researcher gathers themselves. **Secondary** data collection involves accessing data that has been collected by someone else.

Table – primary methods of data collection and how they can be presented

|  |  |  |
| --- | --- | --- |
| Primary methods | Types of data collected | How data is presented |
| Questionnaires | Qualitative  Quantitative | Graphs  Tables |
| Interviews | Predominantly qualitative | Transcript |
| Focus groups | Predominantly qualitative | Transcript |
| Experiments | Quantitative | Process  Graphs  Tables |
| Observations | Qualitative | Tables or tally sheet |
| Case studies | Predominantly qualitative | Transcript |

Table – secondary methods of data collection

|  |  |
| --- | --- |
| Secondary methods | Types of data collected |
| Literature review | Qualitative  Quantitative |
| Content analysis | Qualitative |

## Sources of data

Once the type of data has been decided, making decisions on who or where to collect the data from is the next step. Data can be gathered from:

* individuals
* groups
* print and electronic sources.

Decisions on who and where to access data from are important for the researcher. These decisions can impact on whether the data collected can be credible and reliable. Some questions or considerations when deciding on the sources are in the table below.

Table – considerations for accessing sources of data

|  |  |
| --- | --- |
| Source | Questions or considerations |
| Individuals | What new perspective can this individual bring to the investigation?  Is the individual an expert in their field?  Does the individual have the skill or capability to be a part of the investigation?  Is the individual bringing a one-sided message that could influence the outcome of the investigation?  Do I need to access different individuals to offer a broader perspective?  How can I access the individual?  How will I make sure that I represent the individuals’ whole views? |
| Groups | Who is the group that the investigation targets?  How can I capture data that represents a broad view of the whole group, rather than a small group? |
| Print or  electronic | How credible is the author?  How current is the content?  Are they selling a product or an idea?  Who is the audience?  When was it written, published or last edited?  Is the intention of the information to entertain, inform, educate or sell an idea or product? |

## Sampling methods

Data can be gathered from a census or sample. When data is gathered from a ‘census’ it captures the entire population, such as the entire school population. A ‘sample’ is when selected members of a group are involved in the research, such as one class in each year group. The census method is accurate, however takes more time to conduct and analyse the data.

There are a [variety of methods](https://www.questionpro.com/blog/types-of-sampling-for-social-research/) of sampling a population, each with their own advantages and disadvantages. For whatever the type of research, choosing the right sample group can impact on your results, either opening them up to speculation or ensuring the conclusion is trustworthy.

## Influences on collecting data

Ethics pertains to what is right and wrong in conduct. Ethics is about:

* doing what is considered the right or most acceptable thing in a situation
* being able to justify the suitability of decisions made and actions taken.

Ethical behaviour or the moral principles of the researcher can influence the data collected. If this is not a priority, the data collected will be judged as useless, as will the conclusion to the research question or hypothesis.

The researcher must maintain ethical behaviour when collecting data from both primary and secondary sources. Throughout the investigation process, the researcher continuously makes decisions on how to collect the data and what data to use. They may use the questions in Table 7 to help keep their behaviour ethical.

Ethical considerations for primary sources includeindividuals and groups. It is the researcher’s responsibility to ensure that these sources feel a level of comfort and safety, resulting in offering truthful responses or full commitment physically to experiments or observations. This ensures that the data collected is reliable.

Table – considerations and questions for accessing primary data ethically

|  |  |
| --- | --- |
| Source | Questions and considerations |
| Individual and groups | What data do I need to collect to answer the research question or hypothesis?  How will I collect that data?  What types of questions/observations will I use to collect that data?  Who is the target sample group and how will I access them?  What time of day, or what conditions are needed to make sure the data collected is not impacted?  How will the sample group know they can trust the process of data collection?  How will the sample group know I will keep their data confidential?  What types of communication is needed for the sample group to feel safe to give honest responses?  What instructions will need to be given when collecting the data?  How will I store the data to increase participant confidence in the process?  What if the data I collect is not what is expected? |

**Ethical considerations for secondary sources** such as print and electronic may be evaluated and used based on the CRAAP framework, as shown in table 8.

Table – considerations and questions for accessing secondary data ethically

|  |  |
| --- | --- |
| Term | Questions and considerations |
| Currency | How recent is the information? |
| Relevance | Is the information related to the topic under investigation? |
| Authority | Who published the information? |
| Accuracy | Is the information accurate and reliable? |
| Purpose | What is the intention of the information? |

This table is an adaptation of [The CRAAP Test: Critically evaluating information sources – transcript](https://www.library.qut.edu.au/transcripts/craaptest.jsp) by [QUT](https://www.qut.edu.au/).

The answers to these questions, if responded to in an ethical manner, will ensure that the data collected is reliable and credible. Therefore, the audience can accept the true findings of the investigation.

# Presenting data

Data in its raw form can be complicated to decode and extract meaning from. Presenting data is a key step towards breaking down data to extract the useful content. Data can be represented as graphs, tables/charts or transcripts, and they support researchers to analyse data and observe trends.

How a researcher presents data will depend on the method of collecting data. Once all data has been collected, presenting it in a way that is simple to understand is important to be able to provide clear insights into your group’s findings. There are a variety of ways this can be done, depending on whether quantitative or qualitative data has been collected.

## Quantitative data

Programs such as Microsoft Excel allow students to create visualisations of data sets, for example, graphs and tables. Students can [enter the raw data](https://support.microsoft.com/en-us/office/arrange-data-for-specific-types-of-charts-in-excel-for-mac-d56fe26d-0c9e-4ab5-825f-36136363163c) into the cells of Excel, highlight the set of data and ask Excel to recommend a chart. It will provide students with several types of charts options and provide recommendations on the most appropriate based on their raw data.

### Graphs

Graphs create a pictorial representation of the data. They are used to provide an at a glance illustration of the main findings and are usually used to visualise trends and relationships. Different graphs are used to present and represent different data. For example:

* pie graphs are useful to show proportions of a whole (usually used to display percentages of things)
* line graphs are great for showing change over a period of time
* bar graphs are great for comparing between groups.

Data labels including descriptive titles and labelled axes should always be included to help emphasise or explain a particular piece of data and help the reader easily understand what is being shown. The horizontal (x) axis is usually based on fixed values that increase from left to right, the vertical (y) axis includes the variable data.

Table – types of graphs and their features

|  |  |  |
| --- | --- | --- |
| Type | Features | Best suited for |
| Column graph  Example of a column graph. | * A column for each category * Space between each column * Each column is the same width * Categories along the horizontal axis * Frequencies along the vertical axis – equal spacing * Title of graph and labels on both axes | * Categorical data * Numerical – discrete * Comparing 2 or more groups or categories |
| Pictograph  Example of a pictograph. | * Key to show what symbols or pictures means * Each picture is identical in size and shape * Title of graph and label on horizontal axis | * Categorical data * Numerical – discrete * Younger audiences when comparing categories |
| Bar or divided bar graph  Example of a bar or divided bar graph. | * Whole bar represents the whole data set * In a divided bar, each segment represents the proportional size of each category * Similar to a sector graph * Title of graph and labels for each segment (could be shown in a legend) * Number or percentages showing the size of each segment | * Categorical data * Numerical – discrete * Displaying a breakdown of a category |
| Sector or pie graph  Example of a sector or pie graph. | * Circle represents the whole data set * Each segment represents the proportional size of each category * Similar to a divided bar graph * Title of graph and labels for each segment (could be shown in a legend) * Number or percentages showing the size of each segment | * Categorical data * Numerical – discrete * Provides an overall feel for your findings in one visual * Demonstrating differences in size of data responses |
| Line graph  Example of a line graph. | * Title of graph and labels on both axes * Time is often displayed on horizontal axis – equal spacing * Frequency is displayed on vertical axis – equal spacing * Individual data points are joined by a line | * Categorical – ordinal * Numerical – discrete * Comparing large amounts of data * Showing trends, predictions, changes |

### Tables

Tables include both written and numerical information. They usually communicate exact values, giving a brief overview of various results and drawing attention to others. They allow data to be presented in a clear and concise manner without the lengthy explanation. Tables are:

* an organiser for an investigation
* a way of presenting data in a report.

When creating tables:

* a clear and simple title is required to summarise what the table is showing
* any column heading should have all the information needed to define the tables meaning
* the fewer columns the more readable
* using colour in your table can highlight key points for the reader.

Considerations for when using tables:

* avoid repeating the same information in a table and a graph
* use text paragraph when there is not extensive data to display
* tables are read in a sequential order, plan the order of the data presented for reader ease
* use tables if precise numbers are important for the comparison of data
* tables are useful for showing ranks.

## Qualitative data

Presenting large amounts of data can be difficult and time consuming. Parts of the qualitative data may not support the conclusions and will not be necessary to present in your investigation but is important to the overall story of the investigation and evidence of the data collection. Using transcripts of interviews or focus group are a way of presenting the data.

A transcript is converting a speech or interview into text, word for word. While the task can be laborious in nature, there are many benefits and modern talk-to-text technology can increase the speed of the task.

Presenting data in a transcript enables the researcher and others within the investigation group to perform a content analysis. Using time stamps to organise the transcript can flag key quotes and ideas, identify points that relate between quantitative and qualitative (the interview) data to create themes and to find common patterns across the data sets.

# Analysing data

Once students have collected and presented their data, they will need to be able to form a point of view by creating relationships, interpreting, speculating, critiquing, analysing and constructing meanings that allow conclusions to be drawn. At this point, usually more than one method has been used to collect data, each method bringing a certain element, so when combined together the researcher has a clear picture of the research as a whole and the correct conclusions can be drawn.

For example, primary data that has been collected through a questionnaire brings quantitative data. To create context and understanding, this can be combined with qualitative data from an expert, gathered from an interview. Where gaps are missing, a literature review or content analysis of secondary sources may be used to collect credible secondary data.

## Creating relationships between quantitative and qualitative data

An investigation should contain both qualitative and quantitative data. While charts, graphs and tables are good for some types of information, they do not tell the whole story. They convey data visually, however, not meaning, and meaning is invaluable to understanding the overall conclusion. Without the meaning, inferences often have to be made from the data shown.

Likewise, if only qualitative data were presented, readers would have no evidence or clear numbers or statistics that visually support interpretation of findings which readers need to understand how conclusions are drawn. The quantitative data helps to answer the ‘what’ of the research or investigation question and the qualitative data helps to answer the ‘why.’ Together this will support a high-level analysis and provide a logical flow from quantitative to qualitative data so the audience can see how the numbers or statistics and the interpretations are connected.

## Quantitative data

Quantitative analysis is focused on combining information across a group or multiple groups of people, factors, things or themes and using this to draw out wider trends.

Before analysing the results, the researcher must interpret the data first. The following reflective questions can be used as a guide to; interpret the data, determine reasons for data and comparing the data. They can assist in creating relationships with qualitative data.

Interpretation questions:

* Explain the graph or table in words. This should be presented using percentages of the whole sample to create a narrative for the reader.
* What was the most common response?
* Were the results expected?
* Are there any trends in the data?
* Are there any outlying results? Can these outliers be accounted for?
* Were there differences or similarities between the age groups, gender or cultural groups in my sample?

Possible ways to start the data interpretation:

The results indicate …

The most common response was …

The evidence for these results can be seen in the above graph, showing …

A trend that exists …

Subjects in the 20–25 age group were more likely to favour …

Following the interpretation of the data, the reader should be asking ‘why.’ Answer this by identifying one of the trends, patterns or relationship to:

* identify possible reasons for the trend, pattern or relationship found
* make inferences and predictions from graphs and justify.

The reasons, inferences and predictions need an evidence base and is the result of deep reading and understanding the topic. This can support, clarify or use qualitative data or secondary data. The qualitative or secondary data may even challenge the quantitative data. Consider the following:

* Are the results similar or consistent with other studies or knowledge about this topic?
* Does the secondary data provide evidence to support or challenge the findings?
* Do the results reflect, differ and/or extend on the area of interest, issue or focus?
* What conclusions can be drawn from these results?

## Qualitative data

Analysis and interpretation of qualitative data coming from open ended questionnaire questions, interviews, observations or focus groups requires judgement and care, to identify key themes and ‘decode’ meaning in what people have said. Analysis of qualitative data should identify the main themes (in students’ own words) and illustrate these with quotes (in the words of respondents or observed facts). The analysis should also identify ‘outlier’ positions – perspectives that are equally valid and important, but less common.

The nature of qualitative data is that it is time consuming to gather and interpret. It can also be overwhelming for the researcher to make sense of. Working with a large volume of qualitative data may require ‘coding’. Coding is a useful strategy when working with a large volume of qualitative data.

* The first step is to create some categories. Start by reading the first few pages of comments and identifying consistent themes. For example, in response to the question ‘How do you think young people’s meaning of health has changed over time?’ themes might emerge like ‘more access to health education’, ‘more of a focus on mental health rather than just physical health’, ‘health is strongly determined by genetics’ and so on.
* When coding open-ended responses in a spreadsheet, start with each comment in its own row. Each theme then gets its own column. Ensure there is an ‘other’ column.
* For each comment, put a ‘1’ in each of the columns where that theme is identified.
* If there is a need to clarify, expand or split a theme during coding, pause at that point to check comments that had previously been tagged in that theme and reapply the new code-frame.
* At the end, review the comments coded ‘other’ and ensure that they are genuine outliers.
* Once qualitative data has been coded, the data should behave like a multiple response quantitative question, allowing greater comparison and additional analysis to be undertaken. The coding and identifying themes in qualitative data will support stronger links to the quantitative data.

# Drawing conclusions

The success of the whole research paper depends on the way the hypothesis is proved or disproved. This can only be done if the researcher is able to report on the answers discovered by the research method(s).

A conclusion should revisit the purpose of your investigation or hypothesis. Each part of your data collection both primary and secondary come together and form pieces of the puzzle to form the answer to the original question or hypothesis. Your conclusions should be valid (that is, logical) and limited to the results of the investigation.

When drawing conclusions, researchers often:

* make recommendations for future research
* justify or propose how the findings of the research could be used to benefit audiences.

# Research methodology overview

Research methodology is the umbrella term, that simply refers to how a researcher or team of researchers’ design, collect and analyse data to answer the research question or hypothesis. It is a system of methods used together for conducting research.

A research method is the behaviour or tool to collect data. To collect the data, the researcher will follow a rigorous step-by-step process that can be replicated. Individually, each method will collect an aspect of the research question or hypothesis. When put together the results of each method will create enough data to complete a full picture to answer the research question or hypothesis.

Establishing sound research methodology practises involves understanding the whole process of investigation or research. To begin, the researcher(s) need to look at the big picture and what the aims and objectives of the research are. Simply asking, ‘what do I want to find out and how can I find it out?’ Understanding the steps prior to selecting, creating and applying research methods is pivotal to ensuring the gathering of valid and reliable data.

Through the Health and Movement Science 11–12 Syllabus, students will use the following 10 steps as part of the collaborative investigation process:

1. forming a group
2. identifying areas of interest
3. collecting, analysing and recording secondary data
4. developing a research question
5. selecting research methods
6. creating methodologies to collect data
7. applying research methods to collect data
8. interpreting and analysing research to determine findings
9. drawing conclusions from the research
10. presenting findings to the class or a panel of experts.

Figure – collaborative investigation 10-step process

10 steps as part of the collaborative investigation process:
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4. developing a research question
5. selecting research methods
6. creating methodologies to collect data
7. applying research methods to collect data
8. interpreting and analysing research to determine findings
9. drawing conclusions from the research
10. presenting findings to the class or panel of experts.The steps prior to selecting research methods, creating methodologies to collect data, applying research methods to collect data and the steps to follow will support the researcher(s) to decide:

* what data to collect (see data fact sheet for more information)
* who (sample/population) or where (secondary sources) to collect the data
* how to collect data
* how to analyse the findings.

## Research methods

There are many different methods a researcher can use to collect data. Each method has its own purpose, collects different types of data, needs its own set of resources, and all have strengths and limitations. The types of methods commonly used include:

* interviews
* focus groups
* questionnaires
* experiments
* observations
* literature reviews
* case study research methods
* content analysis.

A number of reflective questions can be used by a researcher to decide on the most suitable research method.

* What data do I need?
* What resources (time, experimental equipment, space) do I have access to?
* Can I collect the data myself? Do I have the expertise to collect and analyse the data?
* Do I have access to the sources/people (known as the target sample group) I need to collect the data?
* How will I record and store the data?

The answer to these questions can help identify which method the researcher will use.

The reliability and validity of the research is reliant on the correct research method being chosen.

## Interviews

Interviews are a primary research methodology that aim to gain an in-depth understanding of a topic. Interviews can be conducted face-to-face or may use technology, for example, video conferencing or phone calls. They also allow consideration of non-verbal communication and cues, not just what people say. They typically gather qualitative data and involve 2 or more people. One is the interviewer and the other is the subject. If there is more than one subject being interviewed at that point in time, it is called a focus group.

Interviews rely on people expressing their opinions or describing their own experiences, attitudes or behaviours. This relies on memory, as well as their willingness to disclose information. There can be a risk of the respondent to not ‘say the wrong thing’ and therefore the data collected may not be completely accurate.

Table – interviews advantages and disadvantages

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Depth of responses | Time consuming to conduct and organise |
| Flexibility of face-to-face or over the phone interview | Small number of people interviewed due to data analysis |
| Able to ask follow-up questions to gain depth of understanding | May not reflect the views of the wider population |
| Collect large amounts of data, rich in context and stories | Open to subjectivity |
| Can read non-verbal cues | Responses vary, so results are difficult to compare |
| When completed online or recorded in online spaces, an automatic transcript can be created | The subject must feel safe enough to respond honestly and is the responsibility of the researcher |
|  | The quality of the questions and how the questions are composed can limit the quality of the interview |

## Focus group

A focus group is a group interview whereby the person conducting the focus group acts as a facilitator who encourages discussion and interaction between participants.

The focus group can gather both qualitative and quantitative data and is also a good way to read body language as people discuss the research topic. The role of a facilitator is to encourage the discussion which is different to an interviewer just asking questions.

The participants usually share a common interest or characteristic related to the research focus. Facilitators must be very skilled to enable participants to feel comfortable within the group so they can express their opinions, describe their own experiences, attitudes, motivations and behaviours. Transcripts are created from focus groups and data is collated into themes to help answer the research question. If more than one person is facilitating, the team will need a way of ensuring consistency regarding how questions are asked, how conversations are recorded and analysed.

Table – focus group advantages and disadvantages

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Understand experiences and personal perspectives | Participants may not want to ‘say the wrong thing’ (social desirability bias) |
| Allows follow up questions or clarification | Interviewer may influence responses (researcher bias) |
| Helps explore complex issues and experiences | Time consuming to collect and analyse all data |
| Participants may be more confident in talking about their experiences | Participants may be influenced by the answers of other group members |
| Can be time effective | Requires large amounts of planning and organisation time |

## Questionnaires

Questionnaires are more common in quantitative research where a researcher wants to gather data and insights from a large target population. Questionnaires gather data about peoples’ experiences, opinions, attitudes and motivations through a consistent set of questions. They allow generalisation to the broader population if the sample population has been done carefully.

Questionnaires can be written, digital or oral. Questionnaires require careful design in the wording of questions and response options. A variety of question types may be used including multiple choice, rating scales, open-ended questions, likert scales, demographic, ranking and yes or no questions. Creating a pilot questionnaire is recommended to test on a small group to ensure the successful design of the questionnaire.

Table – questionnaires advantages and disadvantages

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Easy to access a large sample size | Response rates can be low |
| Inexpensive | Cannot investigate responses further |
| It is relatively quick and easy to collect | Meaning of a question can’t be clarified part way through the survey |
| Interpreting the data can be straightforward | If the sample is small or unrepresentative, interpretations of data can be unreliable |
| Easily made private and confidential, data is more likely to be honest and free of bias | No ability to see non-verbal cues or body language |
| Deeper analysis of data can occur when comparing demographic populations within the sample group to data collected |  |

## Experiments

Experiments are designed to test hypotheses under controlled conditions. The researcher attempts to understand cause and effect by manipulating the variables so they can create an environment where they can test their hypothesis. It can look at how a change in one variable results in a change in another.

Researchers can remove or control other factors by narrowing their focus on a small number of variables. A control group may be required to allow comparisons to be made. Experiments follow a ‘scientific routine’ that can increase the validity and reliability of results. Due to the controlled nature of experiments, they can often be replicated over time.

Table – experiments advantages and disadvantages

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Strongest way to test cause and effect relationships | Can be expensive and difficult to implement |
| Researchers can isolate specific variables | Can require expensive equipment |
| Researchers can gain a high level of control | Can be affected by user errors |
| Experimental research can be easily duplicated | There may be ethical or practical problems depending upon the variables manipulated |

## Observations

Observations involve collecting data through the 5 senses of the researcher(s) and documenting it. It is the watching, hearing, feeling, touching or smelling behaviours, interactions, events or noting characteristics of participants in their natural setting. It is done by observing things in a systematic and meaningful way. Observations can be used to collect quantitative or qualitative data. The success of observations involves very clear planning of what is to be observed and how the data is to be collected, organised and analysed.

There are 2 main types of observations direct (participant) or indirect (non-participant) observations. Direct observations involve the researcher being physically present and monitoring what takes place. Indirect observations are when the recording is done by cameras, or other electronic means. During direct observations the subjects are aware that they are being observed and this can alter their behaviour.

Table – observations advantages and disadvantages

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Occurs in the natural setting | Can be time consuming |
| Simple to conduct | Results can be subjective |
| Can see firsthand what people do rather than what they say they do | Bias in the recording of events viewed |
| Not reliant on people providing information | Presence of observer may influence the behaviour being observed |
| Other data can be observed outside the original parameters of the research | No historical data is collected only what is observed at the time |

## Literature review

A literature review is an overview of existing knowledge and literature in a given subject or chosen topic area. A literature review summarises, analyses, evaluates and synthesises the published literature on a topic. A literature review may also identify the gaps in the current knowledge – things that are yet to be investigated or under-researched areas.

A literature review can provide a background to a researcher’s work by summarising the previously published work on the chosen topic. It can also provide changes over time by indicating historical patterns, if applicable, as well as explaining recent developments. A literature review can help justify and focus research by indicating how it is different from other existing work in a similar topic area.

It is important when completing a literature review to act with integrity and respect for the work that has been previously completed. It is essential that the information used is acknowledged and referenced as it assists researchers to create or develop new ideas or research. Students should be reminded of the work completed as part of the [All My Own Work](https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/hsc/hsc-all-my-own-work) program.

Table – literature review advantages and disadvantages

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Large amount of research available | May not find information which is specific enough to the topic |
| Identifies current knowledge or gaps in a research area | Time consuming |
| Helps to evaluate trends within a research topic | Not providing new information on the subject |
| Determines methodologies in past studies of similar topics | May not be credible or academic sources |

## Case study

A case study research method is an in-depth, detailed study of an individual or a small group of individuals. A case study is a written account that gives detailed information about a person, group or thing and their development over a period of time. Such studies are typically qualitative in nature, resulting in a narrative description of behaviour or experience.

Table – case study research method advantages and disadvantages

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Gives deeper insight into a topic or issue | Time consuming, as periodic data collection points are needed |
| Provides examples or evidence to support research | Open to bias through sampling method and questioning |
| Gathers information not accessible by other research methods due to flexibility (real time) | Specific to an individual and not necessarily representative of a large group |
| Can be used to develop a hypothesis | Large amounts of data both qualitative and quantitative, collected by multiple sources. |
|  | High-level content and statistical analysis skills needed to analyse the data collected |

At times, case studies will be referred to as a secondary method. This is due to the required depth of content and detail in data collection and the monitoring of the data over a period. Researchers use research from published case studies to guide further investigations.

## Content analysis

As a qualitative method, a content analysis is used to analyse and interpret themes, words and images from sources such as documents, newspapers, advertising, images, film, other cultural artefacts and media. Once the sources have been identified, a pre-determined set of themes is established and coding occurs. Coding rules are especially important if there are several researchers, these can be based on:

* frequency of individual words or phrases
* the number of times an image or theme of images occurs
* identification of repeated patterns.

Storing and documenting a content analysis in a table or excel spreadsheet is essential given the large nature of the data. After coding the responses, the researcher analyses, interprets and makes qualitative judgements about meanings of the content.

Table – content analysis advantages and disadvantages

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| Qualitative | Time consuming due to the nature of coding |
| Can be used with text, audio or visual data | Limited to small amounts of data |
| Provides depth to research to discover hidden meanings in research | Open to subjectivity or misinterpretation, leading to bias |
|  | Difficult to present digitally |

# Research glossary

The glossary explains terms that will assist teachers in the interpretation of the collaborative investigation.

Table – research glossary

|  |  |
| --- | --- |
| Term | Definition |
| bias | A tendency to favour one viewpoint, idea or outcome over others. It can be conscious or unconscious and arise from various factors such as personal experience or values, or from deliberate manipulation. |
| bibliography | A list of all the sources an investigator uses in the process of generating and researching their ideas and work. |
| case study research method | An in-depth, detailed study of an individual or a small group of individuals. Such studies are typically qualitative in nature, resulting in a narrative description of behaviour or experience. |
| confidentiality | Not sharing information gathered through an investigation without informed consent. It may include maintaining anonymity for participants by removing identifiable characteristics of individuals in research findings. |
| content analysis | A qualitative method used to analyse and interpret themes, words and images from documents, film and other cultural artefacts and media. After coding the responses, the researcher analyses, interprets and makes qualitative judgements about meanings of the content. |
| credibility | A measure of whether a research or investigation’s process, methods and findings are trustworthy. An investigation process which reflects reliability and validity is deemed credible. |
| ethical | Relates to moral principles. Pertaining to what is right and wrong in conduct. Abiding the rules of conduct recognised in certain patterns of behaviour. |
| experiment | A method of collecting primary data that is conducted to test a hypothesis. It is a scientific or systematic procedure where researchers manipulate one or more variables to observe the effect on a dependent variable while controlling other variables. The validity of an experiment is dependent on the quality of its design and the control of confounding variables that might influence the results. |
| focus group | A discussion between 2 or more people in which the researcher plans areas for discussion. This could include a combination of open questions, response to stimulus material such as images, materials, themes or problems for open discussion. |
| hypothesis | The statement or a prediction the research study sets out to prove or disprove. Usually expressed as a precise and unambiguous statement that can be supported or refuted by investigation. |
| informed consent | Providing all people participating in the research with clear information of what is to be done within the research study, allowing them to make an informed decision about whether to be involved in the research. |
| integrity | Relates to the honesty of all aspects of the research process. It requires researchers to follow established protocols and guidelines, to use rigorous and reliable research methods, to avoid plagiarism and to disclose potential conflicts of interest. This ensures data that is collected or conclusions that are drawn are presented with honesty, openness, fairness and with respect for intellectual property. |
| interview | A planned and structured conversation between 2 or more people with a set of predetermined questions developed by the researcher. |
| literature review | A search and evaluation of the available literature in your given subject or chosen topic area. It provides an overview of the previously published works on a topic. |
| observations | A process of watching and recording the behaviours of individuals or groups as part of a research activity. |
| participant | An individual or group involved in the collection of primary data. |
| primary data | Original materials collected firsthand by the investigator or researcher, for example observation notes, measurements, responses to a survey or questionnaire. |
| privacy | The right to be left alone, be free from interference or intrusion, and to have some control over your personal information and how it is accessed, used and shared. |
| qualitative data | Relies on personal accounts or opinions, words and meaning to illustrate in detail how people think or respond. Information is expressed in words and narratives. |
| quantitative data | Information that is numerical in nature that can be presented as numbers, graphs and tables. |
| questionnaire or survey | Any written set of questions a researcher is asking an individual. The purpose is usually to find out information about an individual. |
| reference list | A document that provides a comprehensive list of secondary sources that have been cited such as a research paper, essay or other written work. The purpose of a reference list is to acknowledge and give credit to the authors of the sources used in the work, and to allow readers to locate and verify the information presented. |
| reliability | How consistently a method measures something and the extent to which the results can be reproduced when the research is repeated under the same conditions. |
| research | An investigation of a particular topic, problem or question, using a set of methods and procedures. It is a process of discovering new knowledge, testing and validating existing theories, or generating evidence-based conclusions. |
| research methods | A systematic plan for conducting research. How information or data will be collected to assist in answering a question; whether qualitative or quantitative.  Qualitative methods aim for a complete, detailed description of observations, including the context of events and circumstances. Quantitative methods aim to classify features, count them and create statistical models to test hypotheses and explain observations. |
| research problem statement | Presents the idea, issue or situation that the researcher intends to examine in their study. |
| research question | The question the collaborative investigation sets out to answer. A research question:   * gives clear direction, focus and purpose to the investigation * guides the path through the investigation, research and writing process * can take the form of a problem statement, hypothesis or question. |
| respect | Showing due regard for the feelings, wishes or rights of others. |
| sample group | A group or portion of the population involved in research. The hypothesis or research question usually identifies who the sample should be. |
| secondary data | Information collected and analysed from secondary sources. |
| secondary sources | Sources of information that have been collected, processed, interpreted and published by others, for example healthcare data, newspaper articles and images or information in a published report. |
| self-reported data | Data or information collected through a survey, questionnaire or poll in which respondents read the question and select a response by themselves without any outside interference. May include asking a participant about their feelings, attitudes or beliefs. |
| validity | How accurately or the extent to which a research method or results really measure what they intended to measure. |
| variable | A factor that can be changed, maintained or measured through an investigation, for example time, distance, intensity, amount, temperature, type of behaviour, age of participants, type of training, location. |

# Further reading

* Informed Consent – [International Charter for Ethical Research Involving Children (childethics.com)](https://childethics.com/informed-consent/)
* [Research Governance and Ethics: Informed consent and plain language](https://www.rch.org.au/ethics/informed_consent_and_plain_language/Informed_consent_and_plain_language/) – The Royal Children’s Hospital Melbourne
* [Ethics Explainer: Respect? –The Ethics Centre](https://ethics.org.au/explainer-respect/)
* [National Statement on Ethical Conduct in Human Research (2007) - Updated 2018 | NHMRC](https://www.nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2007-updated-2018)

# Additional information

The information below can be used to support teachers when using this teaching resource for health and movement science.

## Support and alignment

**Resource evaluation and support:** all curriculum resources are prepared through a rigorous process. Resources are periodically reviewed as part of our ongoing evaluation plan to ensure currency, relevance and effectiveness. For additional support or advice contact the PDHPE Curriculum team by emailing [PDHPEcurriculum@det.nsw.edu.au](mailto:PDHPEcurriculum@det.nsw.edu.au).

**Alignment to system priorities and/or needs:** [School Excellence Policy](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468), [School Success Model.](https://education.nsw.gov.au/public-schools/school-success-model/school-success-model-explained)

**Alignment to the School Excellence Framework:** this resource supports the [School Excellence Framework](https://education.nsw.gov.au/about-us/strategies-and-reports/school-excellence-and-accountability/school-excellence#:~:text=SPaRO%20platform.-,School%20Excellence%20Framework,-The%20school%20planning) elements of curriculum (curriculum provision) and effective classroom practice (lesson planning, explicit teaching).

**Alignment to Australian Professional Teaching Standards:** this resource supports teachers to address [Australian Professional Teaching Standards](https://educationstandards.nsw.edu.au/wps/portal/nesa/teacher-accreditation/meeting-requirements/the-standards) 3.2.2, 3.3.2.

**Consulted with:** Curriculum and Reform and subject matter experts

**NSW syllabus:** Health and Movement Science 11–12 Syllabus

**Syllabus outcomes:** HM-11-06, HM-11-10, HM-12-06, HM-12-10

**Author:** PDHPE Curriculum Team

**Publisher:** State of NSW, Department of Education

**Resource:** Support booklet

**Related resources:** further resources to support Stage 6 health and movement science can be found on the [Planning, programming and assessing PDHPE 11–12 curriculum webpage](https://education.nsw.gov.au/teaching-and-learning/curriculum/pdhpe/planning-programming-and-assessing-pdhpe-k-12/planning-programming-and-assessing-pdhpe-11-12) and the [HSC hub](https://hschub.nsw.edu.au/).

**Professional learning:** relevant professional learning is available through the [PDHPE statewide staffroom](https://teams.microsoft.com/l/team/19%3a93bb42a54e4b4779b28ab5b737b9e642%40thread.tacv2/conversations?groupId=d759a943-a680-4d0b-bdfe-88a8998f709e&tenantId=05a0e69a-418a-47c1-9c25-9387261bf991).

**Universal Design for Learning:** [Curriculum planning for every student in every classroom](https://education.nsw.gov.au/teaching-and-learning/learning-from-home/teaching-at-home/teaching-and-learning-resources/universal-design-for-learning). Support the diverse learning needs of students using inclusive teaching and learning strategies.

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[Health and Movement Science 11–12 Syllabus](https://curriculum.nsw.edu.au/learning-areas/pdhpe/health-and-movement-science-11-12-2023/overview) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2023.

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