# Health and movement science Stage 6 (Year 11) – teaching the principles of conducting an investigation – sample program of learning



Contents

[Overview 2](#_Toc145573431)

[Syllabus 3](#_Toc145573432)

[Outcomes 3](#_Toc145573433)

[Syllabus content 3](#_Toc145573434)

[Learning sequence 1 – foundations of research and investigation 5](#_Toc145573435)

[Learning intentions and success criteria 5](#_Toc145573436)

[What is a collaborative investigation? 5](#_Toc145573437)

[Applying ethical considerations 6](#_Toc145573438)

[Ensuring the validity, reliability and credibility of the collaborative investigation 9](#_Toc145573439)

[Data in research and investigations 11](#_Toc145573440)

[Applying our learning 17](#_Toc145573441)

[Additional information 19](#_Toc145573442)

[Support and alignment 19](#_Toc145573443)

[References 21](#_Toc145573444)

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

This learning program is intended to be completed in Year 11 as part of either Core. It provides students with opportunities to deepen their understanding of the foundations of research and the process of collaborative investigation. It is best delivered before undertaking any form of investigation or research as it will prepare students ahead of conducting a collaborative investigation later in Year 11.

Five hours have been allocated to this learning program.

## Syllabus

The following syllabus outcomes and content is addressed if all the teaching activities are completed. Teachers should use their professional judgement to ensure that the suggested syllabus content is addressed.

### Outcomes

A student:

* Communication: communicates health and movement concepts to audiences and contexts, using a variety of modes **HM-11-07**
* Research: analyses a range of sources to make conclusions about health and movement concepts **HM-11-10**

### Syllabus content

**Core 1**

What are young people’s meanings of health?

* Investigate the meanings of health for young people

Including:

* creating a research question
* developing a method(s) to collect data (for example survey, interview questions, focus groups)
* discussing ethical considerations
* discussing validity, reliability and credibility of data collection
* presenting findings and drawing conclusions
* identifying further research questions that could be explored

**Core 2**

What factors influence movement and performance?

* Investigate the physiological responses in relation to aerobic training

Including:

* creating a research question
* selecting a method to collect data (for example observation, survey, interview)
* discussing the ethical considerations of the methods chosen
* discussing the validity, reliability and credibility of data collection
* presenting findings and drawing conclusions
* identifying further research questions that could be explored

## Learning sequence 1 – foundations of research and investigation

Opportunities for reflection and adjustments can be made depending on student interest.

### Learning intentions and success criteria

**Note:** these learning intentions and success criteria are general and should be contextualised to suit your school and students’ needs.

Through these activities, students will:

* learn the foundations or principles of conducting an investigation
* explore methods to collect, present and analyse data
* prepare for conducting a collaborative investigation later in Year 11.

It is crucial that students learn the principles of conducting an investigation alongside the content from Core 1 or Core 2.

The **Teaching a collaborative investigation learning programs** for Core 1 and Core 2, provide students with opportunities for application of the collaborative investigation process. These learning programs will be published on the department’s [PDHPE](https://education.nsw.gov.au/teaching-and-learning/curriculum/pdhpe/planning-programming-and-assessing-pdhpe-k-12/planning-programming-and-assessing-pdhpe-11-12) 11–12 webpages.

Combining these sequences provides everything a teacher needs to prepare students ahead of conducting a collaborative investigation later in Year 11.

### What is a collaborative investigation?

A collaborative investigation is a process of research whereby students:

* identify a particular topic, area of interest or problem
* work together to formulate a research question
* develop methods to collect data
* present and analyse data
* draw conclusions
* present findings.

Invite students to brainstorm what collaboration would look like at each step of the investigation.

Remind students that collaboration involves positive interactions with others to solve problems, reach agreements and work towards outcomes or goals. It also involves equal contribution by group members to plan and complete the tasks as part of the investigation, as well as build and share perspectives and understanding of concepts.

### Applying ethical considerations

* As a class, brainstorm a response to the question: How do we know that we can trust a conclusion?
* Use the information below to discuss the response as a class.

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.

Ethics refers to a set of moral behaviours that governs the researcher or researchers when applying the process of research or investigation. When ethical behaviour is applied, it ensures that all steps and measures are taken to collect the most honest data, leading to the conclusion being trustworthy.

To answer a research question, the researcher collects data from different sources. The researcher must use informed consent, integrity, privacy and respect to create a feeling of safety. Without this feeling of safety, the sample group or subject of the investigation will not feel comfortable to give honest responses or be open to participate in the investigation or research. This will impact on the quality and credibility of the data collected.

**Informed consent** involves providing all people participating in the investigation with clear information of what the research involves. This allows them to make an informed decision about whether to be involved in the investigation.

**Integrity** relates to honesty of all aspects of the investigation 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 and conclusions that are drawn are presented with honesty, openness, fairness and with respect for intellectual property.

**Privacy** is 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. Participant confidentiality is important to ensure they feel safe to contribute to the project and that their personal information is not made available to anyone not directly involved in the research. Where possible, participants should remain anonymous unless they have consented otherwise.

**Respect** is showing due regard for the feelings, wishes or rights of others. It is important that researchers remove their own personal values and judgements as these may impact on the honesty and openness of participants. Researchers should represent the data or findings collected from individuals, even if they do not necessarily agree with their opinions, behaviours or decisions. The wording of a question should be carefully considered to not offend or upset individuals, thus ensuring psychological and physical safety.

Students complete a [continuum activity](https://education.nsw.gov.au/teaching-and-learning/curriculum/pdhpe/planning-programming-and-assessing-pdhpe-k-12/pedagogy/teaching-strategies#Positioning1) to develop a better understanding of ethics.

* Place the terms ‘ethical’ and ‘not ethical’ at either side of the room.
* Read the behaviours from Table 1 to the class.
* Students decide whether the behaviour is ethical or not and show their positions by moving to the side of the room that corresponds with their answer.
* Invite students to justify their decision by highlighting the ethical consideration that applies and providing any suggestions to make the behaviour more ethical if appropriate.

Table 1 – teacher guide – are the behaviours ethical?

|  |  |
| --- | --- |
| Behaviour | Is this ethical or not? |
| Changing the recorded number of breaths when counting ventilation rates to reflect an increase in heart rate. | No, issues with the integrity of the data. There should be acknowledgment of the process for collecting the data and steps taken to reduce mistakes. |
| Using quotes from secondary data as your own. | No, the researcher’s work is not their own and therefore not using the secondary data with integrity or showing respect to the authors and their intellectual property. |
| Naming the participants or samples when presenting the findings. | No, this is a breach of privacy or confidentiality and can be avoided through changing names. |
| Asking a novice boxer to compete against a professional to observe skill. | No, there are safety considerations being ignored. Respect for the sample group. |
| Asking children to be a part of a research sample group. | Yes, with informed consent. |
| Changing the method of collecting data on the day of testing. | No, impacts a participant’s ability to provide informed consent. |
| Altering the observation data. | No, this reduces the integrity of the data. |
| Sharing personal information that alludes to the identity of a sample. | No, this breaches the privacy of the subject. |
| Interviewing a CEO (Chief Executive Officer) of a pharmaceuticals company about the side effects of a competitor’s drug. | No, the integrity of the research is an issue. There is a conflict of interest here due to the profitable nature of the pharmaceuticals. |
| Using the best test result rather than the mean result. | No, this reduces the integrity of the data. |

### Ensuring the validity, reliability and credibility of the collaborative investigation

Share the following information with students.

An investigation process which reflects reliability and validity is deemed credible. Establishing reliability in research is necessary to ensure that the data collected is appropriate, able to be replicated and the results obtained are trustworthy. It guarantees the quality of the research, ensures more accurate conclusions and reduces false claims or misinformation. This will ensure the credibility of the data.

**Credibility** is a measure of whether a research or investigation’s process, methods and findings are trustworthy.

**Reliability** or a reliable method refers to a research method which, if used by another researcher under similar conditions, will lead to the same or similar results. To achieve this, research needs to be systematic, organised and the sample needs to be an accurate representation of the population.

**Validity** refers to how well the research method measures what it is supposed to measure. To achieve validity, the researcher must have background knowledge of the topic to make informed assumptions and generalisation rather than relying on value judgements or biased views.

In pairs, students complete the reliability and validity activity below. Divide the examples from Table 2 amongst the pairs and have each pair complete the following.

* Discuss and make a judgement on whether the example is a reliable or valid way of designing or documenting data collection or research methods.
* Justify their reasoning.
* Propose ways to increase reliability and validity.
* Share their allocated example of data collection or research methods, their judgement, justifications and proposed ways to increase reliability and validity with the class for further discussion.

Table 2 – reliability and validity examples and justification

|  |  |  |
| --- | --- | --- |
| Example of data collection or research methods | Is this reliable or valid? | Justification |
| Measuring a 100-metre sprint with a tape measure. | Not valid | The unit to test speed is time. A stopwatch measures time whereas a tape measure measures distance or length. |
| Using the screen time analysis on a smart phone to measure daily phone usage. | Both reliable and valid | This tests phone usage and is broken down to time of day, day of the week and averages the data due to the global time setting. |
| Using a sample of 100 people over the age of 65 to find the meaning of health for young people. | Not valid | Testing the meaning of health of young people. Using over 65 years will give meanings of health for this age group. |
| Testing the height of adults using scales. | Not valid | To test height, the units should be in centimetres or metres. The most valid tool for testing height is a tape measure. |
| Observing weekly food habits of young people by doing a stocktake of canteen food. | Not valid | A stocktake does not test weekly food habits, but rather buying habits of weekday lunches based on the food ordering of the canteen managers. A weekly food diary would be more reliable. |
| Interviewing 10 parents about their children’s screen habits? | Not reliable | This is reliant on the rules set by parents. Devices and screen habits regarding what children are watching can be hidden. |
| Students designing a test to diagnose dyslexia. | Not reliable | Students are not trained to diagnose dyslexia. Trained professionals implement these tests and draw their conclusions. |
| Using Wikipedia or Tik Tok to understand STIs and blood-borne viruses. | Not reliable | The creation of these sources of secondary data are not subject to the credibility checks and quality assurance that peer reviewed sources or government sources such as [NSW Health](https://www.health.nsw.gov.au/sexualhealth/Pages/sexually-transmissible-infections.aspx) or [AIHW](https://www.aihw.gov.au/reports/australias-health/australias-health-2018/contents/indicators-of-australias-health/sexually-transmissible-infections-bloodborne-virus) secondary sources would be. |
| Using the same sample group to test the heart rate and ventilation rate of different aerobic types of training. | Reliable | The same sample group is consistent across the aerobic types of training. |
| Asking young people their experiences of the global event of September 11 and COVID and their impacts on their meanings of health. | Not valid | Young people do not have the experiences to compare these 2 global events. They would need the same sample group that have lived through both global events. The sample group would both need to understand the meaning of health or the definition of health. |

### Data in research and investigations

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

Share the following information with students.

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 and qualitative

Students brainstorm what quantitative and qualitative data is to highlight the differences between the 2.

* Watch the video [Quantitative and Qualitative – What’s the difference?](https://www.youtube.com/watch?v=4iws9XCyTEk) (02:25) and add to their brainstorm.
* Use a table to record the advantages and disadvantages of quantitative and qualitative data.

**Quantitative data:**

* Relates to quantities
* Measures are expressed as numbers, for example how many, how much or how often
* Often expressed in numbers and graphs
* Requires many respondents
* More objective and reliable with less bias.

Examples: experiments, questionnaires, surveys with closed-ended questions or observations recorded as numbers.

Table 3 – 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 very easy to replicate (reliable) | Limited to closed responses (already defined answers) |
| Easy to access a large sample size | Selective use can create reliability issues |
| Easy to put into graphs and tables to identify trends | n/a |

For quantitative data to create reliable trends large amounts of data need to be collected. This also means that a large sample group is required.

**Qualitative data:**

* Relates to language and descriptions of attitudes, opinions or behaviours
* Tends to answer questions about the ‘what’, ‘how’ and ‘why’ of an investigation, rather than questions of ‘how many’ or ‘how much’
* Collected through the observations and recordings of the 5 senses of the researcher
* Relies on personal accounts, words and meaning to illustrate in detail how people think or respond
* Provides in-depth insights on topics that are not well understood
* Uses open-ended questions
* Is subjective and is based on a person’s opinion or experiences.

Examples: interviews and focus groups with open-ended questions, observations described in words, for example, diary entries, video and audio recordings, transcriptions and photographs.

Table 4 – 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 |
| n/a | The large amounts of data can be overwhelming for the researcher to make sense of |

For qualitative data to be manageable for the researcher, the sample size is usually limited due to the depth of the data, such as large amounts of feeling and opinions gathered.

#### Collecting data

Watch the video, [Research Design: Choosing your Data Collection Methods](https://www.youtube.com/watch?v=q17s84ADGfA&list=RDLVq17s84ADGfA) (5:16) to learn about the 2 methods of data collection, primary and secondary.

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

Inform students that as part of the collaborative investigation, opportunities exist for groups to collect primary data. Secondary data will also be collected and will help strengthen primary research collected.

##### 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 affect whether the data collected is credible and reliable.

##### Methods

Brainstorm all the different ways that data can be collected. Some suggestions may include:

* interviews
* questionnaires
* experiments
* observations
* focus groups
* literature reviews.

Examples that students may have been involved in include:

* Tell Them From Me survey (TTFM)
* subject selection form
* SRC (Student Representative Council) reps feeding back student perspectives
* sport choices
* learning logs
* subject or topic feedback evaluations
* collection of house points
* annual school report
* swimming or athletics carnival feedback
* measuring heart rate (HR) in practical classes.

Students identify data collection methods they have been a part of in the past year.

* Categorise their examples into qualitative or quantitative types of data.
* Identify the sources of data.

Table 5 provides an example of how this activity could be completed.

Table 5 – examples and classification of data collection methods

|  |  |  |  |
| --- | --- | --- | --- |
| Examples | Data collection method | Qualitative or quantitative? | Source of data |
| TTFM | Questionnaire | Quantitative | Individual students |
| Subject evaluation | Interview | Qualitative | Individual students |
| Sport choice | Questionnaire | Quantitative | Individual |
| Measuring HR in PE | Experiment | Quantitative | Individual |
| Subject selection process | Questionnaire/interview | Qualitative and quantitative | Individual students |
| SRC student voice | Focus group | Qualitative and quantitative | Group of students |
| Coaching observation on skill acquisition | Observation | Quantitative | Groups of students |
| Annual school report | Literature review | Quantitative and qualitative | Print |

Students watch the video [Research Design: Choosing your Data Collection Methods](https://www.youtube.com/watch?v=q17s84ADGfA&list=RDLVq17s84ADGfA) (5:16) and complete a [PMI (Plus, Minus, Interesting) chart](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Browser?clearCache=f77447e-9a66-12f4-7d6d-f9ab51b628) on each data collection method discussed.

### Applying our learning

**Formative assessment opportunity:** the purpose of the following activities are for students to check their understanding of data in research and investigations by applying their knowledge, making judgements and reflecting.

Students use the following articles and videos to explore the types of data that have been used.

* Distinguish whether the sources are using quantitative or qualitative data or a combination of both.

Some sample questions have been provided to stimulate discussion and reflection.

#### Articles and videos – Core 1

* Australian Institute of Health and Welfare (AIHW) – [Australia’s youth - in brief](https://www.aihw.gov.au/reports/children-youth/australias-youth-in-brief/contents/summary)
* Australian Institute of Family Studies (AIFS):
* [Too much time on screens? Screen time effects and guidelines for children and young people](https://aifs.gov.au/resources/short-articles/too-much-time-screens)
* [3. The physical health of Australian children](https://growingupinaustralia.gov.au/research-findings/annual-statistical-reports-2018/physical-health-australian-children)
* [Young adults returning to live with parents during COVID-19](https://aifs.gov.au/research/commissioned-reports/young-adults-returning-live-parents-during-covid-19)
* [Growing Up in Australia: The Longitudinal Study of Australian Children (LSAC) Annual Statistical Report 2018](https://growingupinaustralia.gov.au/research-findings/annual-statistical-reports-2018)
* [Promoting adequate sleep in young people](https://aifs.gov.au/resources/short-articles/promoting-adequate-sleep-young-people)
* eSafety Commissioner:
* [The digital lives of Aussie teens](https://www.esafety.gov.au/research/digital-lives-aussie-teens)
* [State of play: Youth, kids and digital dangers](https://www.esafety.gov.au/research/youth-digital-dangers)
* [Young people and social media usage](https://www.esafety.gov.au/research/youth-digital-dangers/social-media-usage)
* Mission Australia – [Youth survey 2022 summary booklet](https://www.missionaustralia.com.au/publications/youth-survey)
* Simon Sinek –[Millennials in the Workplace](https://www.youtube.com/watch?v=hER0Qp6QJNU) video on YouTube (15:00)
* ABC news – [Is 13 too young to have TikTok or an Instagram account? Some medical experts think so](https://www.abc.net.au/news/2023-02-12/right-age-children-get-social-media-tik-tok-instagram/101952894)

#### Articles and videos – Core 2

* Australian Institute of Health and Welfare (AIHW) – [Australia’s youth in brief](https://www.aihw.gov.au/reports/children-youth/australias-youth-in-brief/contents/summary)
* [Australian Institute of Sport, Nutrition](https://www.ais.gov.au/nutrition)
* Australian Institute of Sport – [Surfing and Diving athletes undergo Athlete Performance Health program (1:39)](https://www.youtube.com/watch?v=2s2xXp3tHI0)
* Cycling news – [Tour de France power analysis: Tadej Pogačar's record-breaking ascent of the Col de Peyresourde](https://www.cyclingnews.com/features/tour-de-france-power-analysis-tadej-pogacars-record-breaking-ascent-of-the-col-de-peyresourde/), Josh Croxton published September 06, 2020
* Clearinghouse for Sport – [Participation trends in Australia since 2001](https://www.clearinghouseforsport.gov.au/research/ausplay/results)

#### **Questions**

1. Identify the article or video you chose to review.
2. What is the purpose of the article or video?
3. What is the author trying to communicate?
4. What type of data is being presented in the article or video? Provide examples.
5. How do you know it is quantitative or qualitative?
6. How do you know this is secondary data?
7. What is the source of the data? Has the article or video used more than one source? Explain your answer. Does this support the credibility of the article or video?
8. How could you tell if it was a reliable source? Does this support the credibility of the article or video?
9. What methodology was used to collect the data? If a group, what size do you think it would be? Does this support the credibility of the article or video?
10. How was the data presented?
11. Was the presentation of data in this way easy to understand? Explain your answer.
12. How else could the data have been presented?
13. What potential research questions could be generated from this article or video?

## 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.

**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-11-07, HM-11-10.

**Author:** PDHPE Curriculum Team.

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

**Resource:** Learning program.

**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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## References

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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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