VCE Physics

Units 3 and 4 key science skills mapping grid

A set of key science skills apply across Units 1 to 4. The table below provides a planning template for teachers to map how the contextualised key science skills on pages 11 and 12 of the *VCE Physics Study Design* will be developed by students across Units 3 and 4.

| **Key science skill** | **VCE Physics contextualised skills for Units 1–4** | **Unit 3** | **Unit 4** |
| --- | --- | --- | --- |
| **AoS1** | **AoS2** | **AoS3** | **AoS1** | **AoS2** |
| Develop aims and questions, formulate hypotheses and make predictions  | * identify, research and construct aims and questions for investigation
 |  |  |  |  |  |
| * identify independent, dependent and controlled variables in controlled experiments
 |  |  |  |  |  |
| * formulate hypotheses to focus investigations
 |  |  |  |  |  |
| * predict possible outcomes of investigations
 |  |  |  |  |  |
| Plan and conduct investigations  | * determine appropriate investigation methodology: case study; classification and identification; experiment; fieldwork; literature review; modelling; product, process or system development; simulation
 |  |  |  |  |  |
| * design and conduct investigations: select and use methods appropriate to the selected investigation methodology, including consideration of equipment and procedures, taking into account potential sources of error and causes of uncertainty; determine the type and amount of qualitative and/or quantitative data to be generated or collated
 |  |  |  |  |  |
| * work independently and collaboratively as appropriate and within identified research constraints, adapting or extending processes as required and recording such modifications in a logbook
 |  |  |  |  |  |
| Comply with safety and ethical guidelines | * demonstrate safe laboratory practices when planning and conducting investigations by using risk assessments that are informed by safety data sheets (SDS), and accounting for risks
 |  |  |  |  |  |
| * apply relevant occupational health and safety guidelines while undertaking practical investigations
 |  |  |  |  |  |
| * demonstrate ethical conduct when undertaking and reporting investigations
 |  |  |  |  |  |
| Generate, collate and record data  | * systematically generate and record primary data, and collate secondary data, appropriate to the investigation, including use of databases and reputable online data sources
 |  |  |  |  |  |
| * record and summarise both qualitative and quantitative data, including use of a logbook as an authentication of generated or collated data
 |  |  |  |  |  |
| * organise and present data in useful and meaningful ways, including tables and graphs
 |  |  |  |  |  |
| Analyse and evaluate data and investigation methods  | * process quantitative data using appropriate mathematical relationships and units
 |  |  |  |  |  |
| * use appropriate numbers of significant figures in calculations
 |  |  |  |  |  |
| * construct graphs that show the relationship between variables
 |  |  |  |  |  |
| * extrapolate to determine graph intercepts of significance
 |  |  |  |  |  |
| * construct linearised graphs and identify the significance of the gradient (using relationships relevant to the key knowledge outlined in the areas of study)
 |  |  |  |  |  |
| * identify and analyse experimental data qualitatively, handling, where appropriate, concepts of: accuracy, precision, repeatability, reproducibility, resolution and validity of measurements; and errors (random and systematic)
 |  |  |  |  |  |
| * identify outliers, and contradictory, provisional or incomplete data
 |  |  |  |  |  |
| * repeat experiments to evaluate the precision of data
 |  |  |  |  |  |
| * evaluate investigation methods and possible causes of error and uncertainty, and suggest how precision can be improved, and how uncertainty can be reduced
 |  |  |  |  |  |
| Construct evidence-based arguments and draw conclusions | * distinguish between opinion and evidence, and between scientific and non-scientific ideas
 |  |  |  |  |  |
| * evaluate data to determine the degree to which the evidence supports the aim of the investigation, and make recommendations, as appropriate, for modifying or extending the investigation
 |  |  |  |  |  |
| * evaluate data to determine the degree to which the evidence supports or refutes the initial prediction or hypothesis
 |  |  |  |  |  |
| * use reasoning to construct scientific arguments, and to draw and justify conclusions consistent with evidence and relevant to the question under investigation
 |  |  |  |  |  |
| * identify, describe and explain the limitations of conclusions, including identification of further evidence required
 |  |  |  |  |  |
| * discuss the implications of research findings
 |  |  |  |  |  |
| Analyse, evaluate and communicate scientific ideas | * use appropriate physics terminology, representations and conventions, including standard abbreviations, graphing conventions, vector diagrams, algebraic equations, significant figures, uncertainty bars and units of measurement
 |  |  |  |  |  |
| * discuss relevant physics information, ideas, concepts, theories and models and the connections between them
 |  |  |  |  |  |
| * analyse and explain how models and theories are used to organise and understand observed phenomena and concepts related to physics, identifying limitations of selected models/theories
 |  |  |  |  |  |
| * critically evaluate and interpret a range of scientific and media texts (including journal articles, mass media communications and opinions in the public domain), processes, claims and conclusions related to physics by considering the quality of available evidence
 |  |  |  |  |  |
| * analyse and evaluate physics-related societal issues taking into account the influence of social, economic, legal and political factors relevant to the selected issue
 |  |  |  |  |  |
| * use clear, coherent and concise expression to communicate to specific audiences and for specific purposes in appropriate scientific genres, including scientific reports and posters
 |  |  |  |  |  |
| * acknowledge sources of information and assistance, and use standard scientific referencing conventions
 |  |  |  |  |  |