ASELL SCHOOLS
Advancing Science & Engineering through Laboratory Learning

Welcome to the Inquiry Scaffold Tool (Victorian Curriculum)

This tool was developed by the **ASELL for School – Victorian Node** from working with teachers and students to re-design engaging science laboratory learning activities (LLAs) in lower secondary classes (years 7-10). This work has also been extrapolated into a primary focus for year 3-6.
Some points to be considered in the **Inquiry Scaffold Tool** are as follows:

- The tool offers a conception of the way that teachers provide students with inquiry scaffolding at different levels. Across the levels in the tool, the dimension of change is the degree of agency and responsibility accorded the student for making informed decisions and exhibiting independent inquiry skills. At the prescription level, the teacher strongly frames inquiry, and models the skills through direction;
- The tool offers a way of thinking about the degree of scaffolding put around each skill, with support being reduced at each successive level;
- Teachers should focus on one or two of the seven inquiry skills in each laboratory learning activity; and
- Teaching inquiry skills necessitates direct teaching and skill learning prior to assessing the development of each skill.

Some ideas on the overall structure of the **Inquiry Scaffold Tool**.
Each outcome can be taken up through a practical activity in a developmental progression as described below:
Prescription: The student performs the skill strongly scaffolded by explicit instructions. This might involve a highly directive worksheet, or teacher instruction.
Confirmation: The student makes constrained choices within a set of instructions, or strongly guided class discussion. There is minimal room for variation.
Structured inquiry: The student interprets and modifies inquiry processes within an explicit framework. This may involve prior class discussion.
Guided inquiry: The student is involved in substantial decision making and interpretation within a broad outline of suggestions of possible approaches.
Open inquiry: The student engages with a question or problem that they have posed and are invested in, and conducts an investigation with minimal guidance.

Some of the flexibility built into the **Inquiry Scaffold Tool** is as follows:

- It would be understood that even if an inquiry was intended to develop the open inquiry level of a skill, in supporting individual students the teacher would provide guidance characteristic of the lower levels. This tool therefore supports the application of individualised learning and differentiation.
- If questions and planning occur at the higher levels then it is more likely that analysis, communication etc. will also occur at the higher levels.

Ways the **Inquiry Scaffold Tool** could be used include:

- Used to plan a structured program supporting the development of individual inquiry skills;
- To map the inquiry skill outcome for each practical activity and provide suggestions for differentiation of student learning;
- To map all inquiry skill outcomes across a unit or year level, scaffolding the development of each skill; and
- To map inquiry skills across all years, building student capacity towards the open investigations found in the senior secondary sciences.

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Victorian Curriculum - Years 3-4 and 5-6 (2016)

Curriculum outcome - Years 3-4 and 5-6	**Prescription**	**Confirmation**	**Structured Inquiry**	**Guided Inquiry**	**Open Inquiry**
Questioning and predicting 3-4: With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge (VCSIS065) 5-6: With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be based on previous experiences or general rules (VCSIS082)	Student engages with a question provided by teacher.	Student chooses from a provided, constrained set of questions.	Student sharpens or clarifies a question or questions provided by teacher, or other source.	Based on discussion with teacher, or others, student poses and refines their own question.	Student autonomously poses a question of interest.
Planning and conducting 3-4: Suggest ways to plan and conduct investigations to find answers to questions including consideration of the elements of fair tests (VCSIS066) 5-6: With guidance, plan appropriate investigation types to answer questions or solve problems and use equipment, technologies and materials safely, identifying potential risks (VCSIS083)	Student follows a provided plan of investigation.	Student follows a plan that offers limited choices in approach, or that the teacher develops using guided discussion.	Student adapts and refines a plan outline that is provided, or developed in class discussion.	Student uses a planning framework to devise and enact a plan.	Student autonomously devises and enacts a plan for a chosen investigation.
3-4: Safely use appropriate materials, tools, equipment and technologies (VCSIS067) 5-6: Decide which variables should be changed, measured and controlled in fair tests and accurately observe, measure and record data (VCSIS084)	Student follows instructions to use equipment and collect data.	Student makes limited decisions in following instructions to use equipment and collect data.	Student devises data collection and recording procedures using a structured framework.	Student makes substantial decisions in collecting and recording data, supported by an outline of possible approaches.	Student autonomously devises and enacts data collection and recording processes.
Recording and processing 3-4: Use formal measurements in the collection and recording of observations (VCSIS068) 3-4: Use a range of methods including tables and column graphs to represent data and to identify patterns and trends (VCSIS069) 5-6: Construct and use a range of representations, including tables and graphs, to record, represent and describe observations, patterns or relationships in data (VCSIS085)	Student uses provided representations such as tables, to record /process data.	Student chooses from provided representations to record / process data.	Student draws on a structured framework, possibly developed through class discussion, to construct representations to record / process data.	Student draws on a provided outline of possible approaches to develop representations to record / process data.	Student autonomously develops representations to appropriately record / process data.
Analysing and evaluating 3-4: Compare results with predictions, suggesting possible reasons for findings (VCSIS070) 5-6: Compare data with predictions and use as evidence in developing explanations (VCSIS086)	Student is strongly directed towards an explanation consistent with data.	Student chooses from alternative links between science ideas, predictions and data.	Student argues for a link between science ideas and data using a guiding framework.	Student constructs links between science concepts and evidence, supported by an outline of principles.	Student autonomously pays close attention to linking scientific concepts and evidence in evaluating conclusions.
3-4: Reflect on an investigation, including whether a test was fair or not (VCSIS071) 5-6: Suggest improvements to the methods used to investigate a question or solve a problem (VCSIS087)	Fairness / methods of investigation is explained.	Student is strongly guided to evaluate fairness / methods of investigation.	Student uses structured framework to evaluate fairness / methods of investigation.	Student draws on an outline of principals to evaluate the fairness / methods of investigation.	Student autonomously evaluates the fairness / methods of investigation.
Communicating 3-4: Represent and communicate observations, ideas and findings to show patterns and relationships using formal and informal scientific language (VCSIS072) 5-6: Communicate ideas and processes using evidence to develop explanations of events and phenomena and to identify simple cause-and-effect relationships (VCSIS088)	Student is directed how to communicate.	Student is given steps and procedures to frame communication.	Student communicates / argues using a structured framework.	Student is provided broad guidelines for arguing / communicating.	Student autonomously develops argumentation / communication of ideas.

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Victorian Curriculum - Years 7-8 and 9-10 (2016)

Curriculum outcome - Years 7-8 and 9-10	**Prescription**	**Confirmation**	**Structured Inquiry**	**Guided Inquiry**	**Open Inquiry**
Questioning and predicting 7-8: Identify questions, problems and claims that can be investigated scientifically and make predictions based on scientific knowledge (VCSIS107) 9-10: Formulate questions or hypotheses that can be investigated scientifically, including identification of independent, dependent and controlled variables (VCSIS134)	Student engages with a question provided by teacher.	Student chooses from a provided, constrained set of questions.	Student sharpens or clarifies a question or questions provided by teacher, or other source.	Based on discussion with teacher, or others, student poses and refines their own question.	Student autonomously poses a question of interest.
Planning and conducting 7-8: Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (VCSIS108) 9-10: Independently plan, select and use appropriate investigation types, including fieldwork and laboratory experimentation, to collect reliable data, assess risk and address ethical issues associated with these investigation types (VCSIS135)	Student follows a provided plan of investigation.	Student follows a plan that offers limited choices in approach.	Student adapts and refines a provided plan outline.	Student uses a planning framework to devise and enact a plan.	Student autonomously devises and enacts a plan for a chosen investigation.
7-8: In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task (VCSIS109) 9-10: Select and use appropriate equipment and technologies to systematically collect and record accurate and reliable data, and use repeat trials to improve accuracy, precision and reliability (VCSIS136)	Student follows instructions to use equipment and collect data.	Student makes limited decisions in following instructions to use equipment and collect data.	Student devises data collection and recording procedures using a structured framework.	Student makes substantial decisions in collecting and recording data, supported by an outline of possible approaches.	Student autonomously devises and enacts data collection and recording processes.
Recording and processing 7-8: Construct and use a range of representations including graphs, keys and models to record and summarise data from students' own investigations and secondary sources, and to represent and analyse patterns and relationships (VCSIS110) 9-10: Construct and use a range of representations, including graphs, keys, models and formulas, to record and summarise data from students' own investigations and secondary sources, to represent qualitative and quantitative patterns or relationships, and distinguish between discrete and continuous data (VCSIS137)	Student uses provided representations such as tables to record / process data.	Student chooses from provided representations to record / process data.	Student draws on a structured framework to construct representations to record / process data.	Student draws on a provided outline to develop representations to record / process data.	Student autonomously develops representations to appropriately record / process data.
Analysing and evaluating 7-8: Use scientific knowledge and findings from investigations to identify relationships, evaluate claims and draw conclusions (VCSIS111) 9-10: Analyse patterns and trends in data, including describing relationships between variables, identifying inconsistencies in data and sources of uncertainty, and drawing conclusions that are consistent with evidence (VCSIS138)	Student is strongly directed towards a conclusion.	Student follows instructions involving limited decisions on analysing / concluding.	Student draws on a framework suggesting approaches to analysing / concluding.	Student develops approaches to analysing / concluding, supported by a provided outline.	Student autonomously develops approaches to analysing data and drawing conclusions.
7-8: Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (VCSIS112) 9-10: Use knowledge of scientific concepts to evaluate investigation conclusions, including assessing the approaches used to solve problems, critically analysing the validity of information obtained from primary and secondary sources, suggesting possible alternative explanations and describing specific ways to improve the quality of data (VCSIS139)	Student is directed to link conclusions to science concepts.	Student chooses from possible links between conclusions and science concepts.	Student argues for a link between conclusions and science concepts using a guiding framework.	Student constructs links between conclusions and science concepts, supported by an outline of principles.	Student independently pays close attention to scientific concepts in evaluating conclusions.
Communicating 7-8: Communicate ideas, findings and solutions to problems including identifying impacts and limitations of conclusions and using appropriate scientific language and representations (VCSIS113) 9-10: Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (VCSIS140)	Student is directed how to communicate.	Student is given steps and procedures to frame communication.	Student communicates / argues using a structured framework.	Student is provided broad guidelines for arguing / communicating.	Student autonomously develops argumentation / communication of ideas.

References

National Research Council (2000). Inquiry and the national science education standards: A guide for teaching and learning. Washington DC: National Academic Press.

National Institutes of Health. (2005). Doing Science: The Process of Scientific Inquiry. Bethesda (MD): National Institutes of Health.

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