Investigation 1: A study on the effect of smoke water on the germination and growth of *Eucalyptus pilularis*

To view the various elements of this example, please use the icons at the side of the screen.

**Note:** The comments in the annotated examples match the labelling on teacher forms.

Investigation 1: Moderator comments

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| **Personal engagement x/2** | **Exploration x/6** | **Analysis x/6** | **Evaluation x/6** | **Communication x/4** | **Total x/24** |
| 2 | 5 | 5 | 5 | 4 | 21 |

**Personal engagement**

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| **Mark** | **Descriptor** |
| 2 | * The justification given for choosing the research question and/or the topic under investigation demonstrates **personal significance, interest or curiosity**.
* There is evidence of personal **input and initiative** in the designing, implementation or presentation of the investigation. 2
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| **Moderator’s award** 2 | **Moderator’s comment**The research question is justified and there is clear indication of personal engagement. Though the experiment employs a standard test for seed germination and the measurement of post germination growth, they have been used in an applied manner to solve the problem of a control. The experiment took place over an extended period of time requiring considerable personal input. |

**Exploration**

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| **Mark** | **Descriptor** |
| 5–6 | * The topic of the investigation is identified and a relevant and fully focused research question is clearly described. 6
* The background information provided for the investigation is entirely appropriate and relevant and enhances the understanding of the context of the investigation. 5
* The methodology of the investigation is highly appropriate to address the research question because it takes into consideration all, or nearly all, of the significant factors that may influence the relevance, reliability and sufficiency of the collected data. 5
* The report shows evidence of full awareness of the significant **safety**, ethical or environmental issues that are **relevant to the methodology of the investigation**. 6
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| **Moderator’s award** 5 | **Moderator’s comment**The research question is focused and relevant background information is provided, however, more information on the interaction of the minerals identified with germination would be needed.The methodology is highly appropriate to the research question providing sufficient control and data, though the pH of the smoke water ought to have been monitored.Safety issues are considered. The experiment presents no ethical or environmental issues. |

**Analysis**

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| **Mark** | **Descriptor** |
| 3–4 | * Appropriate and sufficient data processing is carried out that could lead to a broadly valid conclusion but there are significant inaccuracies and inconsistencies in the processing. 4
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| 5–6 | * The report includes sufficient relevant quantitative and qualitative raw data that could support a detailed and valid conclusion to the research question. 6
* The report shows evidence of full and appropriate consideration of the impact of measurement uncertainty on the analysis. 6
* The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced. 6
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| **Moderator’s award** 5 | **Moderator’s comment**Sufficient relevant quantitative and qualitative data is collected to support a detailed and valid conclusion. These data are appropriately and successfully processed most of the time with consideration of the uncertainties. However, it is not certain that data for heights follows a normal distribution therefore the t-test may not be valid. The processed data are correctly interpreted. |

**Evaluation**

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| **Mark** | **Descriptor** |
| 5–6 | * A conclusion is **described and justified** which is relevant to the research question and supported by the data presented. 6
* A conclusion is correctly **described and justified** through relevant comparison to the accepted scientific context. 6
* Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are **discussed** and provide evidence of a clear understanding of the **methodological issues** involved in establishing the conclusion. 5
* The student has **discussed** realistic and relevant suggestions for the improvement and extension of the investigation. 5
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| **Moderator’s award** 5 | **Moderator’s comment**A relevant conclusion, justified through comparison with scientific literature values, is drawn and is supported by the data.The investigation is evaluated and there is some consideration of the uncertainties and the limitation of the data and the experiment. However, there are some assumptions made that may not have a strong foundation, for example, the candidate assumes that the different seed masses will necessarily have different nutrient contents.The suggested improvements are generally sensible though selecting seeds of exactly the same mass is not realistic. Feasible extensions are proposed. |

**Communication**

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| **Mark** | **Descriptor** |
| 3–4 | * The report is well structured and clear: the necessary information on focus, process and outcomes is present and presented in a coherent way. 4
* The report is relevant and concise thereby facilitating a ready understanding of the focus, process and outcomes of the investigation. 4
* The use of subject-specific terminology and conventions is appropriate and correct. Any errors do not hamper understanding. 4
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| **Moderator’s award** 4 | **Moderator’s comment**The report is coherent and complete. It is relevant and reasonably concise. There are no major or consistent errors in subject-specific terminology or conventions. |