**Stage 1 Biology**

**Skills and Applications Task**

**Topic 2: Infectious Diseases**

**Purpose and Background Information of the Assessment Task:**

**Consider:** Can the flu vaccine give you the flu?

It is a question that is asked by many people in the community because sometimes mixed messages are given by those who advocate *for* vaccination programs and those *opposed* to them. As a result, the safety and effectiveness of vaccines may be questioned.

In this task you will

* undertake a number of simulations to analyse the effect of vaccination rates in the community
* analyse the results and evaluate the consequences of the different rates of vaccination
* explain the importance of the concept of herd immunity
* research the development of influenza vaccinations to consider whether vaccinations can give you the disease, influenza
* justify a position on whether vaccination should be compulsory

**Assessment Conditions:**

In a format of your choice, prepare a report to educate the community group (e.g. kindergarten parents, ante-natal class, workshop for nurses) on the benefits and risks associated with vaccination. You will scaffold your report by responding to a series of questions to enable you to demonstrate your ability to analyse, evaluate, and propose justified conclusions. The use of appropriate biological terminology will also be assessed. A reference list and appropriate acknowledgement of sources is also required.

This task will be completed in class over two weeks with access to computers/internet and any resources you bring with you. The word count for the report (Part D) is a maximum of 1000 words or equivalent in a multimodal format. The answers to Part A, B and C should be presented on no more than 4 sides of an A4 page.

Assessment Design Criteria: IAE3 and KA1, 2, 4

**The Task:**

**Part A: Influenza Vaccination Simulation**

*Note: You may wish to make notes as you view the simulations.*

1. Go to the URL:

<https://www.koshland-science-museum.org/sites/all/exhibits/exhib_infectious/vaccines_01.jsp>

* 1. Press the button “Start the Interactive”
  2. Select the influenza scenario
  3. Complete each of the vaccination rate scenarios available and note *which people* in the community are being vaccinated, *how many people* are infected when vaccination takes place compared with when no one is vaccinated.
  4. After completing the simulations, respond to these:
* How effective is the vaccination in each scenario?
* Propose a hypothesis for how vaccination rates may affect the spread of influenza in a community.
* Consider the limitations of using this simulation model when drawing your conclusions.

**Part B: Measles Outbreak Simulation**

1. Go to the URL:

<http://www.theguardian.com/society/ng-interactive/2015/feb/05/-sp-watch-how-measles-outbreak-spreads-when-kids-get-vaccinated>

The simulation for the outbreak of measles will run automatically, however, if you need to observe it more than once, the simulation can be started again by clinking the button *‘Run simulation again’*.

Consider the different scenarios:

* Which communities are protected?
* What percentage of vaccination is required to protect the whole community from measles?
* Explain how herd immunity is required to reduce or eliminate measles from the population.
* Explain why the number of individuals who are susceptible to the disease decreases as the vaccination rate increases.
* Will all people be protected if 100% of the population is vaccinated?
* What are the limitations of this simulation model? Consider these when drawing conclusions from the results of the simulation.

1. Do the simulations for influenza and measles show the same pattern of results? Explain.
2. Would the results be the same for all diseases that can be vaccinated against?

**Part C: Research the following:**

1. Explain why influenza vaccinations are only effective for one flu season? Why do other vaccines to other diseases provide longer protection?
2. What are the benefits and risks associated with getting the flu vaccination? Are there people who should not receive the vaccination?
3. Is there evidence that measles has been eradicated from populations? Why are there still outbreaks of this disease?
4. What factors determine if a vaccination program will be effective? Is it the same for all diseases?
5. Should vaccination be compulsory? Who is at risk when vaccination rates drop?

**Part D: The report- Can the flu vaccine give you the flu?**

Using a suitable format, present a report based on your research to inform the community about the effectiveness and use of vaccines including:

* the benefits and risks
* whether or not vaccines can give you the disease being vaccinated against
* vaccination rates and herd immunity
* your recommendations, based on your findings, as to whether vaccination of common diseases should be compulsory.

Suitable formats could include: a brochure, a video like a TED talk, a FAQ fact sheet or scientific opinion article. Part D has a maximum of 1000 words limit (or equivalent).

**Performance Standard:**

|  |  |  |
| --- | --- | --- |
|  | Investigation, Analysis and Evaluation | Knowledge and Application |
| A | Critically deconstructs a problem and designs a logical, coherent, and detailed biological investigation.  Obtains, records, and represents data, using appropriate conventions and formats accurately and highly effectively.  Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.  Critically and logically evaluates procedures and their effect on data. | Demonstrates deep and broad knowledge and understanding of a range of biological concepts.  Applies biological concepts highly effectively in new and familiar contexts.  Critically explores and understands in depth the interaction between science and society.  Communicates knowledge and understanding of biology coherently, with highly effective use of appropriate terms, conventions, and representations. |
| B | Logically deconstructs a problem and designs a well-considered and clear biological investigation.  Obtains, records, and represents data, using appropriate conventions and formats mostly accurately and effectively.  Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.  Logically evaluates procedures and their effect on data. | Demonstrates some depth and breadth of knowledge and understanding of a range of biological concepts.  Applies biological concepts mostly effectively in new and familiar contexts.  Logically explores and understands in some depth the interaction between science and society.  Communicates knowledge and understanding of biology mostly coherently, with effective use of appropriate terms, conventions, and representations. |
| C | Deconstructs a problem and designs a considered and generally clear biological investigation.  Obtains, records, and represents data, using generally appropriate conventions and formats with some errors but generally accurately and effectively.  Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.  Evaluates procedures and some of their effect on data. | Demonstrates knowledge and understanding of a general range of biological concepts.  Applies biological concepts generally effectively in new or familiar contexts.  Explores and understands aspects of the interaction between science and society.  Communicates knowledge and understanding of biology generally effectively, using some appropriate terms, conventions, and representations. |
| D | Prepares a basic deconstruction of a problem and an outline of a deconstruction and biological investigation.  Obtains, records, and represents data, using conventions and formats inconsistently, with occasional accuracy and effectiveness.  Describes data and undertakes some basic interpretation to formulate a basic conclusion.  Attempts to evaluate procedures or suggest an effect on data. | Demonstrates some basic knowledge and partial understanding of biological concepts.  Applies some biological concepts in familiar contexts.  Partially explores and recognises aspects of the interaction between science and society.  Communicates basic biological information, using some appropriate terms, conventions, and/or representations. |
| E | Attempts a simple deconstruction of a problem and a procedure for a biological investigation.  Attempts to record and represent some data, with limited accuracy or effectiveness.  Attempts to describe results and/or interpret data to formulate a basic conclusion.  Acknowledges that procedures affect data. | Demonstrates limited recognition and awareness of biological concepts.  Attempts to apply biological concepts in familiar contexts.  Attempts to explore and identify an aspect of the interaction between science and society.  Attempts to communicate information about biology. |