

## **Stop the Spread & Links to Australian Curriculum Information**

The Australian Curriculum has Three Primary Educational goals for science learning across every year level, from Foundation (prep) to Year 12. This document focuses on the Foundation and Primary School curriculum links that the game has, and the areas of student learning that it can help enhance. Educational lessons and activities related to Stop the Spread (STS) can help increase student knowledge of each of these categories.

These three main categories for each year level are:

*Science Understanding* - awareness and knowledge of scientific concepts and methods

*Science as a Human Endeavour* - how humans do science, and how we use it in the world

*Science Inquiry Skills* - understanding and use of research skills, data gathering, report writing, and the scientific method

Stop the Spread would be a useful learning resource for the following specific targets in each specific grade:

### **Relevance and Ideas for Year 7 to 10 Lessons and Curriculum Goals**

#### *Science Understanding*

- Biological Sciences
  - Year 7 - Players can encounter a wide variety of organisms and creatures while playing, and learn about how their food chains and webs can affect humans and lead to higher rates of disease.
  - Year 8 - Viruses are one of the smallest units of life (though whether they are living is disputed). This information can be used to describe how cells are the basic units of living things, and how viruses interact with their specialised structures and functions.  
As humans are multi-cellular organisms that contain systems of organs carrying out specialised functions that enable them to survive and reproduce, this game can lead to a variety of interesting topics and discussions of how viruses affect the body and impact some of these functions. Also, how viruses and bacteria can affect creatures from completely different species in different ways, based on their cellular structures.
  - Year 10 - Playing Stop the Spread can help form an understanding of the evolution and spread of viruses, as well as how natural selection can help creatures (including humans) to become less susceptible to death from certain illnesses. The arms race between contagions and immune systems is experienced as students race to control the spread while a vaccine is being

developed.

- Chemical Sciences
  - Year 8 - The properties of vaccines and other medical treatments can be discussed based on interactions encountered while playing this game.
  - Year 9 - Students can investigate and discuss how living and non-living systems react to various environmental effects encountered during play, as viruses are fundamentally different from other forms of life.
  - Year 10 - A litany of medical apparatus is presented during the game, and this can be used to spark conversations of how different types of chemical reactions can be used to produce a range of products. For example, oil helps the virus spread around the world by enabling transportation, but then helps slow the spread of the virus by producing sterile equipment and masks/face shields.
- Earth and Space Sciences
  - Year 7 - Seasons play a large part in the spread of disease. Climate change is also contributing to the rates that infections can spread around the world (due to climate refugee movement, water shortages, drought conditions, natural disasters, etc.) These impacts come up during gameplay as players interact with the SPREAD cards.
  - Year 10 - The global systems and interactions involving the biosphere, lithosphere, hydrosphere and atmosphere affect the rate of global viral spread. Some of these effects are present in the game, particularly the impact of natural disasters and rainfall on populations, and how this can affect infection rates in different populations.

### *Science as a Human Endeavour*

- Nature and Development of Science
  - Year 7 - Understanding of scientific methods and techniques is enhanced through gameplay, as players use data gathering and analysis skills to track global infection rates throughout the game, and are presented with a myriad of choices of scientific interventions to deploy and keep track of. Players can take on the roles of different scientific disciplines, from many different parts of the world. At teacher discretion, these can add special abilities or bonuses to different players, eg: data scientist, immunologist, medical doctor,

etc.

- Year 8 - Through play, students will be able to see how scientific knowledge changes peoples' understanding of the world. They will experience their own thoughts and beliefs adapting to new evidence that appears, and will be able to refine their plans and attitudes to the information presented to them while playing. Players can take on the roles of different scientific disciplines, from many different parts of the world. At teacher discretion, these can add special abilities or bonuses to different players, eg: data scientist, immunologist, medical doctor, etc.
- Years 9 & 10 - Predicting outcomes of interventions and measuring the subsequent impact will allow students to refine their scientific understanding of their actions within the game, and allow them to create and contest their own models and theories that they collaboratively form while they play. Discovering new forms of technology to deploy is an important part of the game, and can reinforce the notion that advances in scientific understanding often rely on technological advances, which are often linked to scientific discoveries.
- Use and Influence of Science
  - Year 7 & 8 - Contemporary issues such as food/water availability, population migration, national security, biosecurity, biological agents, trade, etc. are included in the game and involve players finding solutions both in the game mechanics and as independent strategists. Some of the measures they can take - like enforcing lockdowns, closing borders, enforcing masks - all have ethical considerations and impact other areas of society. Players can play with a "Freedom vs Restriction" mode, where every action increases or decreases the amount of control they are exerting over Earth's population. A follow-up activity could include discussing these choices and writing/presenting these justifications. Another follow up activity could be to play the game some more times, focusing on trying to do a "Freedom-Only Run" or trying to use "Maximum Restriction", and comparing/contrasting the results. Players can gain interesting insights for discussion of how people use science understanding and skills in their occupations, and how these have influenced the development of practices in areas of human activity.
  - Years 9 & 10 - COVID19 and the stress that has been placed on the world's medical and scientific systems has revealed how science and scientific research can affect peoples' lives. Fields like immunology and data science will likely see an increase in the number of career opportunities as nations change their systems to attempt to avoid another pandemic stopping the world in it's tracks. This game highlights the need for people to use scientific knowledge to evaluate

whether they accept claims, explanations or predictions, because there are many real-world nations that ignored or were slow to react to the data warning of the impact of the pandemic, due to the values and needs of those contemporary societies. Scientific research is absolutely critical to our modern and future world, and Stop the Spread powerfully reinforces this message.

### *Science Inquiry Skills*

- *Questioning and Predicting*
  - Years 7 to 10 - Every round, players must identify questions and problems that can be investigated scientifically. They then hypothesise the impact of interventions they choose, and then deploy said interventions based on the data they've gathered. They will be able to see the effects of their predictions, and gain a limited form of game-specific scientific knowledge that allows them to refine and adjust their future actions. This repeating process can give an understanding of the scientific method and how concepts and theories can be investigated scientifically.
  
- *Planning and Conducting*
  - Years 7 to 10 - Through play, students will be able to perform a form of simulated (and thus safe and ethical) fieldwork by gathering data on events that occur in the game. This mechanic is central to the gameplay, and it requires students to collaboratively and individually plan and conduct a range of spontaneous investigation types and experiments, including “is lower infection probability better than definite reductions of infection” and “can data science help us predict the next waves of infection?” (The answer is yes!)  
Students will spend the entire playthrough measuring and controlling variables, selecting equipment appropriate to their hypotheses and goals, and collecting/collating data relevant to their choices and the impacts of their actions. Systematic and accurate recording of data is a large part of the game, and so students will have the opportunity to develop and hone these skills.
  
- *Processing and Analysing Data and Information*
  - Years 7 & 8 - The *Global Data Feed* sheet in this game guides players to construct and use a range of representations during play, including graphs, keys and models, as they track the rates of infection around the world. They can also model and predict future rates of infection through analysing patterns and relationships in data, as well as using processes of elimination and percentage chances of future game events occurring.  
Using these representations, students can perform a range of summaries and

reflections on the data, information, and knowledge gained during their time playing the game, using digital technologies as appropriate.

- Years 9 & 10 - As the infection rates rise and fall, players are able to analyse patterns and trends in the data, and to see and describe relationships between variables. By identifying inconsistencies with their predictions and the actual events that occur in the game, players can refine their conclusions and actions to make them more consistent with the evidence they are gathering.
- *Evaluating*
  - Year 7 & 8 - Playing this game offers students an opportunity to reflect on their own scientific investigations performed while playing, and to evaluate the quality of the data they've collected. They can discuss real world limitations to data gathering (eg. in the real world it is impossible to measure infection rates or impacts with 100% accuracy, as it is within the game), and identify improvements to those problems through discussion.  
Through play, students will make their own predictions and decisions about the impact of various interventions on infection rates. They could then evaluate the evidence and see if their claims and/or hypotheses were true.
  - Years 9 & 10 - Evaluating conclusions and identifying sources of uncertainty, and proposing possible alternative explanations for events that occur, is key to the collaborative nature of the game. The world will throw curveballs at players at the beginning, but as they play, the use of scientific strategies like hypothesis forming, data gathering and evidence-based decision making will lead to victory.
- *Communicating*
  - Years 7 & 8 - The game is filled with scientific language and requires students to communicate ideas, findings, and to propose evidence-based solutions to the situations they encounter.
  - Years 9 & 10 - Clearly communicating ideas and presenting information for particular purposes is important while playing Stop the Spread, as the arguments that are based on evidence will be more effective in terms of guiding the team's response to the global infection events. Players can use the representations they've constructed through play to support their hypotheses and conclusions.

## **Relevance and Ideas for Secondary Senior Curriculum Lessons and Subject Goals**

In years 11 and 12, students are able to select from a wide variety of specific subjects for multiple levels of academic and subject-specific interest/ability. A full breakdown of Stop the Spread's relevance to every subject and ability level is beyond the scope of this document, however a general guide to the features of the game that would align with each subject's broad learning objectives is provided below:

### *Mathematics (Essential, General, Methods, and Specialist)*

Stop the Spread allows students to participate in a guided exploration of percentages, graphs, rates of change over time, and a variety of other mathematical concepts. It is a fun game that requires teamwork and collaboration, and offers many opportunities for students to extend their knowledge of viruses, data, data science, analysis, prediction, and calculation of probability.

More advanced mathematical techniques can be applied to information gathered throughout the game. A mountain of data is generated and tracked on the sheet every turn, broken down into each continent and a global total. The rates of change and impacts of various interventions can be modelled very accurately, and there is a possibility of being able to determine the best possible series of actions and priorities to prevent global viral catastrophe.

Data science concepts like Bayesian modelling can be introduced, and real-life data from various nations can be combined with the data generated in-game to enhance learning and extend the skills and knowledge acquisition of students. Global networks of reaction and interaction can be determined, and their impact on the system of global response discussed and made into complex problems requiring many different methods to define, measure, and solve.

### *Biology & Earth and Environmental Science*

The concepts of viral spread, evolution, resistance, medicine, and are centrally integrated into Stop the Spread, and provide students with the opportunity to explore these concepts and gather data from simulated world events in a safe and ethical way. Competing hypotheses can be tested, ideas debated, and conclusions formed and discussed through play. This is an exciting introduction to the dangers of the microscopic world, the functions of global ecosystems, or even the concept of human interaction with our planet.

### *English and Literature*

Though the game centers around mathematical modelling of biological and environmental factors, it is also a strong generator of stories, ideas, and arguments that need to be clearly articulated and explained. Students could use the game to gain some insight into the impact of pandemics around the world, and can link these to skills such as writing, reading, comparison of texts, genre reading (including medical and scientific

literature) and the ability to communicate through written, oral, fictional, and non-fictional means.