**STEM**

**Unpacking the Content Descriptions**

**Levels 9–10**

**Unpacking the content descriptions – STEM**

**Levels 9 – 10**

**Integrating Science and Digital Technologies (STem)**

**Focus: Integration of content related to application of developments in technology and networked digital systems**

| **Learning area** | **Science** | **Learning area** | **Digital Technologies** |
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| **Strand** | Science Understanding | **Strand** | Digital Systems |
| **Sub-strand** | Science as a human endeavour |
| **Content Description** | Advances in scientific understanding often rely on developments in technology and technological advances are often linked to scientific discoveries. | **Content Description** | Investigate the role of hardware and software in managing, controlling and securing the movement of and access to data in networked digital systems. |
| **Related extract from Achievement Standard** | Students predict how future applications of science and technology may affect people’s lives. | **Related extract from Achievement Standard** | Students explain the control and management of networked digital systems and the data security implications of the interaction between hardware, software and users. |
| **Suggested focus** | Learning may focus on:* using optical fibres for the transmission of data
* comparing analogue versus digital communication
* examining relationships between nanotechnology, information technology and biotechnology
* exploring practical and beneficial use of electromagnetic radiation; e.g. radar
* using computer modelling and imaging technologies; e.g. climate change.
 | **Suggested focus** | Learning may focus on:* investigating different types of networks and security features
* identifying characteristics of key hardware and software components
* examining communication protocols and standards
* transmitting various types of media
* exploring network configurations
* examining visual representation of common networks
* discussing security implications of the network and user levels.
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| **Sample activities (integrating both learning areas)** |
| * Evaluating the advantages and disadvantages of different transmission media used in networks; e.g. Wi-Fi, Ethernet and fibre-optic.
* Investigating the development of the National Broadband Network within Australia.
* Visiting a telecommunication exchange and/or data centre to explore its operation; i.e. how it can serve the community.
* Creating a timeline showing the history of today’s smart phone/mobile communication.
* Researching applications of nanotechnology; invite a guest speaker who is involved in nanotechnology (CSIRO).
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**Unpacking the content descriptions – STEM**

**Levels 9 – 10**

**Integrating Science and Mathematics (SteM)**

**Focus: Integration of content related to genetics and chance and probability**

| **Learning area** | **Science** | **Learning area** | **Mathematics** |
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| **Strand** | Science Understanding | **Strand** | Statistics and Probability |
| **Sub-strand** | Biological sciences | **Sub-strand** | Chance |
| **Content Description** | The transmission of heritable characteristics from one generation to the next involves DNA and genes | **Content Description** | Describe the results of two- and three-step chance experiments, both with and without replacements, assign probabilities to outcomes and determine probabilities of events. Investigate the concept of independence |
| **Related extract from Achievement Standard** | Students explain the role of DNA and genes in cell division and genetic inheritance. | **Related extract from Achievement Standard** | Students list outcomes for multi-step chance experiments involving independent and dependent events and assign probabilities for these experiments. |
| **Suggested focus** | Learning may focus on:* understanding the role of DNA in controlling the characteristics of an organism; exploring the genetic code through the construction of the double helix
* constructing models to describe the relationship between DNA, chromosome and genes
* comparing the process of mitosis and meiosis, and identifying the key characteristics and stages within each process via a modelling activity
* exploring key terms such as:
	+ haploid and diploid
	+ homozygous and heterozygous
	+ genotype and phenotype
	+ genes and alleles
* modelling patterns of inheritance including dominant and recessive inheritance, incomplete dominance and sex linkage
* performing various crosses to predict the genotype and phenotype involving dominant and recessive, and sex-linkage inheritance; e.g. constructing Punnett squares
* researching genetic diseases such as Down Syndrome, haemophilia.
 | **Suggested focus** | Learning may focus on:* differentiating between theoretical and actual probability
* calculating the complementary probability of events; e.g. Pr(A) + Pr(A’) = 1
* creating visual representations such as two-way tables and tree diagrams to represent multiple events
* calculating probabilities using probability trees; assigning probabilities to the branches of the trees
* exploring notation to represent situations involving ‘and’ Pr (A ∩ B), ‘or’ Pr(A ∪ B) or ‘not’; e.g. union, intersection and complementary events
* identifying events that are mutually exclusive and deriving the Addition Law for Mutually Exclusive events; e.g.

 Pr(*A* ∪ *B*) = Pr(*A*) + Pr(*B*)* differentiating between an event that is independent versus one that is not

 Pr (A and B) = Pr (A) x Pr (B)* exploring the multi-step experiments where there is and isn’t replacement; determining the probabilities of such experiments.
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| **Sample activities (integrating both learning areas)** |
| * Determining the probability of a family having different combinations of boys and girls.
* Punnett squares are an example of a two-way table. Perform numerous crosses for simple, different types of inheritance including dominant and recessive inheritance.
* Modelling the variation in potential offspring; i.e. theoretical probability versus experimental probability.
* Exploring the inheritance of blood types.
* Construct pedigrees for the inheritance of a characteristic including a genetic disorder.
* Designing an experiment to determine whether a characteristic is dominant or recessive such as a black or white coat in mice.
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