Transformational Teaching:

An Adventist Worldview

SCIENCE

ADVENTIST EDUCATION
AUSTRALIA

INTRODUCTION

This curriculum framework is a brief statement that provides the foundational worldview from which an Adventist teacher delivers the Australian National Curriculum. It is a concise statement of principles, values and threads that undergird and guide what we consider to be real, true and good. This worldview is shaped and permeated with our belief that Jesus is "the Way, the Truth, and the Life." John 14:6.

We also believe strongly that each teacher must teach from within their own authentic Christian journey and that their experiential relationship with Jesus will permeate all they say and do. This framework endorses the notion that rather than being Christians who happen to teach, we are wanting to teach Christianly. We wish to reveal a God who loves unconditionally.

"To think Christianly is to accept all things with the mind as related, directly or indirectly, to man's eternal destiny as the redeemed and chosen child of God." Harry Blamires, ***The Christian Mind: How Should a Christian Think?*** , p. 44

Teaching is more than imparting information. Effective Christian teaching is transformational. It will take Romans 12:1-2 as its focus and try to nurture a discipleship response to God's love in the lives of our students. This provides the basis for the term "threads" used in the Values and Response Threads section. Threads are simply the qualities or characteristics we desire as responses from our students. They help provide cohesion and linkage to everyday living. These Response Threads, like Values, will often overlap in various subject areas, and provide a discipleship response to God's love.

The document is intended to be practical and succinct with a clear focus on the transforming role that the Adventist teacher can play in the lives of their students. It commences with:

- A challenge to maximise the transforming teachable moments.
- An overview Adventist curriculum statement.
- A subject-specific rationale followed by the objectives for that KLA.
- A section focused on just how values and threads, with appropriate essential questions, can challenge the teacher to maximise an Adventist worldview and seek transformational experiences for their students.
- Three pro forma options for developing units with an embedded Adventist worldview.
- Sample units – for both primary and secondary – that illustrate this.

The Transformational Teaching documents are designed to assist teachers in being intentional in including an Adventist Worldview in their Learning Areas. The suggestions included in each framework can also support teachers in achieving the following **Adventist Identity Teaching Standards** (Supplement to the AITSL National Professional Standards for Teachers). Further elaborations of these standards can be obtained from your principal or your Director of Education. They can also be found on the ASA website http://asa.adventist.edu.au

ADVENTIST IDENTITY TEACHING STANDARDS	PROFICIENT STANDARD
1.7 Understand how students learn about God	Design and implement teaching programs to promote and support students' learning about God.
2.6 Knowledge of the content of the Bible and its teachings	Use effective teaching strategies to integrate Bible stories and themes into specific content in appropriate and meaningful ways.
2.7 Reflect an Adventist Worldview	Understand and differentiate the various worldviews to integrate a genuine Adventist Christian Worldview into classroom and school activities.
3.8 Integrate Faith and Learning	Plan and implement effective strategies for the integration of Faith and Learning to engage students in their learning about God.

CHALLENGE

While these curriculum documents have been put forth as suggestions of how topics of faith, God, and values might be interwoven into Science classes, anecdotal research indicates that when people are asked about their "best" teacher, by far the most influential aspects for 70-80% of responses relate to the kind of person the teacher was, and how his/her personal faith and experience with God was talked about, lived, modelled and shared with students. This idea is backed by one Valuegenesis report that recommends that since young people are wanting a deeper personal relationship with God, "church leaders need to consistently model life lived in relationship to God, and teach that religion is basically a matter of relationships with God and fellow humans rather than a system of beliefs or a code of behaviour." More recently the current generation's desire for authenticity, wants to know how this God thing works and to see how it is lived out in everyday life.

EXAMPLES OF POWERFUL AND TRANSFORMING TEACHABLE MOMENTS

In STORIES, teachers share ways that God works and is at work through…

1. Object lessons, metaphors, word pictures, illustrations
2. Teachers or students providing personal stories involving understandings of God, His intervention, His answers…
3. Teacher exemplifying values in his/her own life which students might model – e.g. patience, perseverance, joy of learning, humility, wonder of God's ways , fairness, equity, mercy, and grace for the challenging students.

In FAITH EXPERIENCES in which…

1. Teachers and students have opportunity to share aspects of their personal walk with God with each other (e.g. sharing with a student how your faith in God informs your understanding of the world).
2. Students and teachers explore ways of building relationships with other people through community work, cooperation and service.
3. Class activities/assignments that include opportunities for students to communicate God's message through experiments, discussion, analysis, reporting and other appropriate ways.

In the SCHOOL SETTING, opportunities to acknowledge God exist in…

1. What is written in words, official policies, documents, newsletters, safety precautions and signage.
2. What is visually displayed in terms of bulletin boards, displays, neat and tidy classrooms without rubbish on the floor, manicured lawns and gardens, large posters with a Bible text, inspirational quotation … etc.
3. The 'hidden curriculum' – what is 'felt' when one comes into the school – warmth, belonging, sharing; how we look out for each other; how discipline issues are solved; how the wider community is served; how the environment is cared for; how we rally around those in need…

CURRICULUM in an Adventist School

This statement represents the heart of Adventist Curriculum in Australia, providing a context and orientation for the learning areas that make up the full curriculum.

Seventh-day Adventist education begins with recognition of the eternal, loving and personal God who has always existed, is all powerful, and is the source of all life, truth, beauty and what is of value. It is based on the premise that God has provided insights into His character and what He has created. It believes that as created beings, humans are dependent on God for such insights in order to know how to grow, function and develop in keeping with His ideal for mankind. This need is because of humanity's separation from God through sin, and God's initiative in re-establishing a relationship with humanity through the coming of Jesus Christ, the perfect expression of what God is like.

Adventists believe that humans were created by God to be perfect and in His image, but people exercised their God-given powers of choice and rebelled against God. Mankind is now naturally depraved, dependent on the divine initiative of God for salvation and the restoration of former God-man relationships. Mankind's true value is only found in his relationship with God and not in isolation from Him. This view asserts that an infinite God, through Christ, created this world as part of a perfect universe which He continues to sustain by His power, through the law He has ordained. Although created perfect in God's likeness, humanity's free choice led to alienation from the Creator. This broken relationship resulted in a fallen nature out of harmony with God, and a blighted creation. Through His infinite love, God instituted a plan of salvation through the life, death and resurrection of His Son, Jesus Christ. This plan provides for the restoration of a harmonious relationship between humanity and the Creator, and gives hope of eternal life.

The curriculum in Adventist schools is seen as contributing to the restoration process towards God's ideal. It is, therefore, a needs-based curriculum, covering a range of knowledge, skills, attitudes, behaviours and values through teaching and learning experiences designed to facilitate holistic development – spiritually, mentally, physically, emotionally, creatively and socially. It endeavours to provide this foundation through a comprehensive range of *learning areas*. These learning areas (or LAs) represent the various *facets* of God's creation, how each aspect functions, and how created elements within them interrelate. Although they stand with their own distinctive form and character, and may be studied as such, they also allow for integration with one another, thus acknowledging holism in God's created order. These learning areas, therefore, are like 'windows' in two senses – windows through which students may gain views of God's character and action, and windows of opportunity to respond to God in ways that reflect His character and the values that are part of His Kingdom.

God's design for enjoyment of a full and abundant life is realised in acceptance of His laws and values as revealed in the unselfish life of Christ and is expressed in His teachings. These values impact on all people's cultural activities and reflect their relationship with God, other people and the natural world entrusted to their care as well as providing a foundation for an eternal life lived in God's presence. Related aesthetic values shape their appreciation of beauty and creativity. From this perspective, the development of Christian faith pervades all of life, so every activity within every learning area has spiritual significance.

The Purpose of Teaching and Learning SCIENCE in an Adventist School

God is the loving Creator of the universe and the Author of the laws that govern the natural order. We believe scientific inquiry and the pursuit of a relationship with God are compatible and complimentary. The various 'sciences' as we know them each represent an exploration of particular aspects of the natural order. By studying the sciences we gain an insight into the complexity and purpose evident in nature, which reflect God's intelligence and original design. Although the created order was originally in perfect harmony, we recognise that Satan has actively attempted to corrupt, distort and discredit God's work and character.

Humans are part of God's creation and have been appointed a special role to play in its care. Although we are finite and fallible, we have the capacity for reflection, moral choice and action. By observing, experimenting and reasoning we more fully understand our environment and social context. This places us in a better position to address ethical issues in a wide range of fields: health, environmental management, use of technology, resources etc.

SCIENCE provides students with opportunities to explore, experiment and grapple with ideas. Reasoning, problem solving and practical skills are nurtured in this process. Each student brings a set of predetermined attitudes about God, themselves, other people and the natural world. The study of SCIENCE gives students opportunities to question these preconceived ideas in the context of knowing their own and others' immeasurable value in the eyes of a loving Creator. Scientific theories are constantly being revised as new evidence comes to light. Reflecting on the discoveries of the past allows students to understand their place in history and engage meaningfully in current scientific dialogue.

"The heavens proclaim the glory of God. The skies display his craftsmanship.
Day after day they continue to speak; night after night they make him known."
Psalm 19: 1, 2

"My goal is that they may be encouraged in heart and united in love so that they may have the full riches of complete understanding, in order that they may know the mystery of God, namely, Christ, in whom are hidden all the treasures of wisdom and knowledge."
Col 2: 2, 3

SCIENCE Objectives

The study of **SCIENCE** in a Seventh-day Adventist school will…

***THE FOUR LENSES**	**CREATION**	**THE FALL**	**REDEMPTION**	**RESTORATION**
The Symbol				
The Focus	**PURPOSE**	**PROBLEM**	**RESPONSE**	**HOPE**
The Descriptor	*The meaning of a particular learning concept and God's purpose.*	*What went wrong because of rebellion?*	*How to respond, using learning for God's purpose in everyday life.*	*Points to the future when "all will be made new" i.e. present actions being shaped by the future ideal.*
SCIENCE Objectives	Affirm that God is the omniscient and omnipotent Creator of all things who established natural laws and sustains the universe. Each person was made in God's image and has been charged to explore and develop the earth, caring for it as a steward for its owner, God.	Help students recognise that, because of Man's choice, creation is marred by sin and is in a constant state of change. The scientific method is a way of investigating the world, but our ability to discern truth is limited by what can be observed and measured.	Support students identify how scientific discoveries and understandings can be used to reveal God's character, to further God's Kingdom and have His will done here on earth. Enable students to confidently articulate a rational defence of a biblical worldview within the context of Science. Consider how men and women of Science have expressed and valued their Christian belief.	Encourage students to develop scientific knowledge, understanding and skills to make informed decisions about positive lifestyle choices, service to others, stewardship and management of God's creation. Provide opportunities for students to be awed as new revelations of the wonders of God's world occur.

***Note:** The team developed four objectives after discussions about the book "Connecting Learners with God's Big Story" from Christian Schools Australia, 2015. This books suggests four 'lenses' through which to view the world. These align with our understanding of the Great Controversy and provide a useful tool to assist with integrating faith and learning.

Linking Values for Adventist Schools and Action Responses

VALUES FOR ADVENTIST SCHOOLS	ACTION RESPONSE (THREAD NUMBER)	DESCRIPTION OF ACTION RESPONSE	BIBLICAL FOUNDATION	KEY ESSENTIAL QUESTIONS FOR STUDENTS Adapted from *Transformation by Design*	FURTHER QUESTIONS FOR TEACHERS Adapted from *Transformation by Design*	SAMPLE TEACHING AND LEARNING IDEAS THAT REFLECT AN ADVENTIST WORLDVIEW IN THIS VALUE
*LOVE	**LOVING GOD (1)**	Students respond to God's love by loving God in return and their neighbour and themselves.	1 John 4:16-21 Is 49:15 Matt 22:37-39	• What does Love look like? • What does God's love look like? • How do we respond to God's love?	• What does love look like in my classroom? • Am I capitalising on teachable moments so that students can appreciate God's love in the unit or in my classroom? • Do we see God's love while studying this unit? • How do we learn more of the nature and character of God?	• What does God look like? • Natural disasters • Anthropic principle (finely tuned universe) • Balanced ecosystems
	BUILDING COMMUNITY (2)	Students are active contributors and encourages of others as the community is built up	1 Peter 4:10-11 Phil 2:1-8 1 Thess 5:12-15	• What makes a community? • Who is our neighbour? • How do I make sure that my classmates feel supported? • How can we resolve conflict? • Can we live without others?	• What opportunities are we providing for students to enhance their local and global community? • How can we encourage our students to build each other up and to share burdens? • How do our practices ensure that our classrooms are inclusive spaces where each student has a role to play?	• Living Things – Meeting needs and Living in communities • Communication - Radio signals, photonics • Group collaboration • Energy sources
*SERVICE	**UNDERSTANDING VOCATION (22)**	Students enrich theirs and others' lives through developing and using their gifts.	Eph 6:7 Col 3:22-25 Eccles 9:10	• How do we reflect our Creator in our work? • What's God's plan for my life, and what's the right job for me?	• Is work a blessing? • How are we preparing our students for jobs that do not exist with technology that is yet to be invented? • How are we preparing students for responsive discipleship if/when they enter the workforce?	• Use online tools to determine skills, interests and attitudes • Visits by scientists • Trips to careers expos and Avondale College • Exploring roles in science and give examples of what scientists do
	UNWRAPPING GIFTS (23)	Students enrich their and others' lives through developing and using their gifts.	Rom 12:4-8 1 Cor 12:4-11	• What do I do with my gifts and talents? • How do we learn about God from the gifts He gives us?	• What opportunities do we provide for students to identify and develop their gifts to each other and in their community? • How do you design your assessment to ensure that your students, with a variety of gifts, can flourish academically?	• Rich assessment tasks (e.g.. design a 3D cell, a garden, or a solar oven) • Using multiple intelligences in designing an assessment task • Allowing choice in how students demonstrate their thinking

* Denotes the addition of **Love** and **Service** to the Values for Adventist Schools. Love overarches these Values and Service is the active evidence of God's Love and Kingdom Values. For the purpose of keeping this forefront in our thinking, Love and Service have been included with the Values listed.

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EXCELLENCE	**DISCOVERING PATTERNS (6)**	Students explore and discover God's patterns and designs for delighting in and or using for the benefit of all.	Jer 31:35-36 Gen 9:12-16 Ps 8:3	• What can we learn from patterns? • Are people programed to behave a certain way? • Is human conflict a pattern? • Can you safely mess with natural patterns?	• What do patterns and order reveal about the character and nature of God? • What opportunities are we creating for students to play with patterns? • What patterns and structures are you deliberately shaping in your classroom? • What concerning patterns are emerging in your classroom? Do they need attention?	• Graphing motion and the natural world. • Day and Night • Tides • Earth and Space • Climate change • Endangered species • Pollution
	IMAGINING INNOVATIONS (10)	Students innovate renew for good purposes and thereby praise the Master Designer?	Rev 21:1, 5 John 1:1-3 Ps 33:6-9	• Are innovations always improvements? Who decides? • What is progress? • Is there any truly unique and new idea? • Can an innovation have no purpose? • Where do new ideas come from?	• How do we ensure our innovations / changes are aligned with God's will? • What role does relationship / community / empathy play when creating innovations? • Where in our programs are we giving students the opportunities to innovate? • Where are we teaching them skills of the design process? • What opportunities are we giving student to explore and create through innovation?	• Renewable energy • Science as a Human Endeavour • Design investigations (e.g. in a forces unit on push and pulls, or packaging)
	REFLECTING CREATIVITY (16)	Students praise God by reflecting their Creator and designing creative processes, things and ideas.	Gen 1:1, 31 Ps 19:1-7 Col 1:16	• How did God make me creative? • Does everyone have the gift of creativity?	• In what ways is reflecting creativity both a service to God and others?	• Create a model of a cell • Design a bridge • Communicate scientific ideas by a variety of techniques
COMPASSION	**PURSUING PEACE (15)**	Students bring healing and restoration to people and areas of brokenness.	Is 58:6-14 Col 3:15 2 Cor 13:11	• Why is peace defined as not just the absence of trouble? • Is lasting peace achievable in a broken world? • Can all broken relationships be restored?	• How can we be agents of peace in caring for creation? • What issues of social justice and the need for restoration arise out of the unit being studied?	• Renewable energy • Endangered species • Nuclear energy • Defense technology
	SHOWING MERCY (20)	Students respond to God's mercy by likewise being merciful to others?	Col 3:12,13 James 2:12-13 Exodus 33:19-20	• How does empathy encourage us to show mercy? • How should we act towards others who hurt and offend us?	• What does compassion and mercy look like in our classrooms? • How do we teach our students to forgive and show mercy?	• Health and nutrition • Discussions on issues such as bioethics, abortion, euthanasia, GMOs… • Water projects • Disease treatment

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HUMILITY	**IMITATING HUMILITY (11)**	Students recognize that Jesus is our model and we encourage our students to put other first.	Matt 11:28-30 Romans 12:3 Matt 20:26-27	• Are scientific understanding founded on collaboration by scientists, both past and present? • Do students understand that science is about being open to new ideas and findings?	• How can we foster a spirit of humility in our classroom? • Are we modelling collaboration and openness in our own lessons?	• Developing scientific theory and ideas, e.g. – science of the atom • Our place in the universe • Examples of great scientists who contribute without expecting a reward
	PRACTISING HOSPITALITY (14)	Students welcome and accept others, and use their gifts to embrace others into community.	Heb 13:2-3 Gen 18:1-5 Acts 2:42-47	• Am I welcoming and accepting of others? • Do we have a responsibility to show hospitality within my community and have a global community awareness?	• Am I conveying a sense of acceptance and support within my classroom? • Do I encourage an awareness of compassion and responsibility to others? • Do I cultivate a spirit of generosity in my students, teachers and school?	• Use garden produce to feed others • Cook and share with others • Welcome students into lab groups • Intergenerational community projects
JUSTICE	**SEEKING JUSTICE (18)**	Students act as agents of change by identifying and responding to injustice.	Is 1:17 Ps 101:1 Is 61:8 Matt 12:18	• How do we use Science to make choices that promote justice? • How do we respond to injustice?	• How is our lifestyle an outworking of our understanding of justice? How are we applying this in our classrooms?	• Issues in bioethics. • Unintended consequences of government policies on the poor or powerless, for examples, in climate change. • Exploitation and ethical use of resources, such as water, mineral and human resources.
RESPECT	**EMBRACING DIVERSITY (7)**	Students respect and celebrate built in differences between cultures and peoples given for the enhancement of all.	Gal 3:26-29 Rev 7:9-10 Acts 17:24-27	• Why are we all different? • What good comes out of diversity?	• Are we encouraging students to recognize there is diversity in ideas within science? • How can there be unity in Christ with such diversity in scientific understanding?	• Evolution • Genetic inheritance • Family trees • Classification of living things • Natural selection demonstrates the importance of diversity to the survival of a species • Survival

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RESPECT [CONT]	**PONDERING CREATION (13)**	Students contemplate both the Creator and His handiwork and respond in delight and praise.	Ps 19 Rev 4:11 Matt 6:25 -31	• Where can we see the fingerprints of God in creation? • What does creation tell us about God and ourselves? • How is design evident in creation? • How do we respond to questions of nature that we cannot answer? • If God created the whole universe, why does he care about us?	• How are we recognizing God's supreme artistry in creation? How can we draw our students' attention to this in our units? • While pondering creation, what do we learn about our relationships with our creator? • In what ways are we incorporating moment to pause/reflect/ contemplate in this unit? • Different people ponder and respond in different ways. How can we create opportunities for student to ponder and respond in their style? • What are examples of God's good creation? Are we limiting these to the physical creation?	• Earth and Space • Weather • Natural disasters • Adaptations of animals • Life cycles • Living things
INTEGRITY	**CHALLENGING DISTORTIONS (5)**	Students identify and critique areas impacted by sin and then discern God's purposes.	Titus 2:11-14 Acts 17:22-24 Rom 12:1-2	• Why do we love things that are bad for us? • Who's telling us what to believe?	• How do we highlight/bring out the goodness of God's way of doing things? • Are we aware of the ideas that have shaped our thinking/teaching practices/unit content?	• Explore the nature of science and how it is based on the philosophy of naturalism. • Evolution and the Big Bang theory – giving credit for life to God rather than natural causes. • Sustainability – protecting the environment from overuse of resources. This links to ideas on food webs. • How science can be used for good rather than evil, e.g. nuclear technology
	TRANSFORMING THINKING (21)	Students let every thought be captive to Christ so that their thinking is transformed by the renewing of their minds.	2 Cor 10:3-5 Phil 4:6-8 Is 55:8-9	• What is wrong with the world? • What makes bad thinking bad? What makes good thinking good?	• How do we encourage our students to think about their thinking? • Where are we utilizing moments in our classrooms to highlight how the world's way of thinking is at odds with God's way of thinking? • How does a renewed mind help to 'test and approve' or discern and critique.	• Teach Scientific Thinking and the strengths and weaknesses of this way of thinking. • All humans are children of God

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DISCERNMENT	**GETTING WISDOM (9)**	Students can go deeper than understanding and knowledge to seek the insight of God.	James 1:5 Prov 2:6-9 Col 2:2-3	• What is wisdom? • What is needed to make a wise decision? • Does wisdom change with the times? • How is wisdom different from scientific knowledge?	• What is the relationship / connection between knowledge, understanding, experience, common sense, and insight? • Is it reasonable to expect a child to show wisdom? • How are we ensuring that we are 'in step with the Spirit' so that we are wise leaders in our classrooms?	• Science as a human endeavour: Sir Isaac Newton studied and wrote on the Bible and Science. Howard Florey refused to patent penicillin to help the world. • Was it wise for Nobel winner Barry Marshall to drink Helicobacter? • God's plan for the earth • Lessons from nature
	SHAPING CULTURE (19)	Students understand their cultural context, discern its errors and its virtues, and seek to 'shake and shape' it for the Kingdom.	Heb 11:24-28 Luke 10:36-36 Mark 4:30-32	• How do we discern what is good or bad in our culture? • What does it mean to live counter-culturally?	• Do our classrooms foster an environment that stands up for the oppressed, puts others first and celebrates the success of others?	• Celebrate student success • Expect that students can be successful and support them to achieve success • Sharing an understanding of what success looks like • How culture affects lifestyle, e.g. exercise, diet, disease (e.g. STIs)
RESPONSIBILITY	**CARETAKING EARTH (3)**	Students actively respond to God's call to carefully manage all of creation.	Gen 1:28 Ps 8:5-8 Gen 2:15	• Why should we take care of the earth and what does that look like? • How can we explore and make use of the world God has given us, without going too far in our use of the Earth's resources?	• What whole-school / classroom / individual practices promote caretaking earth? • How do we affirm the hope we have in a loving and sustaining God in the face of a decaying and despairing world?	• Recycling • Sustainable water use • Calculate our ecological footprint (calculators available online) • Pollution e.g. ozone chemistry, the enhanced greenhouse effects, photochemical smog, salinization of soils, acid rain etc. • Sustainability of food webs in the environment • Endangered species • Bio magnification of pollutants
	EXPRESSING WORDS (8)	Students use words to build up, make choices, and express life.	Col 4:6 Matt 12:43-47 Eph 4:29	• Why are words so 'powerful'? • What is the connection between what we think, what we feel, and what we say?	• How are we exposing students to a rich vocabulary so that they may carefully select the most apt words to use in their written and verbal expressions? • Do our classrooms allow for more enriching student conversation rather than teacher talk?	• Vocabulary of scientific terms • Practice collaboration on scientific projects • Write scientific reports • Communicate to specific audiences using scientific ideas • Analyse data • Evaluate scientific information • Respecting others' opinions during classroom discussions and debates • The dynamic and changing nature of scientific language

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HOPE	**OVERCOMING SETBACKS (12)**	Students overcome setbacks through the strength of the Spirit and live in hope and faith.	James 1:12 Matt 5:11-12 Romans 5:4	• What does perseverance look like and how do we respond to setbacks?	• What influence does a positive (growth) mindset have on our responses to setbacks? • By knowing God, how can we intentionally embed resilience and perseverance into our curriculum/teaching practices?	• Great people of the past who persevered: Thomas Edison, Ernest Shackleton, Peter the Apostle, etc. • Redesign a failed science experiment • Suggest improvements to a science experiment • Resilience and courage in receiving and giving feedback
	CELEBRATING LIFE (4)	Students embrace the full suite of God's provisions in life and live in such a way that all may flourish.	Ps 16:8-11 Eccles 9:10 Ps 90:14,17	• What do we do to value and celebrate life?	• How do we provide students opportunities to celebrate life, faith and learning?	• Hatch chickens, grow vegetables and fruit, look at insects under the microscope, investigate decomposers, study genetics, life cycles, reproduction, cooking what we have grown • Ten most ugly animals website
	RELISHING PLAY (17)	Students have an attitude of joy-filled play as they respond to what God has provided and Christ has restored.	Proverbs 8:27-31 Eph 5:20 Job 38:4,7 Job 38:32,35,37	• Why is play important in Science?	• Can we find the balance between work, rest and play? • What is play and how can I make Science fun?	• Physical sciences: play with Lego, make pulleys, paper helicopters, race Billy carts and measure their speed, use robotics, make electronic circuits • Biological sciences: make DNA models, investigate insects and flowers • Earth and space sciences: Make renewable energy, make rockets. • Chemical sciences: investigate as many elements as possible, make plastic or slime, ignite fuels

Key *Values* of the scriptural story can be woven through the curriculum and thereby 'draw together' meaning and purpose in learning.
These numbers in the Response Threads column correspond to the Threads in '*Transformation by Design*" by the National Institute for Christian Education, 2015

Please Note:

The pro formas and samples that follow are not meant to be prescriptive. Each Conference has its own set format for programs and documentation. However, if these would help then please feel free to utilise them. The important thing is that there is embedded in our documentation a clearly articulated Adventist worldview and reference to a desired student response of threads and values. If this is not inherent in existing documentation, then the "God in my Unit" sheet is possibly the easiest way to ensure that this criteria is met. Formats in both portrait and landscape are available on the Adventist Schools Australia website http://asa.adventist.edu.au

GOD IN MY UNIT TEMPLATE

To be used with existing unit documentation to assist in intentionally including an Adventist worldview

1. UNIT FOCUS *What is the main focus of the unit / key questions?*
2. WINDOW ON THE ADVENTIST WORLDVIEW *What are the main connections between the Biblical themes and the unit?*
3. THREADS/VALUES *What main values are in this unit? How might students respond to these values?*
4. APPLIED THROUGH THE UNIT: *Where will the Adventist worldview and threads / values be applied specifically through the unit?* *i.e. p 2 – reflect on the mercy of God as the story unfolds*

THE BIG PICTURE TEMPLATE

1. THE MAIN IDEA *Summarise the Main Idea*	
2. WINDOW ON THE ADVENTIST WORLDVIEW *Articulate the connections between the biblical story and the unit*	
3. THREADS/VALUES *Choose the relevant response threads*	
4. ENDURING UNDERSTANDINGS *Identify the enduring understandings* *Identify misunderstandings*	**5. ESSENTIAL QUESTIONS** *Shape the essential questions*
6A. KNOWLEDGE *Note the relevant key knowledge and skills*	**6B. SKILLS**
7. PRESCRIBED CURRICULUM *List the relevant content heading and descriptors*	

Both templates based on: National Institute for Christian Education, (2015) *Transformation by Design,* p19 The Big Picture Template

SAMPLE UNIT using *THE BIG PICTURE* template

LIFE CYCLES [Year 2 – Biological Sciences]

1. THE MAIN IDEA

Living things grow, change and have offspring similar to themselves.

2. WINDOW ON THE ADVENTIST WORLD VIEW

God is the ultimate Artist and Designer who has created living things that continue to grow, change and have offspring similar to themselves. Even in our current world that is distorted by sin, we can still see God's handiwork and be in awe of His creative power. From the beginning, God established natural laws and we can have confidence that they will endure. As we see evidence of new birth, growth and changes in life we can find joy and celebrate in awe, wonder, interest and amazement.

3. THREADS/VALUES

Values: Respect and Hope
Threads: Pondering Creation (13), Celebrating life (4)

- Respect – Pondering Creation (13)
- Hope – Celebrating Life (4)

4. ENDURING UNDERSTANDINGS
Students will understand that…

- God is the originator of life and He designed it with purpose and sequential order.
- God's patterns in life endure but may be distorted by sin.
- Living things have predictable characteristics at different stages of development.
- Animals have offspring similar to themselves, usually with two parents.

5. ESSENTIAL QUESTIONS

- How do we value and celebrate life?
- Where can we see the fingerprints of God in creation? (order, patterns)
- What are the life cycles of living things?
- Why do living things have predictable characteristics at different stages of development?

6A. KNOWLEDGE
Students will …

- Know the different growth stages in a life cycle.
- Know the origin of life.
- Understand the scientific vocabulary associated with life cycles.

6B. SKILLS
Students will be able to…

- Sequence stages of life cycles.
- Describe changes that occur with growth.
- Participate in guided investigations to answer questions.
- Use a range of methods to sort information e.g. flow charts
- Use relevant scientific vocabulary
- Work collaboratively to compare observations
- Use a variety of media to research and present findings

7. PRESCRIBED CURRICULUM

See Australian curriculum as per state requirements.

SAMPLE UNIT using ***THE BIG PICTURE*** template

OUR SOLAR SYSTEM [Year 5 – Earth and Space Sciences]

1. THE MAIN IDEA
Earth is part of a system of planets orbiting around a star (the sun).

2. WINDOW ON THE ADVENTIST WORLD VIEW

God created our Solar System as part of the Universe. He created it with natural laws and continues to sustain the order He established. We sense that there is so much we still don't know and can't comprehend. As we see the vastness of the Heavens we stand in awe and contemplate both the Creator and His handiwork.

3. THREADS/VALUES

Values: Respect and Excellence
Threads: Pondering Creation (13), Discovering Patterns (6),

- Respect – Pondering Creation (13)
- Excellence – Discovering Patterns (6)

4. ENDURING UNDERSTANDINGS
Students will…

- God created our Solar System as part of the Universe.
- The Earth is part of a system of planets.
- The Earth revolves around a star (the sun).
- Our measurement of time is based on the interplay of our Solar System (days, months, years, seasons)

5. ESSENTIAL QUESTIONS

- Where do we see the fingerprint of God in our Universe? (Suggested resource: Louie Giglio DVD / YouTube – 'Indescribable and How Great is our God')
- What do the patterns and order of our Solar System reveal about the character and nature of God?
- Would the conditions on other planets in our Solar System sustain life? Why/Why not?
- What is a Solar System?
- What are the different characteristics of our Solar System?

6A. KNOWLEDGE
Students will know that…

- Earth is part of the Solar System.
- A sun is a pivotal point of a Solar System.
- Each part of a Solar System is dependent on all other parts.
- Movement follows a pattern.
- Know the names and characteristics of the planets in our Solar System
- The Solar System is part of God's created order.
- Review concepts of revolution, rotation and tilt.

6B. SKILLS
Students will be able to…

- Calculate proportions of distance.
- Represent / Model the Solar System.
- Use a range of methods to represent and describe observations, patterns and relationships.
- Use a variety of research tools.
- Gather data and use evidence to develop explanations of phenomena.

7. PRESCRIBED CURRICULUM

See Australian curriculum as per state requirements.

PRO FORMA FOR UNIT DEVELOPMENT USING UNDERSTANDING BY DESIGN

<table>
<tr><th colspan="3">STAGE 1 – DESIRED RESULT</th></tr>
<tr><td rowspan="8">Established Goals</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to:</td></tr>
<tr><td>Window on the Adventist Worldview</td><td>Values / student response</td></tr>
<tr><td>Share the way an Adventist world impacts on:</td><td>Identify the values / desired student response:</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>Understandings:
Students will understand that:</td><td>Essential Questions
Students will keep considering:</td></tr>
<tr><td colspan="2">Acquisition of Knowledge and Skill</td></tr>
<tr><td>Students will know:</td><td>Students will be skilled at:</td></tr>
<tr><th colspan="3">STAGE 2 - EVIDENCE</th></tr>
<tr><td>Evaluative Criteria</td><td colspan="2">Students will show their learning by:</td></tr>
<tr><td></td><td colspan="2">Performance Tasks:</td></tr>
<tr><td></td><td colspan="2">Other evidence:</td></tr>
<tr><th colspan="3">STAGE 3 – LEARNING PLAN</th></tr>
<tr><td colspan="3">Summary of Key Learning Events and Instructions</td></tr>
<tr><td colspan="2"></td><td>Progress Monitoring</td></tr>
</table>

Based on: Wiggins, G. P., & McTighe, J, (2011) *the Understanding by Design Guide to Creating High Quality Units*, Moorabbin, Victoria: Hawker Brownlow Education.

SAMPLE UNIT using **UNDERSTANDING BY DESIGN** template

What Will My Kids Look Like? [Year 10 Genetics]

<table>
<tr><th colspan="3">STAGE 1 – DESIRED RESULT</th></tr>
<tr><td rowspan="5">Established Goals / Standards
The transmission of heritable characteristics from one generation to the next involves DNA and genes(ACSSU184)

Scientific understanding, including models and theories, are contestable and are refined over time through a process of review by the scientific community(ACSHE191)

Advances in science and emerging sciences and technologies can significantly affect people's lives, including generating new career opportunities (ACSHE195)

The values and needs of contemporary society can influence the focus of scientific research (ACSHE230)</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to:
Describe the structure of DNA and explain how that structure enables processes such as semi-conservative replication of DNA, mitosis and meiosis, and gene expression.
Describe and predict how physical traits are transferred from one generation to another and how scientists can manipulate these traits through methods such as selective breeding and genetic engineering.
Discuss how an Adventist world-view can be used to inform decisions about socioscientific issues.
Identify how the products and understanding resulting from science can be used to further God's Kingdom.</td></tr>
<tr><td>Window on the Adventist world view</td><td>Values / thread</td></tr>
<tr><td>Share the way an Adventist world view impacts on:
Life is sacred and created by God. This will impact upon the way we use gene technologies.
We use gene technology to promote and preserve life.</td><td>Identify the values / desired student response:
Respect – Embracing diversity (7)
Compassion – Pursuing peace (15)
Excellence - Discovering patterns (6) and Pondering creation (13).</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>Understandings:
Students will understand that:
The structure of DNA enables it to be copied quickly and accurately, during the processes of mitosis and meiosis, and enables proteins to be manufactured.
Punnet squares and pedigree charts can be used to describe and predict how physical traits are transferred from one generation to another.
Traits that are passed on from one generation to another can be manipulated through selective breeding and by gene transfer technologies.</td><td>Essential Questions
Students will keep considering:
What do patterns and order reveal about the character and nature of God?
What opportunities are we creating for students to play with patterns?
How do we ensure our innovations/changes are aligned with God's will?
What role does relationship/community/empathy play when creating innovations?
Can you safely mess with natural patterns?
Are innovations always improvements? Who decides?
What issues of social justice and the need for restoration arise out of the unit being studied?</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">Acquisition of Knowledge and Skill</td></tr>
<tr><td></td><td>Students will know:
The structure of DNA.
The processes of semi-conservative replication, mitosis and meiosis, and the production of proteins.
DNA is inherited from parents.
Selective breeding can be used to obtain desired traits.
How gene technologies can be used to transfer DNA from one organisms to another.
How a range of gene technologies are used, such as cloning, transgenics, paternity testing and research.</td><td>Students will be skilled at:
Drawing and labelling diagrams of DNA.
Using punnet squares to predict inheritance.
Drawing and using pedigree charts.
Identify differences between mitosis and meiosis.
Respectful discussion/debate different viewpoints on genetic technologies.</td></tr>
<tr><td colspan="3">STAGE 2 - EVIDENCE</td></tr>
<tr><td>Evaluative Criteria</td><td colspan="2">Students will show their learning by:</td></tr>
<tr><td>Accurate
Creative
Proficient
Detailed
Evaluated
Critically analysed
Coherent and thoughtful</td><td colspan="2">Performance Tasks:
Students will show that they really understand by evidence of:
Draw and label a DNA model.
Construct punnet squares and predict offspring genotypes and phenotypes from parent genotypes.
Analyse and construct pedigree charts using generational information.
Model the differences between meiosis and mitosis.
Group oral presentation on genetic technologies discussing applications and ethics from a variety of worldviews.
EXAMPLES OF TYPES OF TASKS:
MODEL MAKING
TEST
PRESENTATION & DISCUSSION</td></tr>
<tr><td></td><td colspan="2">Other evidence:

Respect in discussions.
Understanding that different worldviews will come up with different conclusions on ethical issues.
Articulating a variety of viewpoints on ethical issues.</td></tr>
</table>

STAGE 3 – LEARNING PLAN	
Summary of Key Learning Events and Instructions	
• Introduction to the unit. Have a look at the traits of the individuals in the class. Use PTC test strips to see who can taste it. Construct a class tally looking at who can roll their tongue, who has a widow's peak, straight vs. curly hair, middle-hair digit, eye colour, hair colour, and other genetic traits. • Brainstorm what students know about DNA. • Discuss and draw the structure of DNA. Make a model of DNA. • Practical: extract DNA from a plant (such as wheat or strawberries) and compare to DNA students extract from their own bodies. • Use video clips and microscope slides to study the processes of semi-conservative replication, mitosis and meiosis, and the production of proteins. • Assessment: model the differences between mitosis and meiosis. • Make an animal activity: using model genes randomly construct the genotype and phenotype of an animal. • Discuss examples of selectively bred plants and animals that benefit us, e.g. brassica family, the dog family. • Discuss a range of examples of gene technologies (such as cloning, creating GMOs, paternity testing, embryo selecting) and discuss the purpose of transferring DNA between organisms. • Discuss the methods for transferring DNA between organisms. • Introduce the concept of ethical thinking. Discuss the ethical issues surrounding the use of gene technologies. Discuss how a Christian worldview changes how we view these ethical issues. Students research and then present an oral presentation on genetic technologies, discussing applications and ethics from a variety of worldviews. • Practice drawing and interpreting punnet squares to predict inheritance. Predict the offspring genotypes and phenotypes from parent genotypes. • Practice drawing and interpreting pedigree charts. • Practice test. • Test.	*Progress Monitoring* Check diagram. Check practical report. Mark assessment on mitosis and meiosis. Monitor weekly homework task. Use an ethical framework to guide discussion. Feedback on worksheets on punnet squares and pedigree charts. Go through answers to practice test.

Based on: Wiggins, G. P., & McTighe, J, (2011) *the Understanding by Design Guide to Creating High Quality Units*, Moorabbin, Victoria: Hawker Brownlow Education.

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ADVENTIST EDUCATION
AUSTRALIA

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