INTRODUCTION: Issues and Theoretical perspectives Influencing Middle Years Students

This unit of work was developed for Victorian Level 4, Year 6 (Middle Years Students) of Trinity Anglican College. Previously the school catered for high school students, so fortunately the Year 6 students have access to a food technology centre and a science laboratory. Science experiments and cooking classes have thus been incorporated into this unit.

This unit was designed taking the issues influencing Middle Years Students of Level 4 in mind in order to cater for their interests, needs and capabilities.

There are many aspects to consider when planning for teaching and learning in the middle years. It is important to have knowledge of children’s growth, development and learning, as it will aid teachers to select the most supportive environment and most effective teaching and learning strategies. Teachers need to consider how a child learns and what the child is capable of learning within their cultural and social context of development.

The Middle Years of Schooling Years 5-8 are the years where students progress beyond their foundations, become more complex thinkers and develop their literacy and numeracy. The Victorian Essential Learning Standards refers to this stage as the time when students are ‘building breadth and depth’; literacy and numeracy becomes more sophisticated, and important interdisciplinary capabilities are introduced. (VELS, 2009) At this stage students are developing physically, mentally and emotionally at a very rapid and individualised pace. Some students may experience the commencement of adolescence while others still remain children. Often there are huge differences in emotional, behavioural and cognitive development among students in the same class. These young teenagers start to associate achievement with skill and cognitive ability instead of effort. Teachers need to develop units of work with content that is perceived by students as being interesting, valuable and consistent with their personal goals.

During this transition phase to secondary school, teachers need to assist students in becoming more independent, flexible and self-regulatory in the process of their learning. They start understanding complex thinking processes such as research, problem solving, creative and critical thinking, reflection and evaluation.

This unit aims to give the students the opportunity to develop these processes by making use of the 5E teaching and learning model:

- Engage: Engage students and elicit prior knowledge
- Explore: Provide hands on experience of the phenomenon
- Explain: Develop scientific explanations for observations and represent developing conceptual understanding
- Elaborate: Extend understanding to a new context or make connection to additional concepts through student-planned investigations.
- Evaluate: Students represent their understandings and reflect on their learning journey and teachers collect evidence (formative and Summative)
Even though Middle Years students develop their thinking skills and become capable of thinking abstractly it is important for teachers to keep in mind their brains are not fully developed. Myelination, which affects the speed at which messages are processed, and their fine motor skills are still underdeveloped. This tends to cause them to react on instincts instead of making sound decisions. At this stage it is essential for students to communicate, participate and work co-operatively and have self-control to resolve conflict in a peaceful manner. This unit provides ample opportunity for interpersonal development and building on social relationships as students work co-operatively in groups while they hold discussions, participate in learning activities and conduct experiments in more extended projects.

According to the Victorian Essential Learning and Standards Students of Level 4 years 5 and 6 have the following key characteristics.

- assuming leadership responsibilities
- developing self-efficacy skills
- specialising and differentiating between domains
- managing new situations and solving problems
- learning deeply through extended projects to build flexible thinking and learning strategies
- exploring concepts that allow for several points of view
- demonstrating a preference for more specialised intelligences.

The most influential constructivist theories, (that were used in this unit) for effective planning of activities for middle years students, are: Piaget’s formal operational stage (years 11-16) of development, Vygosky’s zone of proximal development, Bruner’s & Rogoff’s scaffolding and Brofenbrenner’s social context.

Piaget believed development phases are essential for children to advance to the next level of cognitive development and exhibit the intellectual abilities and increased understandings as they advance to the next phase (Wood & Grossniklaus, 2001). They should also remember that children have their own individual rate of development stretching over a broad continuum (Wood & Grossniklaus, 2001, P. 1). Teachers should have an awareness of the stage characteristics of the thought process and individualise learning experiences so each student is working at a level that presents a mismatch between what the student knows and the new knowledge to be acquired, to ensure they are challenged. Teachers are able to use resources, materials and ITC that encourage creative thought and learning.

In using the constructive theories the teacher’s role is to facilitate learning by providing a variety of experiences. In this unit children are exposed to a variety of learning experiences. Scaffolding developed from the work of Vygotsky and Bruner. It is a process where a teacher provides temporary guidance and support to children moving from one level of competence to another, so they can develop independent learning skills. One of the most important concepts of Vygosky’s theory is that of the zone of proximal development (ZPD). The definition of ZPD is the distance between the most challenging task a child can perform unassisted and the most challenging task a child can perform with assistance. Change takes place within the ZPD when a child demonstrates that he can do
something independent today that he could not do yesterday unassisted.

The Victorian Principles of Learning and Teaching (POLT) stress the importance of these constructivist theories by stating that children ‘learn best when the learning environment is supportive and productive and promotes independence, interdependence and self-motivation and the students are challenged and supported to develop deep levels of thinking and application’ (Department of Education and Early Childhood, 2009, para1).

The Middle Years Pedagogy Research and Development (MYPRAD) project based on a framework describing middle year’s pedagogy provides the following key messages for teachers undertaking literacy development activities:

- Students’ oral language is the foundation for learning to use language and using language to learn across the stages of schooling and within all domains
- A range of theories and research are required to best support all students to improve literacy
- Every teacher is a teacher of literacy
- A balanced and integrated approach to teaching literacy is essential
- Assessment is the beginning place for supporting literacy and the learner at the centre of curriculum planning.

During this stage students need to be challenged as they further develop their literacy and numeracy skills. The focus of this unit is to develop the literacy skills of students integrated into other areas of the Curriculum.

UNIT RASIONALE

This unit of work aims at encouraging students to understand the role of micro-organisms, which are too small to be seen by the naked eye, play in our world. They will learn that micro-organisms are important to life on earth, they are everywhere and affect everyone. Students will investigate the conditions that micro-organisms need to feed, grow and reproduce as they make their home on food, plants, humans and lots of other living things. Some are beneficial while others are harmful.

They will study and research the beneficial role of micro-organisms:

- As a vital ingredient in the production of food such as yeast in bread & bacteria in yoghurt and medicine
- In our bodies to aid digestion
- In the development of penicillin
- As decomposer micro-organisms that decay rotting plant animal matter, returning important nutrients back into the soil

They will hold discussions and learn about harmful micro-organisms:

- Those that are responsible for illnesses and diseases such as sore throats, influenza, food poisoning, chicken pox, athlete’s foot, infected wounds, tuberculosis and AIDS just to name a few
Food spoilage micro-organisms, such as mould

Expectations at the end of the unit:

- Recognise that there are many very small organisms which can cause illness or decay or which can be used in food production and that these micro-organisms feed, grow and reproduce like other organisms
- Describe evidence that yeast is living; explain how micro-organism can move from one food source to another and cause food poisoning.
INTEGRATED & INTERDISCIPLINARY UNIT OF WORK WITH LINKS TO THE CURRICULUM

This unit of work on micro-organisms is being taught as an integrated unit of work involving materials from more than one syllabus. It involves parts of the English syllabus, science syllabus, ICT, Humanities and Physical Health and Education syllabus. This unit will be taught as an integrated unit to allow students to learn about micro-organisms in a variety of ways to meet the learning needs and capabilities of students. The purpose of this approach is to enhance and develop the students’ understanding and enjoyment of this topic.

This unit’s teaching will also be conducted in interdisciplinary/ integrated teaching which is a method, or set of methods, used to teach a unit across different curricular disciplines such as literacy, science, maths, history etc.

The diagram illustrates the distinction between disciplinary, multidisciplinary & integrated disciplinary units of work.

At this level of schooling we will not be incorporating trans disciplinary learning into this unit as students are too young to research new perspectives.

It is intended to provide learning opportunities in the following curriculum areas, leading toward outcomes in the VELS Level 4 Standards and Learning Foci:

**Interpersonal Development:** Working and learning in teams; managing and resolving conflicts; building positive social relationships.

**Personal Learning:** Seek and respond appropriately to feedback from peers and teacher; increasingly manage own learning and growth by setting goals and managing resources; recognise and enact appropriate values within the school context.

**Communication:** Students practice the skills of being attentive listeners and viewers; are encouraged to question; make oral presentations.

**ICT:** Use ICT to research, acquire new knowledge; work in a networked environment; with assistance, locate and retrieve relevant information.

**Thinking Skills:** Develop skills in making accurate observations, and record their observations.

**Science:** Students research micro-organisms and focus on bacteria and moulds. Experiment, investigate, observe and describe the world of micro-organism; expand simple scientific vocabulary; practice basic procedures and processes including those involving safety; repeat observations to make predictions; recognise simple patterns in data and describe them in terms that represent conclusions.

**Food Tech:** The role of micro-organisms in food production; Yeast as a vital ingredient in the baking of bread and bacteria in the making of...
yoghurt. Food safety and handling to prevent cross contamination of micro-organisms and food poisoning.

**Humanities – History: Time, Continuity & Change.**

In the context of micro-organisms students will study a factual recount of how Anton van Leeuwenhoek made the microscope and Alexander Fleming discovered penicillin as a treatment for bacterial illnesses.

Students look at the history of yeast and bread.

**Studies of Society & Environment:** Students research the diversity of bread and yeast and its role in cultural identity.

**Religious Studies:** The role of bread and yeast in religions as a spiritual symbol for example to Christians’ bread is a symbol of Christ’s death and the believer’s renewal. Jews celebrate Passover or the feast of unleavened bread as a reminder of their ancestors’ exodus out of Egypt.

**Indigenous and Cultural perspective:** Indigenous people made damper many years ago.

**Health and Physical Education:** Students research food safety and hygiene practices in the home, the school and other locations.

**English: Literacy Focus:** Reading, viewing and sharing a wide range of texts; writing to convey information, using punctuation and sentence construction; contributing to group activities by asking questions and making relevant comments to facilitate communication and recalling main ideas and information from experiments and presentations.

Analyse factual recount texts and their structure to support interpretations with evidence drawn from the text.

Plan, rehearse and make presentations.

Employ a variety of strategies for writing including such as note-making, summaries, using models, planning, editing and proofreading.

Students keep a science journal to record observations, experiments and reflections. It contains a series of dated and chronological entries; which may include written text, drawings, diagrams, tables and graphs.

Students will learn the value of creating and making use tables consisting of a title, columns with headings to record and organise written and visual information.

A word wall will be created and displayed in class to support the development of vocabulary related to micro-organisms to serve as a reference for students.

Understand the purpose, structure and features of factual recounts.

Procedural texts to describe how something is done for example flow charts, experiments and following recipes.

Information reports.
**TIME FRAME**
8 Lessons spanning over 4 weeks during various subject classes: English, History, Science, Food Tech & Health.

**UNDERSTANDINGS**
What do we want the students to understand about their world through this unit?

<table>
<thead>
<tr>
<th>Essential Question (EQ)</th>
<th>Teaching and Learning Strategies and Styles</th>
<th>Attitudes and Values</th>
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<tbody>
<tr>
<td>What effect do micro-organisms have in our world?</td>
<td>- This unit is based on an inquiry-orientated teaching and learning model using 5Es: Engage, Explore, Explain, Elaborate &amp; Evaluate</td>
<td>▪ Courtesy and respect</td>
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<tr>
<td>Unit Questions (UQ)</td>
<td>- Experiments provide active Hands on collaborative learning opportunities.</td>
<td>▪ Truthfulness and honesty</td>
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<td>- How do micro-organisms affect our lives?</td>
<td>- Experimental and investigative work focuses on:</td>
<td>▪ Caring for personal and others belongings and community environments</td>
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<td>- What role do micro-organisms play in the production of food such as yeast &amp; yoghurt?</td>
<td>- making observations</td>
<td>▪ Taking pride in completed work</td>
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<td>- How was penicillin developed?</td>
<td>- drawing conclusions</td>
<td>▪ Intercultural respect between individuals.</td>
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<tr>
<td>- Why is yeast used in bread-making?</td>
<td>- suggesting explanations for conclusions, using scientific knowledge and understanding</td>
<td>▪ Establish high expectations based on individual students capabilities.</td>
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<tr>
<td>- How can micro-organisms make us ill and what can we do to protect ourselves?</td>
<td>- What role do micro-organisms play in food spoilage and natural decomposing matter?</td>
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<td>- Who was the microscope inventor?</td>
<td>- Think-Pair-Share</td>
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Maria A. Terblanche
Student number: 17387865
EDU4MTM: Integrated Unit of Work on Micro-Organisms

- Offer feedback, encouragement and recognition for efforts and achievements.
- Flow chart in experiments and recipes
- Recount text & procedural text
- TWLH chart
- Building social development and social relationships.

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<tr>
<th>Work Habits</th>
<th>Skills</th>
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<tbody>
<tr>
<td>Maintain personal work area</td>
<td>Thinking</td>
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<tr>
<td>Co-operative teamwork</td>
<td>Knowledge</td>
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<tr>
<td>Develop initiative towards inquiry learning</td>
<td>Observations</td>
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<td>Understanding</td>
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<td>Communication</td>
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<td>Interpersonal Development</td>
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<td>Social relationships.</td>
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<td>ICT</td>
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**ACCOMODATION FOR DIVERSE NEEDS**

This unit strives to meet individual needs of students by making used of a process which is based on monitoring, assessment and differentiation and scaffolding of teaching strategies and learning programs.

- ♠ **Students with Special Needs:** Mixed ability partnerships/groups. Assistance using multimedia; peer mentoring.
- ♣ **Gifted Students:** Students are involved in open-ended activities and developing collective understandings. Assume leadership responsibilities and develop self-efficiency skills. Given extended projects to build on their flexible thinking and learning strategies.

**MATERIALS NEEDED**

**Hardware:**
- Digital Camera; Data Projector; Computers; iPads
- Micro-scopes
- Science equipment for experiments: test tubes, petri dishes, agar plates, balloons, yeast, etc
- Cooking and baking utensils and equipment
- Cooking ingredients
**Software:**
- Word, PowerPoint, iMovie

**Supplies:** YouTube clips on Micro-organisms

**Printed Materials:** Various fiction and non-fiction texts (see attached resource list)

**Internet resources:** (see attached resource list)

### TEACHING AND LEARNING ACTIVITIES

Throughout the Unit, students will be provided the opportunity to share non-fiction texts relating to micro-organisms. A range of non-fiction texts will also be available on the ‘display table’ for students to access at any time. Students will be encouraged to contribute to the display table by bringing in resources from home.

Students will bake bread and make yoghurt.

Conduct experiments to observe:
- mouldy matters
- conditions that yeast needs to grow
- growth of bacteria
- how materials rot and decompose

Create Science Journal
Word Wall
Recounts

### ASSESSMENT PLAN

During this unit the following types of assessment and evaluation methods will be used: formative assessment, summative assessment, diagnostic and process assessment. A range of assessment strategies and tasks will be used to assess student understanding prior to the commencement of the unit, during the unit and upon its completion. The strategies will include self, peer and teacher assessment, teacher anecdotal notes and observations as well as formal student presentation and product development, and will be based on:

- Individual contributions to the unit of work – discussion, timeline, science journal, ceremony
- Essays and Assignment
- Group work: participation and membership
- Baking of bread and making yoghurt
- Science Experiments
- Completion of verbal/written/ICT activities
- Science Journal Entries
- Oral presentations
- Comprehension
- Questioning
- Observations

At the end of the unit students will be working in co-operative teams to prepare a presentation on the role of micro-organisms in our world and how they affect our lives and they will be assessed on the following information:

- Well organised detail information
- Evidence of research into the topic
- Evidence of knowledge of the topic
- Clear oral communication
- Creative presentation
- Evidence of cooperative team work