At Mentone Girls’ Grammar School, we are working to positively influence our students and create a culture of engagement and excellence across the STEM areas of Science, Technology, Engineering and Mathematics.

In order to achieve this, we believe it is vital to nurture STEM inquiry from a very early age, which for us begins in our Early Learning Centre (ELC). Across our ELC and Junior School, we incorporate the fundamentals of the International Baccalaureate (IB) Primary Years Programme (PYP) with the scope and sequence of the Australian Curriculum. In this way we provide an engaging, relevant curriculum that uses an inquiry-based model of in-depth investigations, which is particularly relevant for the way in which girls learn. We also use our single campus model and the strong relationship we have between Junior and Senior Schools to ensure our junior students benefit from our dedicated facilities and the extensive knowledge of our specialist STEM teachers.

In our ELC, we engage our young learners with basic numeracy skills and scientific concepts through our play-based curriculum. We immerse students in experiences which enable them to question, collaborate, think critically, problem solve, communicate and discover new knowledge: the essential building blocks for developing inquiring minds. Students explore materials and events, ask questions, investigate, record and represent their work, reflecting on what they have done and what it means. This allows them to create new theories or ideas about how the world works.

Through this process, our highly skilled Early Years teachers observe the interests of the students and the STEM inquiry develops as a result of their questions. Using different aspects of the curriculum, we work to build our students’ understanding of key concepts and answer their many questions about the world. For example, when using yeast to make pizza dough during a cooking lesson, we talk about what it does and how it works. We plant daffodil bulbs to understand how plants grow and put the petunias in coloured water to watch the petals change colour to help students understand the essential function of roots and stems in plant growth. Other such explorations might include playing with magnets to discover the concepts of magnetism and opposing forces.

Our STEM journey continues as we further use inquiry as a tool for scientific understanding and at Year 3 this informs an important part of the curriculum. Students undertake their own research project and conduct experiments to demonstrate scientific principles. For example, students undertake a study of microorganisms by designing experiments with single variables. They then develop a hypothesis plan for the School which demonstrates our approach to encouraging real-world applications of science. The PYP based inquiry into ‘Sharing the Planet’ further explores the responsibility of individuals, community and government for the conservation of species. In 2012, Year 3 students began a new inquiry to explore ‘How the World Works’. Through this Unit, they explore how scientists generate new knowledge and build on existing knowledge. By exploring the physical sciences of Chemistry, Physics and Aeronautics, students are able to understand and evaluate new scientific knowledge. At the culmination of the unit, the girls present an experiment to demonstrate a key scientific principle that is used by professionals in their every day work. This learning expands into the EnviroKids program at Year 4, where students take a great interest in environmental issues and sustainability and where we make particular use of our unique beachfront location and our ‘Classroom by the Bay’.

In Years 5 and 6, students explore key scientific concepts through formal science classes taught in our dedicated laboratories by expert teaching staff from our Senior School. Our Senior Head of Science has created a novel program of scientific inquiry for our junior students called “What If” that encourages students to explore and question their experiments and their results in such a way that prompts them to develop a greater understanding of the scientific principles involved. The students also influence the curriculum through their own interests and questions, which then forms the basis for further investigation and experimentation.

Three specialist science classes are enhanced by classroom units based on the world of inventions, technology and the future. The goals and materials that students learn a new way of thinking and how to use technology safely. They study engineering principles, as well as design and construction concepts and the development of their motor skills, focus and concentration, and understanding the conceptual world. Through our Year 5 Invention Convention, students are required to create a simple machine which includes an explanation of their invention process from blueprints and prototypes to design and construction. They use pulleys, switches, levers and basic circuits to ‘solve’ or ‘sustain’ everyday household activities.

Further examples of real world applications of STEM include our Year 6 students running experiments on how to make yeast grow well (including using vitamin C) and then preparing the journey by making bread. Year 7 students are undertaking tests on local waterways, including the beach, and putting their results online so that they can be shared and compared with students in other countries. Our Year 10 Astronomy students are also commencing regularly with Astronomy students in Vienna, Austria.

In Mathematics, we have explicit teaching of mathematical concepts every day across the Junior School, as well as a range of specialist numeracy programs, such as financial literacy, where students study many concepts from consumerism and product development, to profit and loss, and marketing.

In the Senior School, we continue our extensive STEM program with a range of offerings from Year 7 through to VCE. Subjects vary at different year levels from Human Physiology and Disease to Marine Studies, Accounting, Economics, Mathematics, Science, Chemistry, Biology and Physics, as well as technology based units such as Interactive Digital Media, Food and Technology, and Visual Communication and Design.

In our School, the numbers of students undertaking STEM subjects is a testament to the teaching and interest we have built in this area. Around 60% of our VCE cohort this year is taking at least one Mathematics subject, together with at least one other STEM-related subject. Over 40% of our 2012 cohort has also chosen STEM-related tertiary studies in fields such as Medicine, Emergency Health, Biomedical Science and Psychology to IT, Systems, Engineering, Game Design and Computer Science.

Our SAIL (Supporting Advantaged & Independent Learners) program also provides extended STEM activities for advanced students who have a particular passion for these areas of inquiry. Students participate in challenges and competitions that accelerate their knowledge and learning. Activities range from the international CANstruction Engineering competition, to the Da Vinci Decathlon, ICAS International Science Competition, Mathematics Challenge for Young Australians, and The Siemens Science Experience.

At Mentone Girls’ Grammar School, we engage our students in an inquiry-based STEM program that is age and stage appropriate and builds in complexity as students progress through the educational journey. By doing so, our aim is to ‘stem’ the significant attrition rate of young women from STEM-related careers that exists worldwide.