Mathematical Applications

Leaving Certificate Applied

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Rialtas na hÉireann
Government of Ireland

NCCA
An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment

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INTRODUCTION

SENIOR CYCLE

Senior cycle students are approaching the end of their time in school and are focusing on the directions they would like to take in their future lives. Senior cycle plays a vital role in helping students to address their current needs as young adults and in preparing them for life in a changing economic and social context.

Senior cycle is founded on a commitment to educational achievement of the highest standard for all students, commensurate with their individual abilities. To support students as they shape their own future there is an emphasis on the development of knowledge and deep understanding; on students taking responsibility for their own learning; on the acquisition of key skills; and on the processes of learning. The broad curriculum, with some opportunities for specialisation, supports continuity from junior cycle and sets out to meet the needs of students, some of whom have special educational needs, but who all share a wide range of learning interests, aptitudes and talents. The curriculum at senior cycle promotes a balance between knowledge and skills, and the kinds of learning strategies relevant to participation in, and contribution to, a changing world where the future is uncertain.

Assessment in senior cycle involves gathering, interpreting and using information about the processes and outcomes of learning. It takes different forms and is used for a variety of purposes. It is used to determine the appropriate route for students through a differentiated curriculum, to identify specific areas of difficulty or strength for a given student and to test and certify achievement. Assessment supports and improves learning by helping students and teachers to identify next steps in the teaching and learning process.

THE EXPERIENCE OF SENIOR CYCLE

The vision of senior cycle sees the learner at the centre of the educational experience. That experience will enable students to be resourceful, to be confident, to participate actively in society, to build an interest in learning, and to develop an ability to learn throughout their lives.

This vision of the learner is underpinned by the values on which senior cycle is based and it is realised through the principles that inform the curriculum as it is experienced by students in schools. The

module descriptor has embedded key skills, clearly expressed learning outcomes, and is supported by a range of approaches to assessment; it is the vehicle through which the vision becomes a reality for the learner.

At a practical level, the provision of a high-quality educational experience in senior cycle is supported by:

- Effective curriculum planning, development, organisation and evaluation
- Teaching and learning approaches that motivate and interest students, that enable them to progress, that deepen and apply their learning, and that develop their capacity to reflect on their learning
- Professional development for teachers and school management that enables them to lead curriculum development and change in their schools
- A school culture that respects students, that encourages them to take responsibility for their own learning over time, and that promotes a love of learning.

Senior cycle education is situated in the context of a broader education policy that focuses on the contribution that education can make to the development of the learner as a person and as a citizen. It is an education policy that emphasises the promotion of social cohesion, the growth of society and the economy, and the principle of sustainability in all aspects of development.

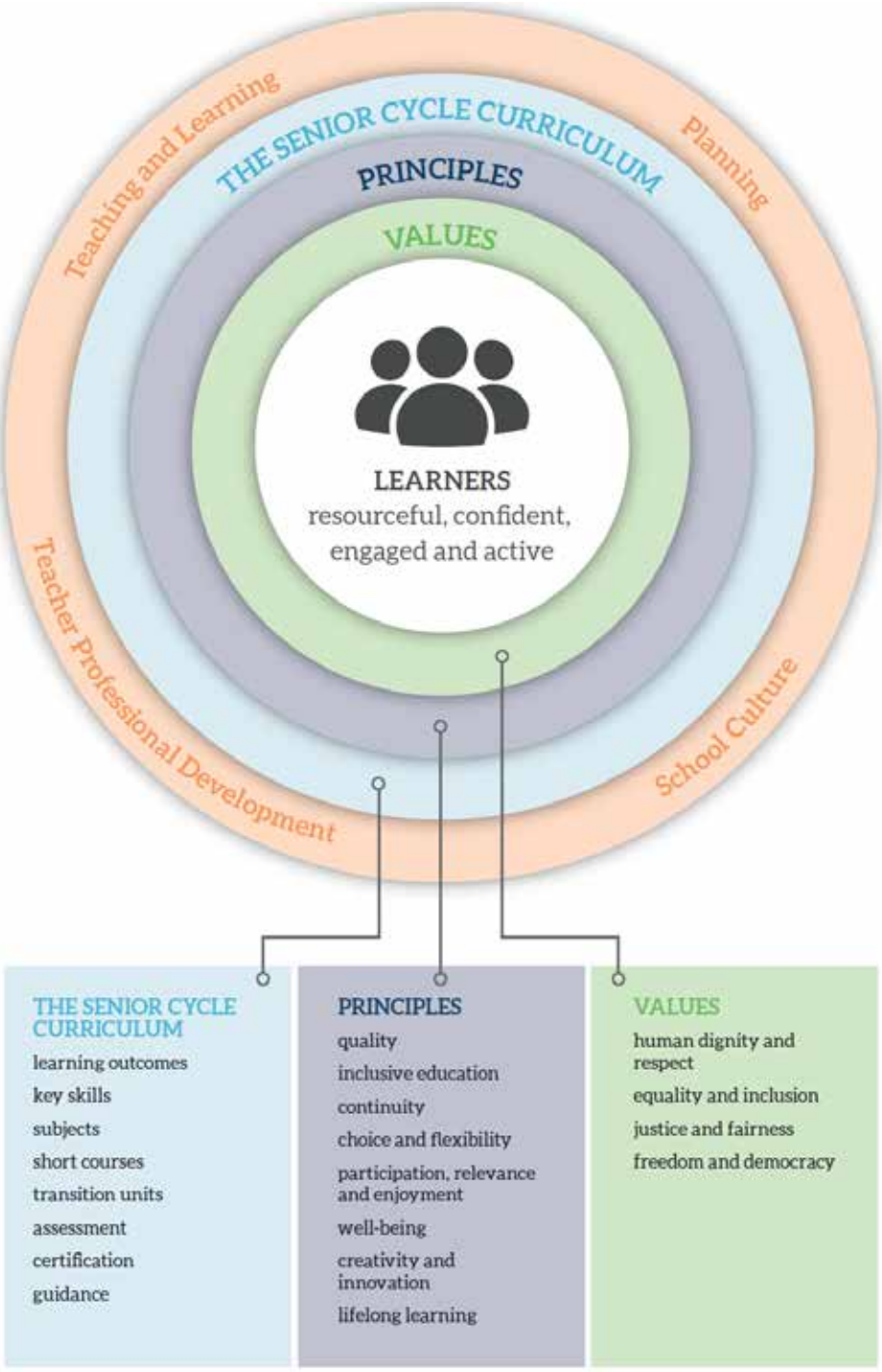


Figure 1: Principles and values of the senior cycle curriculum

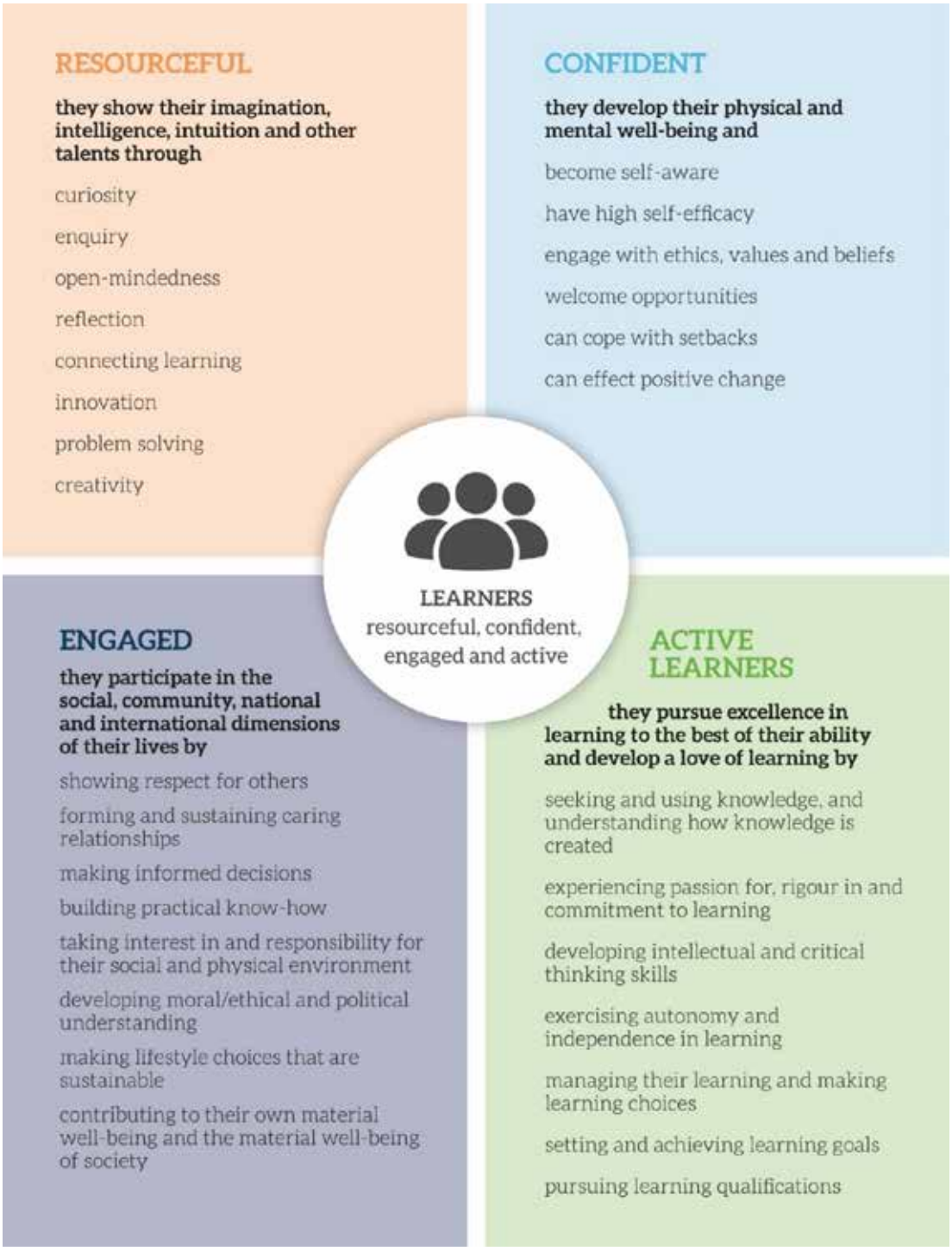


Figure 2: Learners in senior cycle

RELATED LEARNING

Leaving Certificate Applied Mathematical Applications builds on the knowledge, attitudes and a broad range of transferable skills that stem from a learner's early childhood education, through primary school and the junior cycle curriculum.

Early childhood

Aistear, the early childhood curriculum framework, celebrates early childhood as a time of wellbeing and enjoyment where children learn from experiences as they unfold. The theme of Exploring and Thinking is about children making sense of the things, places and people in their world by interacting with others, playing, investigating, questioning, and forming, testing and refining ideas. Children's interests and play should be the source of their first mathematical experiences. Experiences become mathematical by being represented in another form. Young children represent their ideas by talking, but also through models and graphics. From the motoric and sing-song beginnings of rhymes stem the geometric patterns built from unit blocks and the gradual generalisation and abstraction of patterns experienced throughout the child's day. The theme of Communicating is about children sharing these experiences, thoughts, ideas, and feelings with others with growing confidence and competence in a variety of ways and for a variety of purposes.

Primary education

The mathematics curriculum at primary school aims to provide children with a language and a system through which to analyse, describe, illustrate and explain a wide range of experiences, make predictions, and solve problems. Mathematics education seeks to enable students to think and communicate quantitatively and spatially, solve problems, recognise situations where mathematics can be applied, and use appropriate technology to support such applications.

The integrated programme of Social, Environmental and Scientific Education (SESE) in primary schools provides opportunities for children to actively explore and investigate the world around them from a human, social and cultural perspective. A scientific approach to investigations fosters the development of important skills, concepts and knowledge through which children can observe, question, investigate, understand and think logically about living things and their environments, and about materials, forces, everyday events and problems. The knowledge and skills acquired may be applied in designing and making activities in which children perceive a need to create or modify elements of their environments. Through their investigations, children develop informed, critical and scientific perspectives that acknowledge the importance of founding judgements on a respect for facts, accuracy and reason. The designing and making focus of the SESE curriculum fosters the skills of exploring, planning, designing and making, and enables children to apply their scientific knowledge and understanding to devising a method or solution, carrying it out practically and evaluating the final product. As these skills are developed progressively through the primary school, children will build a solid foundation for analysing open-ended problem-solving tasks and developing computational thinking skills in Leaving Certificate Applied Mathematical Applications.

A number of the core strands of the English curriculum at primary school—Competence and confidence in using language, Developing cognitive abilities through language, and Emotional and imaginative development through language—contribute to important aspects of a child's development and to the development of skills that will be relevant for Leaving Certificate Applied Mathematical Applications.

Junior cycle

Many of the junior cycle Statements of Learning relate strongly to LCA Mathematical Applications, especially those that focus on problem-solving, design, communication skills, and understanding the role and contributions of technology in society. In addition, all the key skills required for successful learning by students across the curriculum at junior cycle are relevant for LCA Mathematical Applications. Many junior cycle subjects and short courses have close links with LCA Mathematical Applications, particularly mathematics, science, business studies, and the short course in coding.

Senior cycle

LCA Mathematical Applications is inherently a transdisciplinary subject, authentic and relevant to the real world. Transdisciplinary learning is not confined by traditional subjects but is supported and enriched by them. The knowledge and understanding gained in LCA Mathematical Applications can be enhanced and utilised across the LCA framework by enriching the tasks, learning and key assignments in other areas.

In this way, students will appreciate the power of mathematics to represent and shed light on complex problems in many discipline areas as well as in more complex real-life situations they encounter in their lives.

Further study

LCA Mathematical Applications builds a solid foundation for students to cope with life in a data-rich environment. It teaches a range of generically useful skills in areas such as communication, time management, organisation, and teamwork. These skills are relevant to all further study, and indeed all learning beyond formal education.

LCA Mathematical Applications will help young people to use mathematics to better understand the world they live in; it will provide them with confidence to use data to draw defensible conclusions and use their mathematical knowledge and skills to make real-life impact.

Community and society

Many important aspects of life in society are based around quantitative information. Therefore, the development of a competence in the ability to represent real life situations with mathematics as well as interpret data presented in a variety of different ways, is becoming imperative for developing and maintaining societies based on equality and democracy.

RATIONALE

Mathematical Applications for the Leaving Certificate Applied is intended to prepare students for life, work, further education and a world where skills and knowledge require constant updating. The course seeks to consolidate and improve students' mathematical knowledge, skills and concepts through practical, analytical, problem-solving applications and through integration with other modules. The modules reflect the applied nature of the Leaving Certificate Applied programme. They start with the students' experiences and seek to raise their enthusiasm for mathematics through the achievements and the skills they develop in dealing with mathematics in everyday life, work and leisure. Students are encouraged to develop a work ethic where quality, accuracy and dependability are important.

The module descriptor is broadly aligned with the requirements for progression into further education through the students' engagement with practical, problem-solving classroom activities. The course seeks to encourage a positive disposition towards mathematics through the grounding of all activities in concrete contexts and settings that are relevant and recognisable to the students. In this way the course will enable the students to develop confidence in contemplating a range of pathways to pursue a challenge, engage in flexible mathematical thinking and take learning risks. The development of numeracy in this way recognises the multi-faceted nature of numeracy where the numerate person must not only have mathematical knowledge but also be able to utilise a range of tools in a variety of contexts in order to be able to act in and on the world (Goos et al., 2012[1]).

AIMS

The aim of this course is to develop the students' ability to solve quantitative problems that they encounter in the world around them so that they can:

- represent authentic situations using mathematics
- analyse their mathematical representation of authentic situations
- interpret and communicate the results of their analysis

[1] Goos, M., Dole, S. & Geiger, V. (2012). Numeracy across the curriculum. Australian Mathematics Teacher,68(1), 3-7.

NUMBER AND SEQUENCE OF MODULES

Modules are designed to be taken sequentially and student progression through the modules should enable the development of skills and understanding through encountering similar concepts in different contexts. However, when planning the sequence of modules other elements of the Leaving Certificate Applied framework, such as the selection and timing of vocational education tasks, should be taken into account to ensure that the students are equipped to utilise the necessary skills in the fulfilment of the task requirements.

Module 1: Mathematics and Planning

Module 2: Mathematics and the World around me

Module 3: Mathematics and Life skills

Module 4: Mathematics and Work

GENERAL RECOMMENDATIONS

Within each module, the order of units is discretionary to facilitate integration with other courses, tasks and current events.

Active learning methodologies, including practical work, group work and out of school activities are essential. Integration with other modules is part of the philosophy of the LCA programme. All tasks are cross-curricular in nature and afford opportunities for the integration of Mathematical Applications.

Furthermore, in the case of the Vocational Education Tasks, Mathematical Applications is a specific requirement.

Teachers should recognise the importance of contexts as a distinguishing feature of numeracy and incorporate numeracy rich contexts into their lessons and take advantage of unplanned numeracy opportunities as they arise. Students should work with real documents whenever possible (bills, pay slips, invoices, credit notes, lodgement forms, brochures, catalogues, timetables etc). The Mathematical Applications course has many areas which can be effectively delivered through I.C.T. The Mathematical Applications and I.C.T. teachers should liaise to maximise this potential.Students should become familiar with and utilise the appropriate digital technology, including calculators, to facilitate their learning in each module.

Students will keep a portfolio of learning throughout the modules. This portfolio may be digital or hard copy but should incorporate the elements of learning experienced and investigated by the student as part of the engagement with the modules and will form the basis for the key assignment for each module.

The Key Assignment for each module is a case study that may be a stand-alone piece of work or incorporated into the teaching and learning of the module as part of the learning experienced by the student.

OVERVIEW AND STRUCTURE OF THE COURSE

Mathematical Applications for Leaving Certificate Applied is designed to provide a natural progression for students from junior cycle mathematics while allowing students the opportunity to strengthen their conceptual knowledge in the application of principles to practical, contextual situations. Learners will be assessed by means of problems set in meaningful contexts.

The following summary outlines the progression from junior cycle mathematics and the learning outcomes that are central to the course. It is through mediation of the suggested subject matter that the learning outcomes for students are achieved.

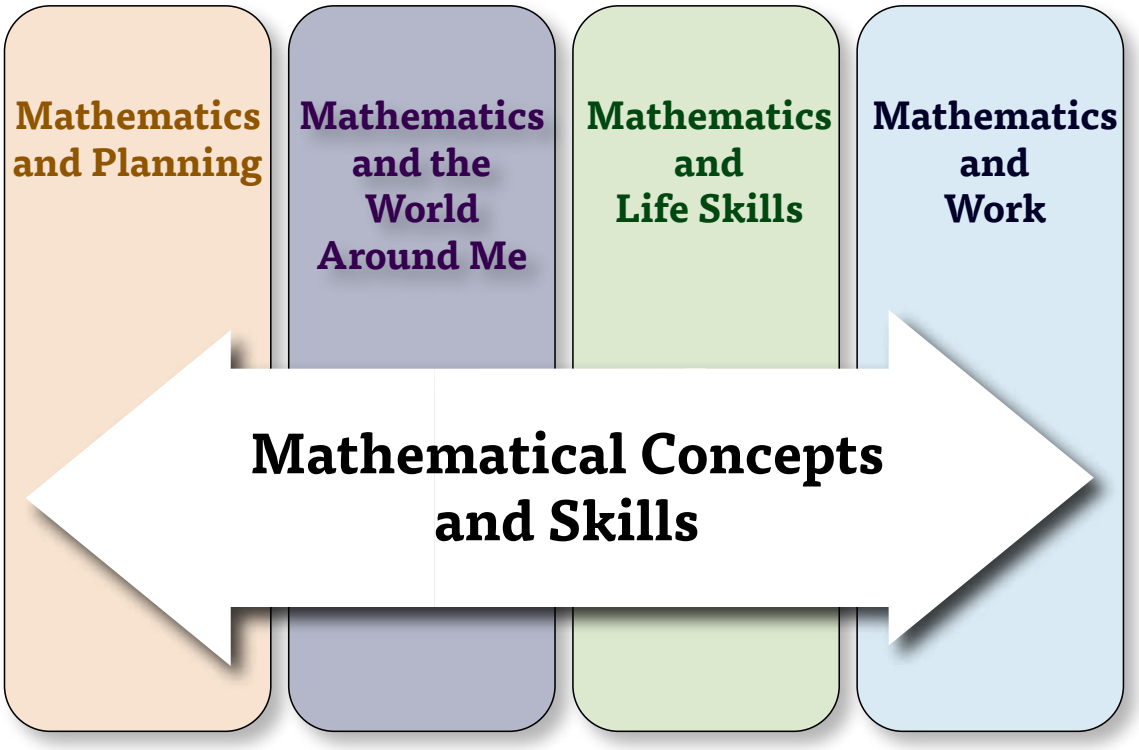


Figure 3 : Structure of the course.

KEY SKILLS

In senior cycle, there are five key skills (Figure 4) identified as central to teaching and learning across the curriculum: information processing; being personally effective; communicating; critical and creative thinking; and working with others.

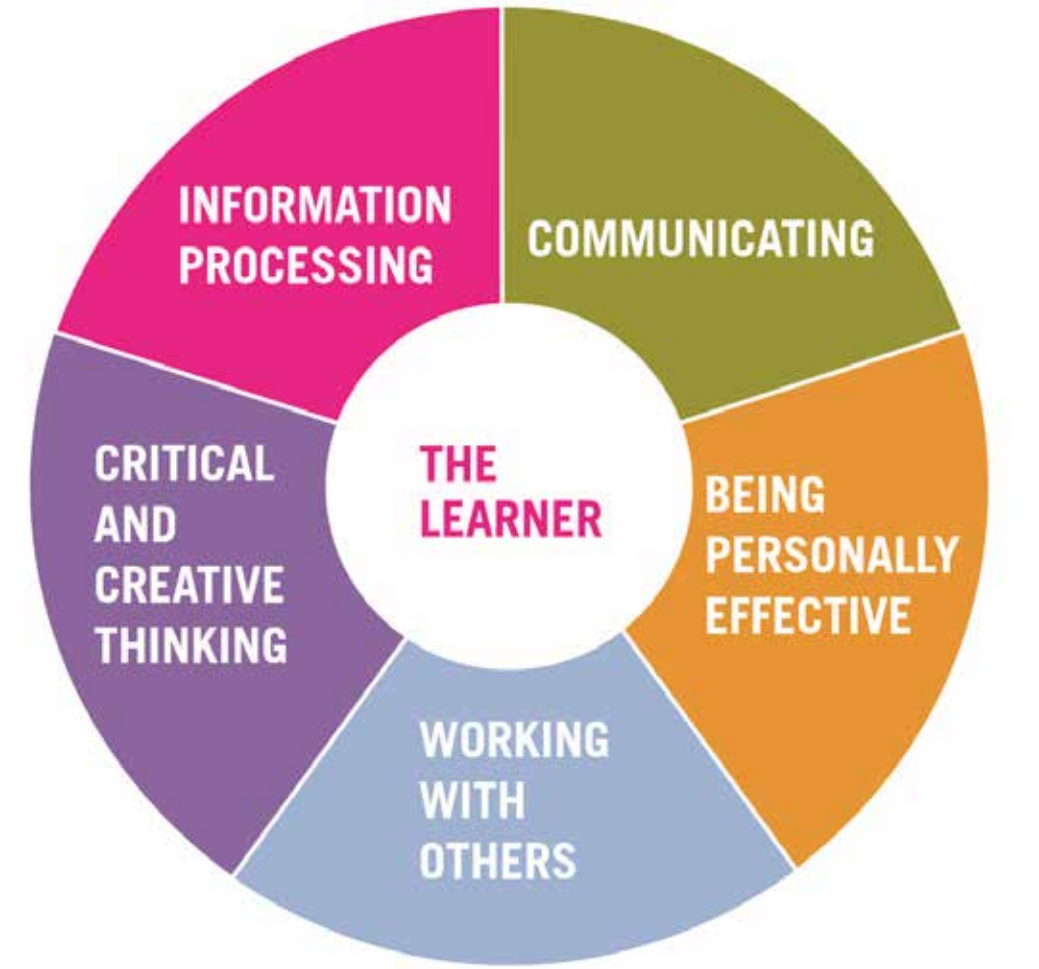


Figure 4: Key skills for senior cycle

The key skills are embedded within the learning outcomes of LCA Mathematical Applications and are assessed in the context of those learning outcomes. This set of key skills, and the learning outcomes associated with them, became the NCCA Key Skills Framework (NCCA, 2009). The Key Skills Framework was developed to provide a common, unified approach for embedding the key skills across all future Leaving Certificate specifications. These skills are identified as being important for all students to achieve to the best of their ability, both during their time in school and in the future, and to fully participate in society, in family and community life, the world of work and lifelong learning. LCA Mathematical Applications develops these skills in the following ways:

Information processing

Making sense of mathematics through engagement with authentic relevant contexts promotes independent research activities in which students are required to access a wide variety of external materials communicated in a variety of ways. The selection, evaluation, and recording of information are addressed as students make decisions and judgments based on data and qualitative and quantitative information.

Critical and creative thinking

Applying mathematics to real life contexts requires careful analysis of patterns and relationships, which develops skills of higher-order reasoning and problem solving. Part of the computational thinking involved in representing the world with mathematics is the ability to identify, analyse and deconstruct problems, explore options and alternatives, and hence solve problems. Hypothesising, making predictions, examining evidence, and reaching conclusions underpin the core of all the activities proposed in LCA Mathematical Applications.

Communicating

Effective communication skills are developed through collaborative project work. Students communicate face-to-face and through digital media. Although literacy skills are not targeted directly, they are required by students to participate fully in the learning experience. Online research requires and builds analysis and interpretation skills. Students need to read a wide range of information sources. Students are required to express and share their opinions and to hypothesise the reason clearly; debate and argument ensues which encourages engaging in dialogue, listening attentively and eliciting opinions, views and emotions. There are opportunities to develop communication skills further as students compose and present using a variety of media.

Working with others

LCA Mathematical Applications is underpinned by collaboration and working with others. Students gain some appreciation of group dynamics and the social skills needed to engage in collaborative work. This contributes to an appreciation that working collectively can help motivation, release energy, and capitalise on all the talents in a group. One of the most beneficial outcomes of working with others is in identifying, evaluating and achieving collective goals. Students learn to negotiate and resolve differences of opinion as they discuss their different strategies and achieve compromise.

Being personally effective

This key skill contributes to the personal growth of students; they become more self-aware and use this awareness to develop personal goals. An important dimension of this key skill is in building the know-how of students to recognise how to get things done, how to garner and use resources effectively, and how to act autonomously. There is more than one way to answer a problem or set up a problem-solving strategy; there is no golden key to the answer. Students must develop confidence in their self-direction and exhibit tenacity and rigour. To be personally effective, students must build on the metacognitive dimension of knowledge, whereby they develop strategies to learn and to build on previous knowledge.

TEACHING AND LEARNING

Senior cycle students are encouraged to develop the knowledge, skills, attitudes and values that will enable them to become more independent in their learning and to develop a lifelong commitment to improving their learning.

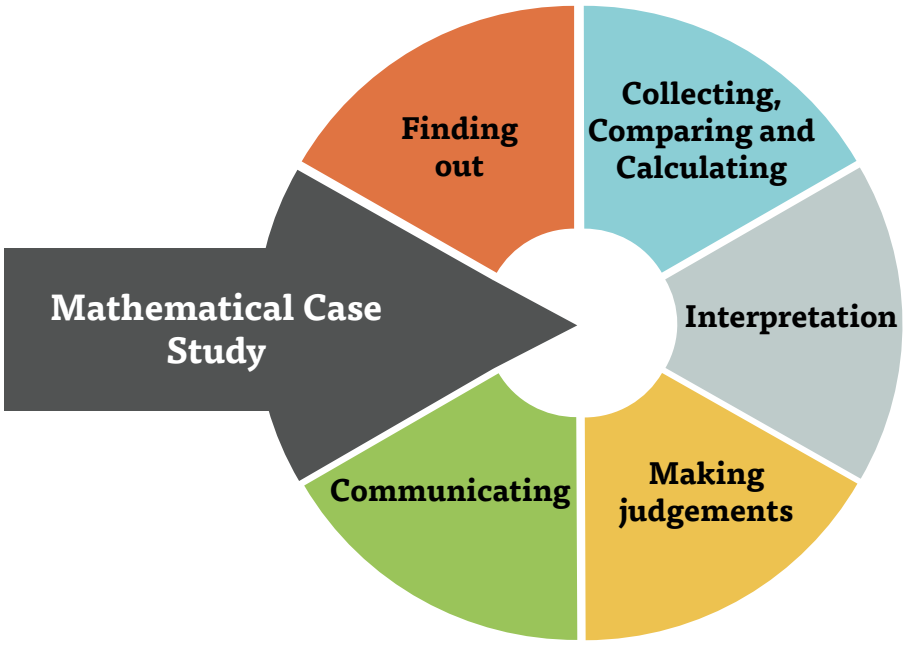
LCA Mathematical Applications supports the use of a wide range of teaching and learning approaches. The course is experiential in its structure and emphasises the practical application of mathematical knowledge to the world around us. As students progress, they will develop problem-solving skills that are transferable across different tasks and different disciplines, enabling them to see the power of mathematics.

By engaging in well-structured group discussions, students will develop skills in reasoned argument, listening to each other and reflecting on their own work and that of others.

Engaging with real problems is motivating for students; it allows them to see the relevance of mathematics to situations that are important in their lives. The open-ended nature of authentic problems allows students to employ the mathematical tools that they prefer as well as practise skills they need to reinforce. The fact that the process itself involves iteration (evaluation and reworking of the model) clearly communicates that a straight path to success is unlikely and contributes to the development of students' tenacity.

Working towards the Key Assignments and tasks that students engage in will enable them to take charge of their own learning by setting goals, developing action plans, and receiving and responding to assessment feedback. As well as varied teaching strategies, varied assessment strategies will support learning and provide information that can be used as feedback so that teaching and learning activities can be modified in ways that best suit individual students. By setting appropriate and engaging tasks, asking higher-order questions and giving feedback that promotes learner autonomy, assessment will support learning as well as summarising achievement.

The suggested approach to the teaching and learning the students should experience for the Key Assignments is outlined in the following graphic.



The elaboration of the following headings may aid planning for classroom activities that will facilitate the learning envisaged by the key assignment.

Finding out: This brainstorming stage of the case study involves exploring the area of interest, examining the scenario to determine what the important factors or variables are, interpreting these mathematically, deciding on the strategy, ascertaining what information is required and where the information or data will be sought, how the data will be accessed and collected.

Collecting, Comparing and Calculating: This may involve gathering evidence from one source or a variety of sources, representing the data in tables charts graphs or formulae, comparing that data under relevant headings (such as price, value, area, distance etc.) and performing calculations.

Interpreting: Using the data collected, the comparisons and calculations made, students can interpret the data to infer conclusions such as value for money, reliability, preferences etc.

Making judgements: Students may use the conclusions reached to make judgements to validate choices made, these may relate to varying priorities, group consensus, on balance judgements etc.

Communicating: Findings may be communicated in a variety of ways; in tables, graphs, charts, oral or digital presentations or as part of a report.

The process however is iterative and cyclical and, depending on the case study undertaken, the learning experienced by the student may not discretely fit under one single heading but may incorporate aspects of several headings or return to an aspect of the process for further clarification. The context and needs of the study should drive the process.

DIFFERENTIATION

The LCA Mathematical Applications specification is differentiated to cater for students of differing abilities and levels of achievement.

Differentiation through the learning outcomes

Learning outcomes should be achievable relative to each student's ability level. Learning outcomes promote teaching and learning processes that develop students' knowledge and understanding incrementally, enabling them to analyse, evaluate and apply knowledge to different situations as they progress.

Differentiation in teaching and learning

LCA Mathematical Applications provides numerous opportunities for teachers to teach the subject and select materials that meet the needs and interests of all students. The focus on the experiential approach to teaching and learning, which is central to LCA Mathematical Applications, means that students can be engaged in learning activities that complement their own needs and ways of learning. The content matter of the course is specified in broad terms to allow the selection and exploration of topics in ways that are of most interest and relevance to the students.

Students vary in the amount and type of support they need to be successful. Levels of demand in any learning activity will differ as students bring different ideas and levels of understanding to it. The use of strategies for differentiated learning such as adjusting the level of skills required, varying the amount and the nature of teacher intervention, and varying the pace and sequence of learning will allow students to interact at their own level.

Differentiation in assessment

Assessment of LCA Mathematical Applications will be based on the learning outcomes in the specification. In the written assessment, the learning outcomes will be assessed by means of problems set in meaningful contexts, focusing on the application of basic facts and concepts. Examination questions will require students to demonstrate knowledge, understanding, application, analysis and evaluation appropriate to Leaving Certificate Applied. Differentiation at the point of assessment will also be achieved through the stimulus material used, and the extent of the structured support provided for examination students at this level.

The Key Assignments provide opportunity for students to display evidence of their learning appropriate to their level.

Successful completion of the Key Assignments will support students in their task assignment and written examination.

Mathematical Concepts and Skills (MCS)

The following learning outcomes underpin the contextual learning outlined in the modules and form the basis for all planning for teaching and learning in the LCA mathematical applications classroom.

Underpinning Learning Outcomes

Students should be able to:

- **MCS.1. reason mathematically about problems so that they can:**

a. make sense of a given problem and represent it using mathematics

b. apply their knowledge and skills to solve a problem, including decomposing it into manageable parts and/or simplifying it using appropriate assumptions

c. interpret and justify their solution in terms of the original problem and communicate their findings mathematically.

- **MCS.2. reason mathematically about problems so that they can:**

a. perform calculations on positive and negative numbers involving addition, subtraction,multiplication, division, square roots (positive numbers only), and positive whole number

b. use the order of arithmetic operations, including the use of brackets

c. present answers to the degree of accuracy required, for example to the nearest whole number, to the nearest thousand, to two decimal places

d. use appropriate units and convert between them, including, but not exclusively, mm, cm, m, km, seconds, minutes, hours, days, €k (i.e. thousands), €million, degrees, etc.

e. flexibly convert between fractions, decimals, and percentages

f. use and understand ratio and proportion.

- MCS.3. investigate 2D and 3D shapes so that they can:

a. draw and interpret scaled diagrams, using appropriate geometric tools (ruler, straight edge, set square, protractor, compass)

b. draw and interpret nets, including those of rectangular solids and cylinders

c. find the perimeter and area of 2D shapes made from combinations of discs, triangles, and rectangles

d. find the volume and surface area of 3D shapes, including those made from combinations of rectangular solids and cylinders

e. recognise and use the important facts regarding angles at a point, on a straight line, and in squares, rectangles, parallelograms, and triangles

f. apply the theorem of Pythagoras to solve simple problems.

- MCS.4. explore certain types of relationships and expressions so that they can:

a. evaluate expressions given the value of variables

b. represent linear relationships in tables, graphs, and generalised expressions (expressed in words)

c. select and use suitable strategies (including graphic, numeric, trial and improvement, and working backwards) for finding solutions to problems involving linear relationships.

- MCS.5. carry out a statistical investigation so that they can:

a. generate a statistical question

b. plan and implement a method to generate and/or source unbiased, representative data

c. select, draw, and interpret appropriate graphical displays of data, including bar charts, pie charts, trend graphs, and histograms (equal intervals)

d. select, calculate, and interpret appropriate summary statistics to describe aspects of univariate data, including measures of central tendency (mean, median, and mode) and of spread (range)

e. evaluate the effectiveness of different graphical displays in representing data

f. discuss misconceptions and misuses of statistics.

Module 1:

Mathematics and Planning

PURPOSE

Through their engagement with relevant and engaging topics students will gain experience in representing authentic relevant issues relating to planning and budgeting with mathematics, analysing the mathematics and communicating the findings in appropriate ways. It is envisaged that this would be integrated with the mathematical work required for other tasks and assignments across the three elements of Leaving Certificate Applied: Vocational Preparation, Vocational Education and General Education.

AIMS

This module aims to provide students opportunity to:

- represent real life situations with mathematics
- make and justify decisions with mathematics
- consolidate and reinforce students' mathematical knowledge and skills
- see the relevance of mathematics in students' everyday lives.

UNITS

Unit 1: Research and planning

Unit 2: Budgeting

Students should engage in the learning outcomes outlined in MCS 1-5 through the contextual experiences offered by Mathematics and Planning (p. 20-21).

UNIT 1: RESEARCHING AND PLANNING

Learning outcomes

The student will be able to:

1. Conduct market research to gather, source and interpret data.

2. Interpret relevant information communicated in tables/charts or graphs.

3. Present findings and draw conclusions.

UNIT 2: BUDGETING

Learning outcomes

The student will be able to:

1. Investigate and cost a leisure/home or work space for a particular purpose.

2. Prepare a project budget.

3. Research, compare and contrast data about costings.

4. Make value for money judgements and justify judgements with mathematics.

Note: While the learning outcomes are divided into two units it is recognised that the activities undertaken to fulfil the learning will be iterative by nature and therefore will cover both unit 1 and unit 2 within a body of work.

Teacher guidelines

The students should have access to authentic, relevant data that allows for differentiation in the classroom (see the resources section at the end of this document for some suggestions). The following activities may represent authentic contexts that allow students access to the learning specified above.

Students may undertake or plan and budget for a project such as decorating a room in their home or the school, building a set for the school play, renovating an outdoor space, designing a playground, building a doll's house /model house etc. The purpose of the project is decided with the students and should incorporate real authentic data as far as practicable. The project will provide rich contexts in which students can apply the mathematics from MCS 1-5.

Students may measure space, make scale drawings or models, compare pricing for materials based on weight/volume/quantity, survey potential users, examine data represented in various ways as they fulfil the learning outcomes listed overleaf.

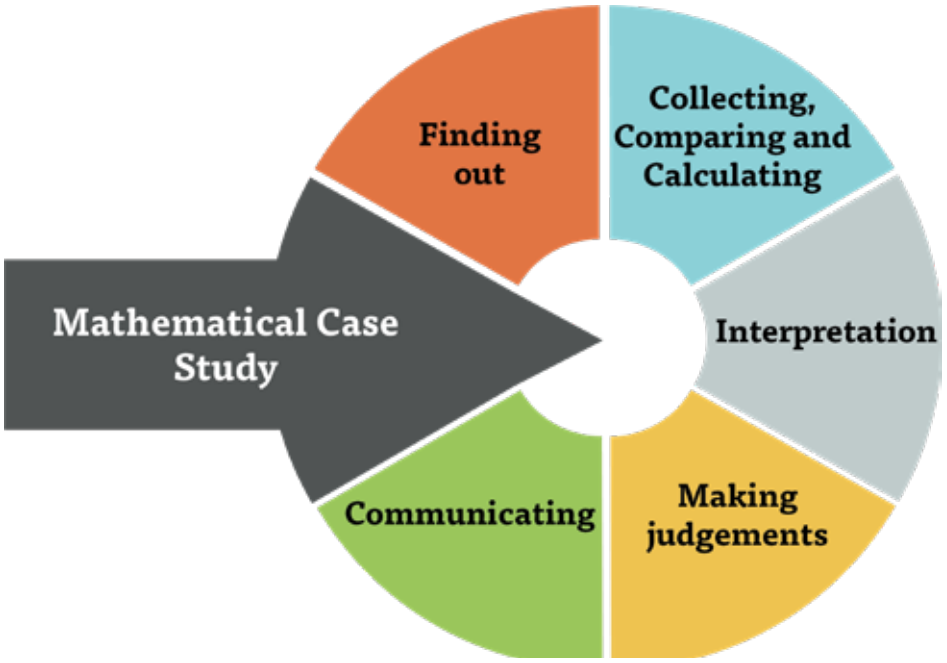
Students may combine unit 1 and 2 and decide to conduct research to gather information about people's preferences in relation to the project. In preparing the project budget they will need to consider issues such as the cost of materials (paint, brushes, etc.). Comparing the data from different retailers, provides opportunity to justify decisions made with mathematics as they will need to take into account the volume being sold, special offers, etc.

Budgeting is a broad skill that will be beneficial for students in a variety of settings. As such, while it is first encountered in this module it will be revisited in many other contexts throughout the modules and the skills developed by the students will be enhanced through their experiences in different contexts and settings.

MODULE 1: KEY ASSIGNMENT

I have carried out a case study into a relevant area of mathematics and planning.

I have collected and selected the relevant examples from my portfolio of learning to exemplify the following areas of the mathematical case study in my specified area. (see p. 17-18 for further details of these headings).



Module 2:

Mathematics and the World Around Me

PURPOSE

Through their engagement with relevant and engaging topics students will gain experience in representing issues relating to current affairs, travel and recreation with mathematics, analysing the mathematics and communicating the findings in appropriate ways. It is envisaged that this would be integrated with the mathematical work required for other tasks and assignments across the three elements of Leaving Certificate Applied: Vocational Preparation, Vocational Education and General Education.

AIMS

This module aims to provide students opportunity to:

- see the relevance of mathematics to issues encountered by them in their everyday lives
- consolidate and reinforce students' mathematical knowledge and skills
- make and justify decisions with mathematics
- develop confidence in using mathematics to solve problems.

UNITS

Unit 1: Current Affairs

Unit 2: Travel and Recreation

Students should engage in the learning outcomes outlined in MCS 1-5 through the contextual experiences offered by Mathematics and the world around me (p. 20-21).

UNIT 1: CURRENT AFFAIRS

Learning outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5
The student will be able to:

1. Create and interpret opinion polls or surveys.

2. Analyse and interpret relevant information including voting data communicated in words/tables/charts or graphs.

3. Investigate an issue and use mathematics to communicate findings.

UNIT 2: TRAVEL AND RECREATION

Learning outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5.
The student will be able to:

1. Research and plan an event to suit a particular budget.

2. Interpret relevant information communicated in words/tables/charts and graphs.

3. Prepare a written itinerary including costs and timings.

4. Communicate mathematics in words/equations/calculations /graphs or charts.

Teacher guidelines

The students should have access to authentic, relevant data that allows for differentiation in the classroom (see the resources section at the end of this document for some suggestions). The following activities may fulfil the learning outcomes outlined above.

Local, national or global issues that are timely or relevant can provide context for the mathematics in MCS1-5. Investigating issues such as waste management, the national budget, homelessness, shortages of commodities, hospital waiting times, the closure of a local amenity /library, hospital etc., service by public transport or school-based issues such as uniform opinion polls/canteen survey/council election.

Events may include commemorative events in the school or community, sporting events, celebratory events, planning a holiday or a school show.

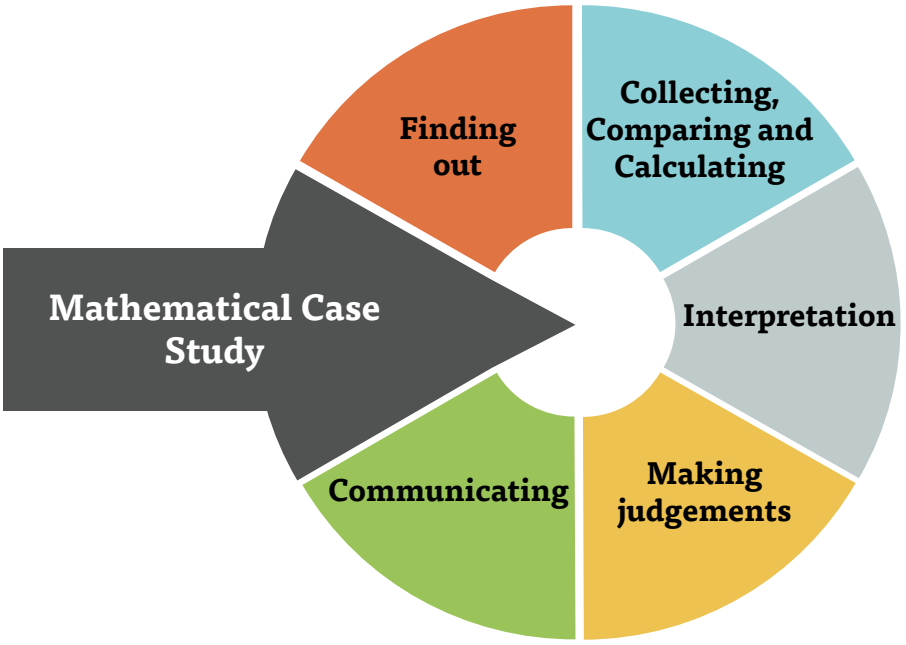
One event that students might find an engaging context is planning a holiday. When considering holidays, relevant information could include weather data, exchange rates, package deal details and special offers. Other considerations that provide context for the mathematical concepts and skills 1-5 are: considerations of travel insurance options, yearly vs single trip cover; timetables and the convenience afforded by different modes of transportation such as plane vs boat, car hire vs public transport; accommodation options such as self-catering vs full board; hotel vs house rental/camping or Air B and B; payment options such as credit card, credit union loan, save in advance and pay off in full. The planning of an itinerary may provide a contextual learning opportunity to explore speed, distance and time calculations relevant to the context.

The utilisation of such parameters will enable students to fulfil the underpinning learning outcomes outlined in MCS 1-5. Differentiation in the classroom will enable students to access the learning at aa level appropriate to them, it will also allow opportunities for students to be challenged by the real-life concepts they meet.

MODULE 2: KEY ASSIGNMENT

I have carried out a case study into a relevant area of mathematics and the world around me.

I have collected and selected the relevant examples from my portfolio of learning to exemplify the following areas of the mathematical case study in my specified area.



Module 3:

Mathematics and Life skills

PURPOSE

Through their engagement with relevant and engaging topics students will gain experience in representing issues relating to healthy life-style choices, food and fitness with mathematics, analysing the mathematics and communicating the findings in appropriate ways. It is envisaged that this would be integrated with the mathematical work required for other tasks and assignments across the three elements of Leaving Certificate Applied: Vocational Preparation, Vocational Education and General Education.

AIMS

This module aims to provide students opportunity to:

- see the relevance of mathematics to issues relating to a healthy lifestyle
- consolidate and reinforce students' mathematical knowledge and skills
- make and justify decisions with mathematics
- develop confidence in using mathematics to solve problems.

UNITS

Unit 1: Personal finance

Unit 2: Healthy life choices

Students should engage in the learning outcomes outlined in MCS 1-5 through the contextual experiences offered by Mathematics and Life Skills (p. 20-21).

UNIT 1: PERSONAL FINANCE

Learning outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5
The student will be able to:

1. Prepare a personal budget.

2. Investigate the financial impact of a large financial commitment.

3. Analyse and interpret data which impacts on personal finance presented in a variety of ways.

4. Communicate findings in words/tables/charts or graphs.

UNIT 2: HEALTHY LIFE CHOICES

Learning outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5
The student will be able to:

1. Research and plan a healthy lifestyle choice.

2. Interpret relevant information communicated in tables/charts or graphs.

3. Compare and contrast different options and justify decisions made with mathematics.

4. Use simple formula related to health and fitness.

5. Communicate mathematics in words/calculations /graphs or charts.

Teacher guidelines

The students should have access to authentic, relevant data that allows for differentiation in the classroom (see the resources section at the end of this document for some suggestions). The following activities may fulfil the learning outcomes outlined above.

The impact of a large financial commitment is a relative concept. The students may investigate the financial impact of commitments such as renting accommodation, buying a car, booking a holiday, buying a mobile phone by comparing and contrasting the financial options available to them. Relevant documentation may include rental contract, finance agreements, phone bills, etc.

The personal finance considerations that will provide context for the mathematics set out in MCS 1-5 might include comparison of products from various financial institutions such as post-office, credit union or bank. Rental considerations may include location comparisons, sharing options or living at home and commuting. Car ownership may be investigated through comparisons such as new vs used, petrol vs diesel, hire purchase vs PCP. Other cost implications would include insurance and car tax rates. A personal budget may include an examination of relevant bills such as electricity or gas, transport cost options, etc.

Students can investigate any aspect of a healthy life style choice and represent the data using mathematics. This data may include tracking steps, fitness app (or other wearable technology) output, such as tracking time spent using technology, time spent doing physical activity comparing and contrasting data collected, comparing nutritional information on food packaging, investigating food choices in school canteen, surveying student choices, etc. Designing a training plan for a sporting target such as a couch to 5k,10k etc. run, cycle, triathlon, team selection etc. Opportunities may arise for preparing scaled diagrams of sports equipment, playing fields, looking at the optimisation of space in the school gym etc.

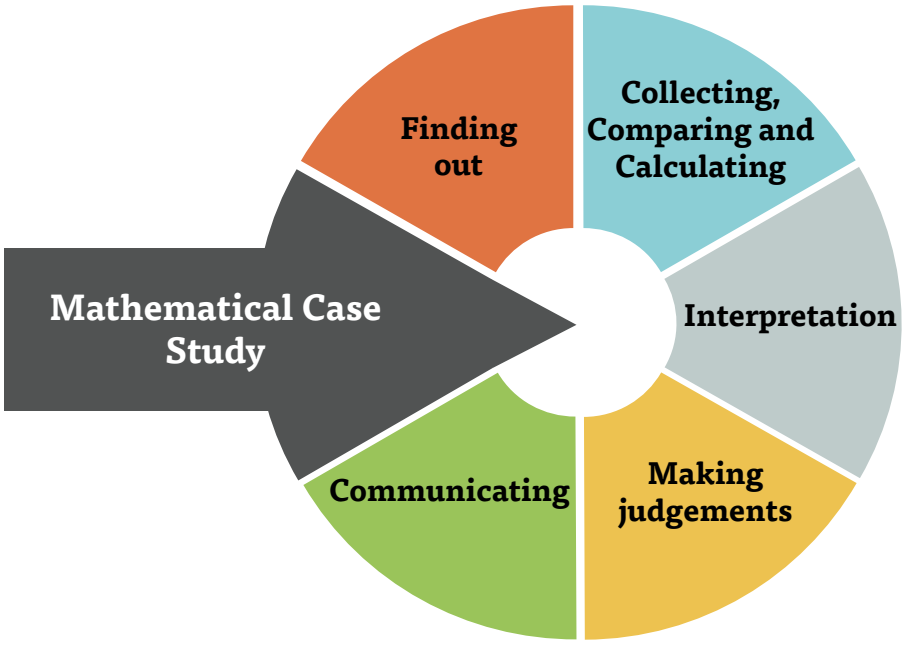
Students may access data such as heart rate, nutrition facts, hydration and sleep information, glycaemic index and daily nutritional information. Mathematical formula they may consider include, Karvonen formula, and RM-1 Muscle strength formula. Opportunities may also arise to incorporate measurement of food, ratios for cooking times, bulk buying vs single use, the related cost of a healthy or unhealthy diet, gym membership, insurance, etc.

The topics covered may provide an opportunity to link with the tasks in Leisure and Recreation, Social Education or Vocational Education.

MODULE 3: KEY ASSIGNMENT

I have carried out a case study into a relevant area of mathematics and life skills.

I have collected and selected the relevant examples from my portfolio of learning to exemplify the following areas of the mathematical case study in my specified area.



Module 4:

Mathematics and Work

PURPOSE

Through their engagement with relevant and engaging topics students will gain experience in representing issues encountered by people in their work such as income and expenditure, with mathematics, analysing the mathematics and communicating the findings in appropriate ways. It is envisaged that this would be integrated with the mathematical work required for other tasks and assignments across the three elements of Leaving Certificate Applied: Vocational Preparation, Vocational Education and General Education.

AIMS

This module aims to provide students opportunity to:

- see the relevance of mathematics to issues encountered by people in employment
- consolidate and reinforce their mathematical knowledge and skills
- make and justify decisions with mathematics
- develop confidence in using mathematics to solve problems.

UNIT 1

Students should engage in the learning outcomes outlined in MCS 1-5 through the contextual experiences offered by Mathematics and Work (p. 20-21).

Learning outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5.
The student will be able to:

1. Analyse and interpret information about income and expenditure represented in words/ equations/tables /graphs or charts.

2. Create an estimate for a job, including costings such as materials, labour, taxes and profit margin.

3. Analyse, interpret and communicate relevant information in relation to wages, time worked and holidays communicated in words/tables/charts/ payslips or graphs.

4. Compare and contrast different job contracts and justify decisions made with mathematics.

Teacher guidelines

The students should have access to authentic, relevant data that allows for differentiation in the classroom (see the resources section at the end of this document for some suggestions). The following activities may fulfil the learning outcomes outlined above.

Investigations that might provide context for the mathematics in MCS 1-5 may include decorating a space, repairing an object, making a product or delivering a service. Information they may need access to for making an estimate may include labour costs /hourly rate/ overtime rate/ salary scale. Students may also research relevant information on tax credits, other deductions and charges. Up to date information can be found on Revenueonline.ie. Students may also investigate the other costs and overheads such as utilities, rent, insurance, bills, cash flow, transport costs, cost price. Students should have access to relevant real documents such as bills, invoices and tax certs to explore the mathematical implications of decisions.

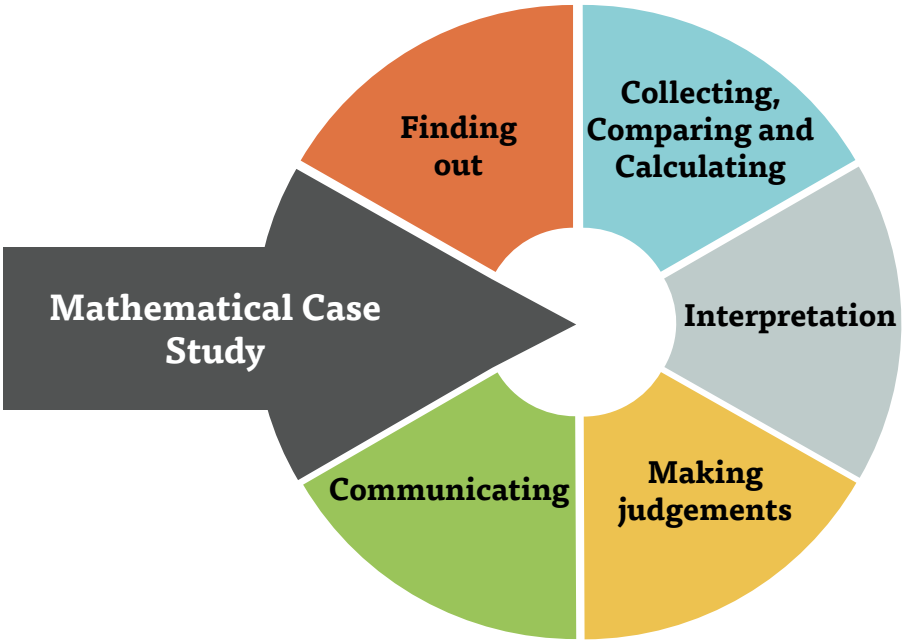
There are opportunities in this module to allow space for students to investigate pathways for progression and the implications of same such as, investigating setting up a small business, working in the locality, travelling to go to an apprenticeship, traineeship or college.

There is an opportunity to link with the vocational specialism when students consider an area of business relevant for investigation.

MODULE 4: KEY ASSIGNMENT

I have carried out a case study into a relevant area of mathematics and work.

I have collected and selected the relevant examples from my portfolio of learning to exemplify the following areas of the mathematical case study in my specified area.



Assessment guidelines

Assessment for Mathematical Applications is based on the aims and learning outcomes in this module descriptor. There are two assessment components:

1. Credits achieved due to attendance and completion of the key assignments for each module. (4 credits)

2. Written examination. (10 credits)

The learning outcomes are assessed through the key assignments, the cross curricular links in tasks and the written examination, therefore not all learning outcomes will be assessed in the final written examination.

The written examination will be two hours long. The number of questions on the examination paper may vary from year to year. Students will be assessed by means of problems set in meaningful contexts. In any year, the learning outcomes to be assessed in the written examination will be a sample of the learning outcomes in this module descriptor.

Resources

The following links may be useful in sourcing authentic, relevant data for use with students. This list will be regularly updated and more recent information may be found on the website.

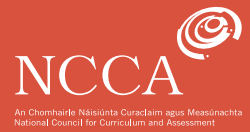
For government datasets: https://data.gov.ie/

Revenue information: https://www.revenue.ie/en/online-services/index.aspx

Access to fee apps such as:

https://www.myfitnesspal.com (calorie intake and nutritional information)

https://bmicalculatorireland.com (calculation of BMI)


NCCA
An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment