The Institution of Engineering and Technology

FIRST LEGO LEAGUE EXPLORE

Teacher Guide for Ireland

Developed by the DCU Institute of Education

FIRST® LEGO® League Explore

Presenting: MASTERPIECE℠

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Welcome to the *FIRST*® LEGO® League Explore MASTERPIECE℠ Teacher Guide for Ireland

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The development of this guide has been enabled by Science Foundation Ireland through the SFI Discover Programme.

Dublin City University Institute of Education

This guide has been developed by a leading team from the DCU Institute of Education to support teachers across Ireland to engage with *FIRST*® LEGO® League Explore within their classrooms.

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IET

We're passionate about STEM (science, technology, engineering and maths) and inspiring children to follow their dreams, get creative and have fun whilst learning how the world around them works. Our programmes are for children aged 4 to 16 years and aim to bring their imaginations alive to inspire them to engineer a better world in the future.

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Since 2010 Learnit has been on a mission to 'inspire the creators of tomorrow by making learning fun for the children of today'. We are the delivery partners for *FIRST*® LEGO® League in Ireland. We are proud to partner with the IET and DCU to bring STEM to life through this hands-on, minds-on approach to learning.

For the digital version of this guide visit:
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Welcome to the MASTERPIECE℠ Teacher Guide

This **MASTERPIECE℠ Teacher Guide for Ireland** aims to support Irish primary school teachers by connecting *FIRST*® LEGO® League Explore MASTERPIECE with the **Irish Primary School Curriculum.** Through this MASTERPIECE challenge learners will share their passions, hobbies and interests in creative and captivating ways. By working through a meaningful, authentic and problem-solving process, learners will design, build and code, in order to create unique solutions made with LEGO elements and powered by a LEGO Education Set (SPIKE™ Essential or WeDo 2.0); this will be their Masterpiece. *FIRST* LEGO League Explore MASTERPIECE is embedded throughout the different subjects of the Irish Primary School Curriculum achieving both the curriculum objectives and skills in a holistic and integrated manner.

This Teacher Guide is organised in two parts:

Part A provides a background to *FIRST* LEGO League Explore MASTERPIECE. An overview of the Irish Primary Curriculum and Policy connections is presented alongside general support and advice for teachers.

Part B is a detailed overview of each of the 12 lessons of the MASTERPIECE Teacher Guide for Ireland. Primary curriculum links and skill development opportunities are highlighted in each lesson. Throughout the lessons, learners will be exploring themes and ideas, creating solutions, testing them, iterating on them and sharing with others what they have learned. The learning activities are specifically designed with plenty of scope for differentiation so the lessons can be adapted to suit each participating class. Resources required, details of coding, teacher support, and guiding

questions are provided for each lesson. It is important to note that each lesson has core curriculum links that are necessary for the learners to learn about different kinds of passions, hobbies and interests and how they can be shared in creative and captivating ways. Extension activities which link across the curriculum and support the development of the learners knowledge and skills are presented, thereby enhancing their understanding of this real-world context and achieving the aims of the curriculum simultaneously. Engagement with the 12 lessons of the MASTERPIECE Teacher Guide for Ireland will involve approximately 15 hours of class time.

What is *FIRST* LEGO League Explore?

FIRST LEGO League Explore is a non-competitive, hands-on programme geared towards primary school aged learners from 2nd class (aged 7-8) to 6th class (aged 11-12). The programme aims to inspire learners to experiment and grow their confidence, critical thinking, and design skills through meaningful, hands-on learning activities. Each year FIRST LEGO League Explore focuses on a relevant, real-world theme with this year's challenge called MASTERPIECE. Children work together in teams using elements from a LEGO Education Set (SPIKE Essential or WeDo 2.0) and a MASTERPIECE Explore Set to enable them to share their passions, hobbies and interests in creative and captivating ways and create their own Masterpiece.

This MASTERPIECE Teacher Guide has been designed to provide learners with authentic and meaningful curriculum connections to this year's theme of sharing passions, hobbies and interests. The lessons in this Teacher Guide have been intentionally laid out so that learners build up their knowledge, understanding and skills, in advance of designing and building their team models and accompanying posters in lesson 10, preparing to present at a celebration event in lesson 11, and reflecting upon their learning journey in lesson 12. Figure 1 provides an overview of MASTERPIECE lessons 1 - 12.

Lessons 1-9	Context and knowledge	Developing familiarity and understanding of knowledge, skills and concepts including computational thinking and coding
Lesson 10	Team Model and Poster	Building and coding Team Model Creating Team Poster
Lessons 11-12	Celebration Event Reflecting on the MASTERPIECE experience	Sharing what the team have learned during the Celebration Experience and reflecting on their MASTERPIECE learning journey

Figure 1. MASTERPIECE Lessons 1-12

Core Values of *FIRST* LEGO League

FIRST LEGO League Explore is underpinned by the six *FIRST* Core Values that are the cornerstones of the program. *FIRST* LEGO League envisions that through the Core Values, learners use discovery and exploration in each lesson and learn that helping one another is the foundation of teamwork. Throughout each lesson it is important that the learners have fun and are motivated. You will find reference to the six Core Values (see Table 1 below) throughout each of the lessons. You can take time to emphasise the Core Value when you see the symbol.

Core Value	Description
	We are stronger when we work together.
	We respect each other and embrace our differences.
	We use creativity and persistence to solve problems.
	We enjoy and celebrate what we do!
	We explore new skills and ideas.
	We apply what we learn to improve our world.

Table 1. Core Values of FIRST LEGO League

The Core Values have strong connections to the Irish SPHE curriculum:

Subject	Strands	Strand Units/Elements	Skills and Concepts
SPHE	Myself and others Myself and the wider world	My friends and other people Relating to others Developing citizenship	Communication skills Working collaboratively and co-operatively with others Personal and self management skills Confidence and competence using language Decision-making skills

Table 2. Irish SPHE curriculum

Learning principles behind MASTERPIECE

The Engineering Design Process underpins the entire MASTERPIECE challenge, see Figure 2. Here, learners are encouraged to work like real engineers, using scientific, geographical and mathematical skills and understanding to investigate and think critically about real-world problems and propose creative solutions. The Engineering Design Process has four stages: Explore a problem; Create one or more solution(s); Test the solution(s); Share with others what you have learned.

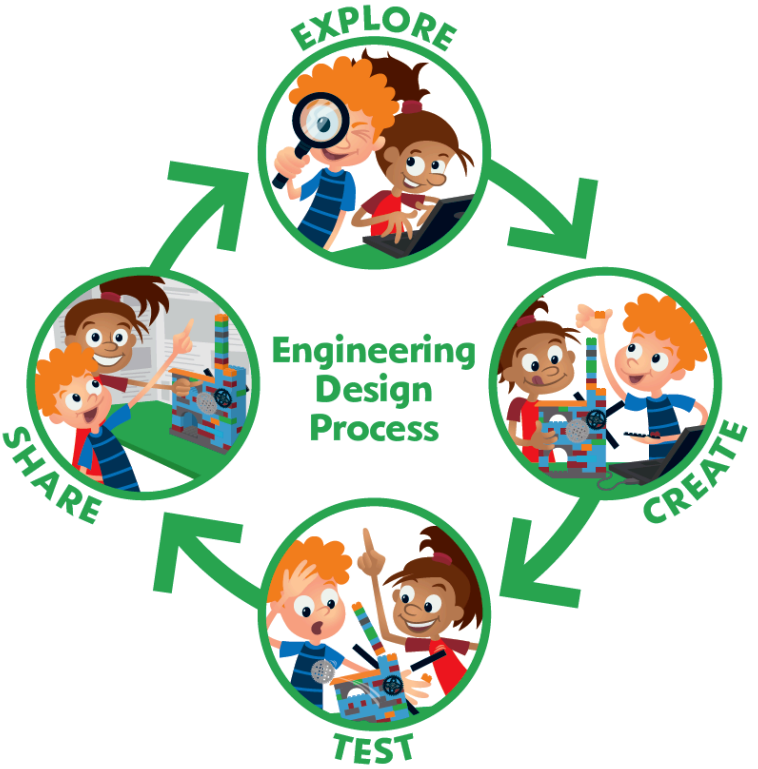
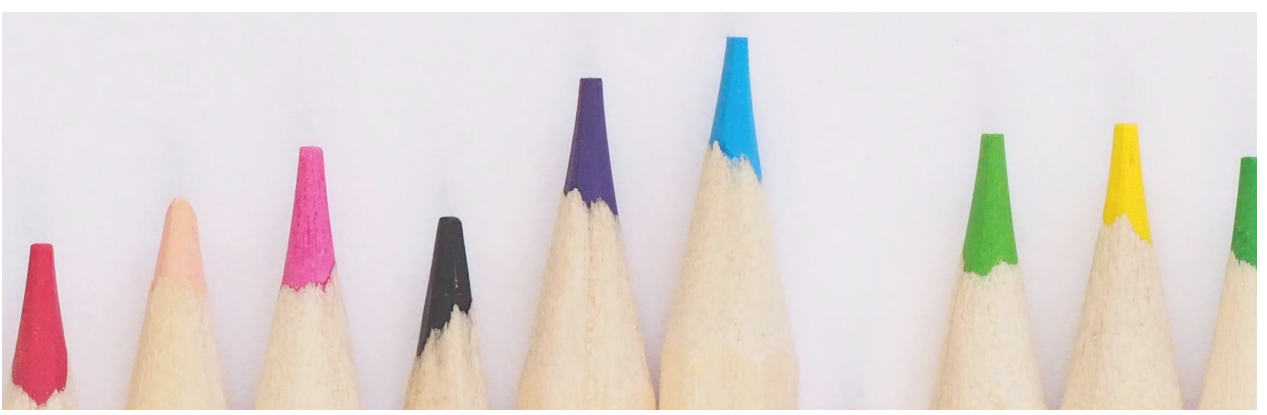


Figure 2. Engineering Design Process

There is no fixed order for this process. Learners may go through some or all parts several times throughout the lessons. These four stages of the Engineering Design Process align with the stages of enquiry-based learning, particularly for both science and geography.

The enquiry-based learning process comprises a child-centred, experiential, constructivist approach whereby learners are active in their learning and participate in the leading of investigations through posing questions and generating ideas before actively creating and collecting data to help develop their understanding. These teaching and learning approaches are advocated throughout the Irish Primary School Curriculum. Enquiry-based learning begins with a problem or obstacle to a learner's development; they analyse the situation; they identify possible solutions; they compare the implications of the different solutions and select the best course of action; they implement this in practice. Roberts' (2013) Framework for Enquiry (Figure 3) is an example of an enquiry-based learning process for teaching and learning in geography and science. As outlined below it has explicit correlations with the Engineering Design Process.



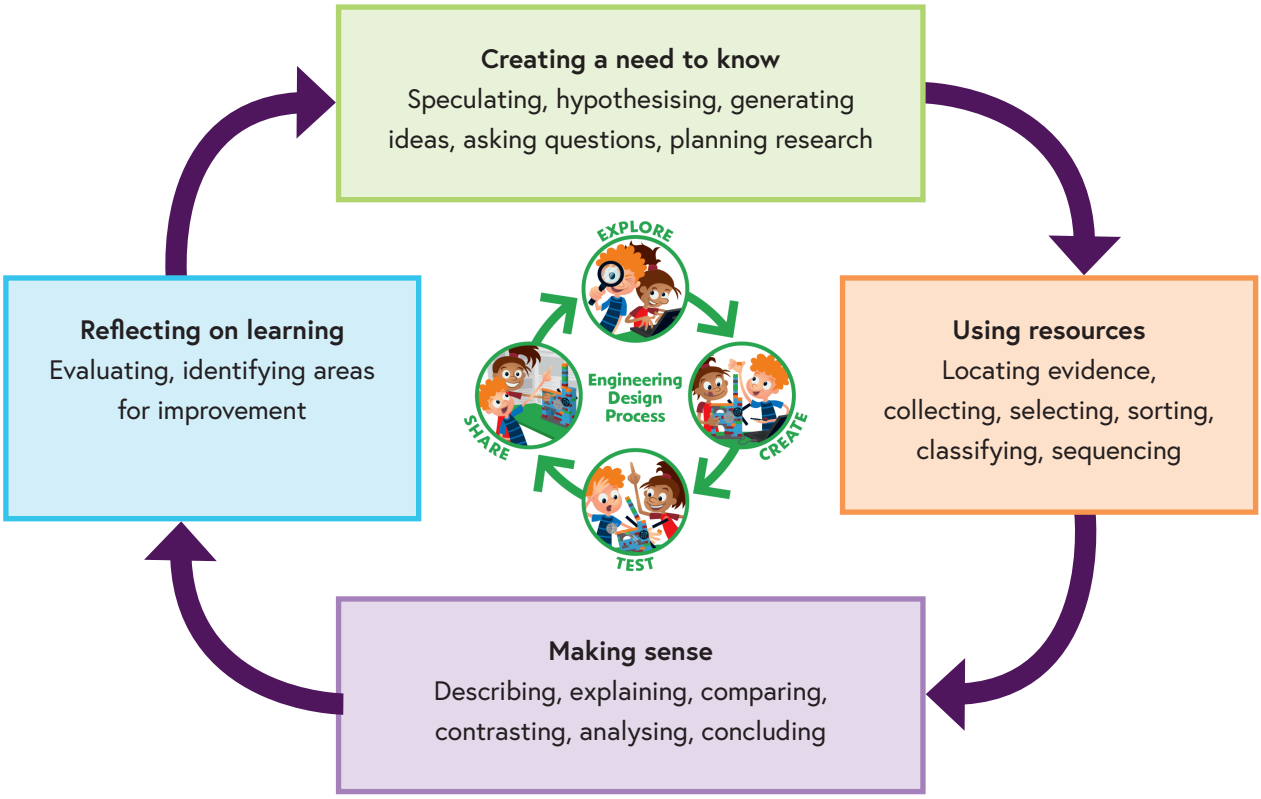
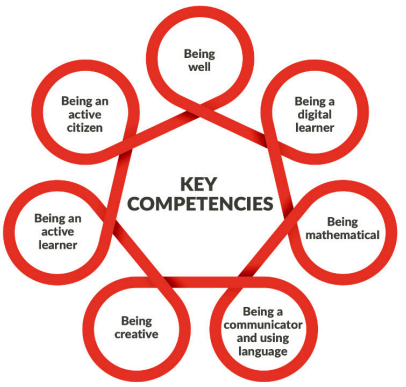
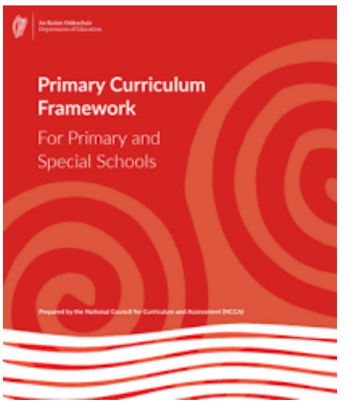


Figure 3. Enquiry-based learning framework (Roberts, 2013)

The Explore stage of the Engineering Design Process is directly aligned with the Creating a Need to Know stage of the enquiry framework. Here, the learners are introduced to the problem or scenario through a stimulus. This involves the learners hypothesising, speculating and generating ideas and questions for investigation drawing on their existing knowledge and everyday experiences. The Create stage of the Engineering Design Process is connected to the Using Resources stage of the enquiry framework. This involves the learners actively carrying out investigations on the issue at hand. Here they use a range of resources to both create and collect data to be used as evidence for their investigations. In both the Test stage of the Engineering Design Process and the Making Sense stage of the enquiry process, the learners analyse and interpret the data pertaining to their investigations, thus reflecting on and modifying their ideas and concepts and developing specific recommendations and solutions for issues. Finally, similar to the Reflecting on Learning stage in the enquiry process, the Share stage of the Engineering Design Process culminates in the learners presenting their work, reflecting on what they learned, and identifying areas where they were successful and areas in need of improvement.

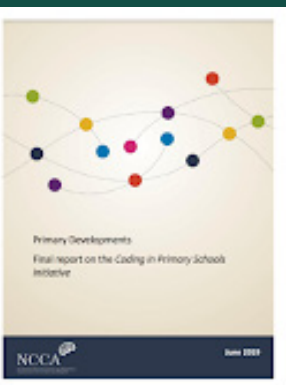
Connections to policy





FIRST LEGO League Explore has explicit and embedded connections across the Irish Primary School Curriculum.

FIRST LEGO League Explore is directly linked with a number of domains, standards and statements across both dimensions of the Digital Learning Framework (DLF). This is a school self-evaluation process and aligns with the new Digital Strategy for Schools to 2027.



FIRST LEGO League Explore has strong connections with a range of recent policy initiatives.

Table 3. Policy connections

How does *FIRST* LEGO League Explore MASTERPIECE connect to the Irish Primary Curriculum?

Table 4 below below presents the connections to the Irish Primary School Curriculum (strands and skills associated with curriculum subjects).

Geography Human environments; Living and Working in the Local Environment and in a Contrasting Part of Ireland *Investigating; Questioning; Observing; Analysing; Recording and Communicating*	**Science** Energy and forces; Materials *Observing; Design and make*	**Mathematics** Data; Number; Shape and space; Measures *Applying and problem solving; integrating and connecting; Reasoning; Communicating and expressing; Implementing*
Literacy Oral Language; Reading and writing *Communicating; Understanding; Exploring and using*	**Visual Arts** Drawing; Construction *An awareness of line; An awareness of form; An awareness of space*	**History** Early people and ancient societies; Life, Society, Work and Culture in the Past; Continuity and Change over Time *Time and chronology; Using evidence; Change and continuity; Synthesis and communication; Cause and effect*
Drama Drama to explore feelings, knowledge and ideas, leading to understanding *The fictional lens; Place; Belief*	**Music** Listening and responding *A sense of pulse; A sense of dynamics; A sense of tempo*	**SPHE** Myself; Myself and others *Self-Awareness; Communication; Cooperation; Decision-making*

Table 4. Irish Primary Curriculum connections

Table 5 provides a more explicit overview of the curriculum Strand and Strand Unit links in each of the MASTERPIECE lessons.

MASTERPIECE curriculum connections

Lesson	Lesson 1: We are all Unique: I am a MASTERPIECE!	Lesson 2: Developing my Passions, Hobbies and Interests	Lesson 3: Performing and Presenting in the Past - The Colosseum	Lesson 4: Experts Behind the Scenes
Overview of the lesson	Learners will share and discuss their passions, hobbies and interests.	Learners will share and discuss their passions, hobbies and interests while recognising and appreciating that each person may have different interests.	Learners will explore how the Romans used technology to enhance performances and presentations in the past, captivating audiences in the Colosseum.	Learners will explore different jobs in the arts which allow for sharing in creative and captivating ways.
Curriculum connections	**SPHE** Strand(s): Myself; Myself and others Strand Unit(s): Self-identity; My friends and other people Skill(s): Self-awareness; Communicating **Literacy** Strand(s): Oral Language Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using	**SPHE** Strand(s): Myself Strand Unit(s): Self-identity; Relating to others Skill(s): Self-awareness; Communicating **Drama** Strand(s): Drama to explore feelings, knowledge and ideas leading to understanding Strand Unit(s): Exploring and making drama; cooperating and communicating in making drama Skill(s): The Fictional Lens; Place; Belief **Visual Arts** Strand(s): Drawing Strand Unit(s): Making drawings; Looking and responding Skill(s): An awareness of line; An awareness of form; An awareness of space **Mathematics** Strand(s): Data Strand Unit(s): Representing and interpreting data Skill(s): Applying and problem solving; Integrating and connecting; Reasoning; Communicating and expressing **Literacy** Strand(s): Oral Language Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using	**History** Strand(s): Early peoples and ancient societies Strand Unit(s): Romans Skill(s): Time and chronology; Using evidence; Change and continuity; Synthesis and communication; Cause and effect **Literacy** Strand(s): Reading; Writing Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using	**Geography** Strand(s): Human environments Strand Unit(s): People at work Skills(s): Questioning, Observing, Analysing, Recording and Communicating **Literacy** Strand(s): Oral Language Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using

Lesson	Lesson 5: Sound all Around	Lesson 6: Movement on Stage	Lesson 7: Museum Exhibition	Lesson 8: Visual Effects
Overview of the lesson	Learners will explore how sound makes an impact on an audience.	Learners will explore how movement can be used in performance spaces like stages to make an impact on an audience.	Learners will explore how museums use digitally enhanced displays to make exhibits more interactive..	Learners will explore how visual effects like Green Screening can be used to share ideas in creative and captivating ways.
Curriculum connections	**Music:** Strand(s): Listening and Responding Strand Unit(s): Listening and responding to music Skill(s): A sense of pulse; A sense of dynamics; A sense of tempo **Science** Strand(s): Energy and forces Strand Unit(s): Sound Skill(s): Observing **SPHE** Strand(s): Myself Strand Unit(s): Self-identity; Relating to others Skill(s): Self-Awareness; Communicating **Literacy** Strand(s): Oral Language Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using	**Mathematics** Strand(s): Number; Shape and Space Strand Unit(s): Fractions; Decimals; 2D / 3D shapes; Lines and angles Skill(s): Applying and problem-solving; Communicating and expressing; Integrating and connecting; Reasoning; Implementing **Literacy** Strand(s): Oral Language Strand Unit(s): Communicating, Skill(s): Communicating; Understanding; Exploring and using **SPHE** Strand(s): Myself and others Strand Unit(s): My friends and other people; Relating to others Skill(s): Communication; Cooperation; Decision-making	**Literacy** Strand(s): Oral Language Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using **Mathematics** Strand(s): Shape and space Strand Unit(s): Lines and angles; Rotations Skill(s): Applying and problem-solving; Communicating and expressing; Integrating and connecting; Reasoning; Implementing **SPHE** Strand(s): Myself and others Strand Unit(s): My friends and other people; Relating to others Skill(s): Communication; Cooperation; Decision-making **History** Strand(s): Life, Society Work and Culture in the Past; Continuity and Change over Time Strand Unit(s): Life in 18th Century, 19th Century, World Wars, or in Ireland since 1950s; Clothes; Homes and Houses; Transport Skill(s): Time and chronology; Using evidence; Change and continuity; Synthesis and communication	**Science** Strand(s): Energy and Forces; Materials Strand Unit(s): Forces; Properties and characteristics of materials Skill(s): Design and Make **Literacy** Strand(s): Oral Language Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using **SPHE** Strand(s): Myself and others Strand Unit(s): My friends and other people; Relating to others Skill(s): Communication; Cooperation; Decision-making **Drama** Strand(s): Drama to explore feelings, knowledge and ideas leading to understanding Strand Unit(s): Exploring and making drama; cooperating and communicating in making drama Skill(s): The Fictional Lens; Place; Belief

Lesson	Lesson 9: Setting the Stage	Lesson 10: Team Model and Poster	Lesson 11: Let's Share - Preparation for Celebration Event	Lesson 12: Let's Reflect
Overview of the lesson	Learners will form teams and decide what hobby, interest or passion their team will share in creative and captivating ways.	Learners will work in teams to create their Team Models and Posters.	Learners will prepare to share their MASTERPIECE at a Celebration Event.	Learners will reflect upon the MASTERPIECE lessons, their Team Model and Poster, and their understanding of how their passions, interests and hobbies can be shared in creative and captivating ways.
Curriculum connections	**Science** Strand(s): Energy and Forces; Materials Strand Unit(s): Forces; Properties and characteristics of materials Skill(s): Design and Make **Mathematics** Strand(s): Shape and space; Strand Unit(s): 2-D/3-D shapes Skill(s): Applying and problem-solving; Communicating and expressing; Integrating and connecting; Reasoning; Implementing **Literacy** Strand(s): Oral Language Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using **SPHE** Strand(s): Myself and others Strand Unit(s): My friends and other people; Relating to others Skill(s): Communication; Cooperation; Decision-making	**Mathematics** Strand(s): Shape and space; Measures Strand Unit(s): 2-D/3-D shapes; Time Skill(s): Applying and problem-solving; Communicating and expressing; Integrating and connecting; Reasoning; Implementing **Science** Strand(s): Energy and Forces; Materials Strand Unit(s): Forces; Properties and characteristics of materials Skill(s): Design and Make **Literacy** Strand(s): Oral Language; Writing Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using **Visual Arts** Strand(s): Construction; Drawing Strand Unit(s): Making constructions; Making drawings Skill(s): An awareness of line; An awareness of form; An awareness of space **SPHE** Strand(s): Myself and others; Myself and the wider world Strand Unit(s): My friends and other people; Relating to others; Developing citizenship Skill(s): Communication; Cooperation; Decision-making	**Literacy** Strand(s): Oral Language; Writing Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using **Visual Arts** Strand(s): Construction; Drawing Strand Unit(s): Making constructions; Making drawings Skill(s): An awareness of line; An awareness of form; An awareness of space	**Literacy** Strand(s): Oral Language; Writing Strand Unit(s): Communicating Skill(s): Communicating; Understanding; Exploring and using **Visual Arts** Strand(s): Construction; Drawing Strand Unit(s): Making constructions; Making drawings Skill(s): An awareness of line; An awareness of form; An awareness of space

Table 5. MASTERPIECE curriculum connections

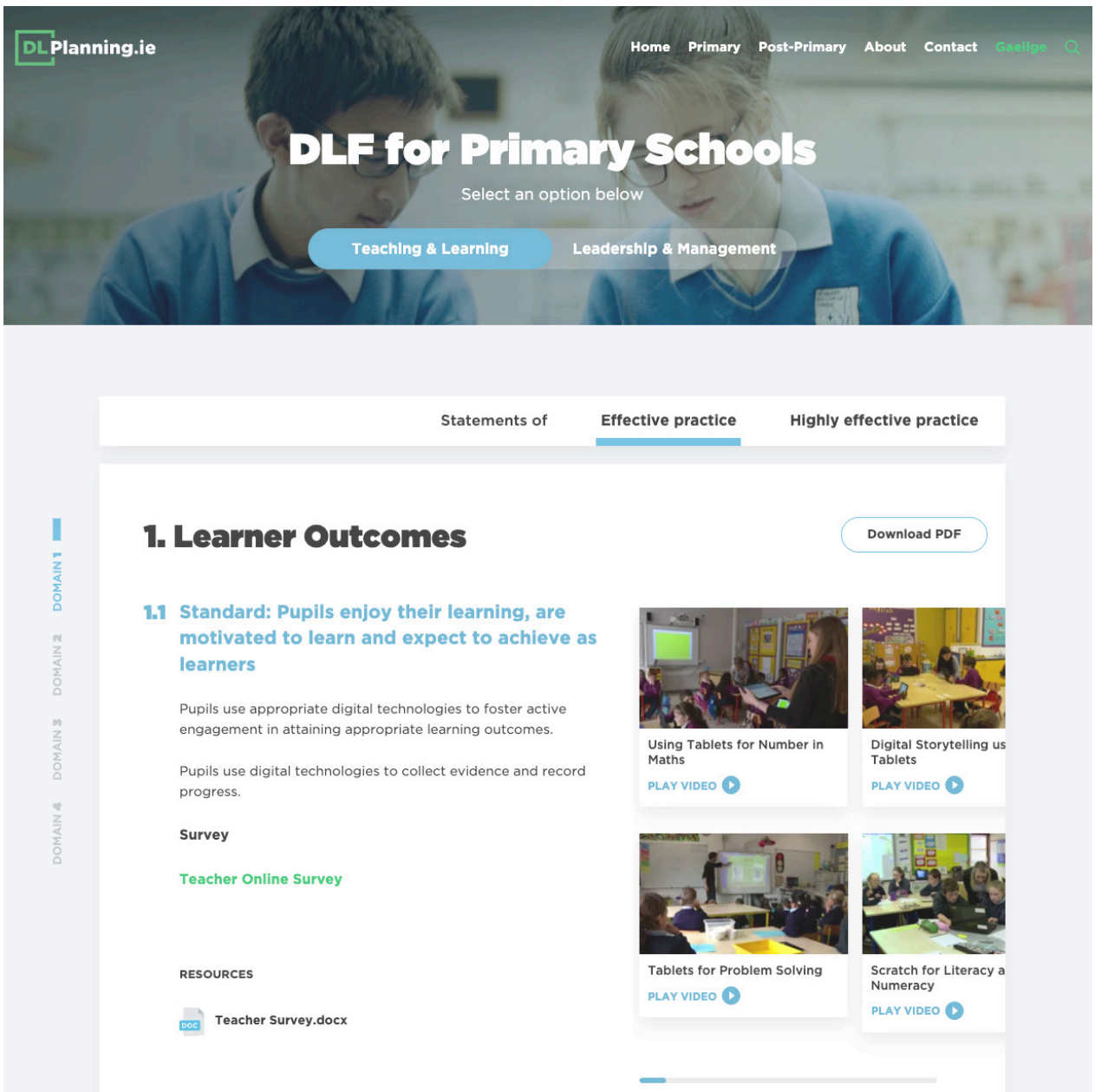
Digital Learning Framework (DLF) and School Self-Evaluation (SSE) connections

As part of the process in writing a digital learning plan, schools should firstly familiarise themselves with the Digital Learning Framework (DLF). Having reviewed the domains and standards, the school should identify the standard or standards on which it wishes to focus. This could be **one standard**, but not more than three. In some instances a school might identify one standard from the Teaching & Learning Dimension, and one standard from the Leadership & Management Dimension. For each standard there are a number of statements of effective practice and highly effective practice.

This MASTERPIECE Teacher Guide will only refer to statements of effective practice, however a school may feel the statement of highly effective practice is more suitable to their context.

For further information on the Digital Learning Framework and the process of completing a Digital Learning Plan for your school visit **dlplanning.ie**. The **Digital Learning Planning Guidelines book** is a very useful guide in creating a Digital Learning Plan.

Tables 6 and 7 give an overview of the connections between MASTERPIECE and the DLF and SSE.



For a school beginning to use a LEGO Education Set (SPIKE Essential or WeDo 2.0) and *FIRST* LEGO League Explore for the first time, one or two of the following standards and statements could be considered when preparing your Digital Learning Plan:

	Teaching and Learning	
Subject	**Detail from DLF**	**Guidance**
Pupil	**Domain 1:** Learner Outcomes **Standard:** Pupils enjoy their learning, are motivated to learn and expect to achieve as learners. **Statement:** Pupils use appropriate digital technologies to foster active engagement in attaining appropriate learning outcomes.	Through engagement with MASTERPIECE, pupils will use appropriate digital technologies (e.g. LEGO Education materials & digital devices etc.) to actively explore the 'challenge question' and create team models.
	Domain 1: Learner Outcomes **Standard:** Pupils enjoy their learning, are motivated to learn and expect to achieve as learners. **Statement:** Pupils use digital technologies to collect evidence and record progress.	Pupils will use digital devices and a portfolio tool to document the engineering design process while exploring the challenge question in MASTERPIECE.
Teacher	**Domain 3:** Teachers' Individual Practice **Standard:** The teacher selects and uses planning, preparation and assessment practices that progress pupils' learning. **Statement:** Teachers use appropriate digital technologies to design complex, real-world problems and structure them in a way that incorporates key subject matter concepts.	Teachers adapt and use the MASTERPIECE learning activities in order to provide pupils with complex, real-world problems which incorporate key subject matter concepts. .
	Leadership and Management	
Leaders	**Domain 1:** Leading Learning and Teaching **Standard:** Promote a culture of improvement, collaboration, innovation and creativity in learning, teaching, and assessment **Statement:** The principal and other leaders in the school encourage teachers to use digital technologies to enhance their learning, teaching and assessment practices, and to share their practice.	School leaders actively encourage and support teachers in their use of MASTERPIECE with pupils. Teachers are encouraged and facilitated to share their *FIRST* LEGO League Explore practice with colleagues.

Table 6. Connections between MASTERPIECE and the DLF and SSE.

For schools who have previously engaged with a LEGO Education Set (SPIKE Essential or WeDo 2.0) or *FIRST* LEGO League resources, or schools who would like to take a different focus within their DL plan, the following section identifies several standards which could be met through participating in *FIRST* LEGO League Explore.

Remember, in order for the DL plan to be achievable, a school should ideally only select one/two standard(s) in a given DL planning cycle.

	Teaching and Learning	
	Detail from DLF	**Guidance**
DOMAIN 1	**Domain 1:** Learner Outcomes **Standard:** Pupils enjoy their learning, are motivated to learn and expect to achieve as learners. **Statement:** Pupils use appropriate digital technologies to foster active engagement in attaining appropriate learning outcomes.	Through engagement with *FIRST* LEGO League Explore, pupils will use appropriate digital technologies (e.g. LEGO Education materials & digital devices etc.) to actively explore the 'challenge question' and create team models.
	Domain 1: Learner Outcomes **Standard:** Pupils enjoy their learning, are motivated to learn and expect to achieve as learners. **Statement:** Pupils use digital technologies to collect evidence and record progress.	Pupils will use digital devices and a portfolio tool to document the engineering design process while exploring the challenge question in MASTERPIECE.
	Domain 1: Learner Outcomes **Standard:** Pupils demonstrate the knowledge, skills and understanding required by the primary curriculum **Statement:** Pupils can use a range of digital technologies to demonstrate the knowledge, skills and understanding required by the Primary School Curriculum.	Through engagement with the MASTERPIECE challenge question, pupils will use a range of digital technologies (e.g. LEGO Education materials & digital devices etc.) to demonstrate knowledge, skills and understanding in the form of team models, team posters and other tasks included in MASTERPIECE.
	Domain 1: Learner Outcomes **Standard:** Pupils demonstrate the knowledge, skills and understanding required by the primary curriculum **Statement:** Pupils use digital technologies effectively to develop their knowledge, skills and understanding in accordance with the content objectives, learning outcomes, skills and concepts of the Primary School Curriculum.	Pupils develop their knowledge, skills and understandings through engagement with the MASTERPIECE challenge question; specifically through the Engineering Design Process, in designing and building team models and in preparing a team poster.
DOMAIN 2	**Domain 2:** Learner Experiences **Standard:** Pupils engage purposefully in meaningful learning activities **Statement:** Pupils use digital technologies for sourcing and exchanging information to develop understanding and support basic knowledge creation.	While engaging with the MASTERPIECE challenge question and tasks, pupils use digital technologies for sourcing, exchanging of information to develop understanding and support the creation of their team model and team poster
	Domain 2: Learner Experiences **Standard:** Pupils reflect on their progress as learners and develop a sense of ownership of and responsibility for their learning **Statement:** Pupils use digital technologies to collect evidence, record and reflect on their progress, and develop their competence as self-directed learners.	The MASTERPIECE challenge question and focus on Engineering Design Process enable pupils to engage in self-directed learning activities which involve the collection, recording and reflection on their projects, including team models and team posters.

	Teaching & Learning	
	Detail from DLF	**Guidance**
DOMAIN 3	**Domain 3:** Teachers' Individual Practice **Standard:** The teacher has the requisite subject knowledge, pedagogical knowledge and classroom management skills **Statement:** Teachers design or adapt learning experiences that incorporate digital technologies and make learning activities relevant and meaningful to support pupils' learning.	Teachers adapt and differentiate the MASTERPIECE learning activities which incorporate digital technologies (e.g. LEGO Education materials & digital devices etc.) to support pupils' learning.
	Domain 3: Teachers' Individual Practice **Standard:** The teacher selects and uses planning, preparation and assessment practices that progress pupils' learning **Statement:** Teachers use appropriate digital technologies to design complex, real-world problems and structure them in a way that incorporates key subject matter concepts.	Teachers adapt and use the MASTERPIECE learning activities in order to provide pupils with complex, real-world problems which incorporate key subject matter concepts.
DOMAIN 4	**Domain 4:** Teachers' Collaborative Practice **Standard:** Teachers value and engage in professional development and professional collaboration **Statement:** Teachers engage in professional development and work with colleagues to help them select and align digital technologies with effective teaching strategies to expand learning opportunities for all pupils	Teachers engage with professional learning opportunities (e.g. DCU/Learnit/PDST) in order to develop confidence and competence in making use of the LEGO SPIKE Essential or WeDo 2.0 and FIRST LEGO League resources to design learning opportunities for all pupils.
	Domain 4: Teachers' Collaborative Practice **Standard:** Teachers work together to devise learning opportunities for pupils across and beyond the curriculum **Statement:** Teachers participate in professional online communities to help them design learning opportunities for pupils across and beyond the curriculum.	Teachers engage with outside agencies (e.g. DCU/Learnit/PDST) in order to develop confidence and competence in making use of the LEGO SPIKE Essential or WeDo 2.0 and FIRST LEGO League resources to design learning opportunities for pupils across and beyond the curriculum.
	Domain 4: Teachers' Collaborative Practice **Standard:** Teachers contribute to building whole-staff capacity by sharing their expertise **Statement:** Teachers collaborate in determining how digital technologies can be used effectively for teaching, learning and assessment (TLA).	Teachers collaborate to discuss and determine how the MASTERPIECE resources and equipment can be used effectively for teaching, learning and assessment.

Table 7 a. Connections between MASTERPIECE and the DLF and SSE.

Leadership and Management		
Detail from DLF	**Guidance**	
Domain 1: Leading Learning and Teaching **Standard:** Promote a culture of improvement, collaboration, innovation and creativity in learning, teaching, and assessment **Statement:** The principal and other leaders in the school encourage teachers to use digital technologies to enhance their learning, teaching and assessment practices, and to share their practice.	School leaders actively encourage and support teachers in their use of MASTERPIECE with pupils. Teachers are encouraged and facilitated to share their MASTERPIECE practice with colleagues.	DOMAIN 1
Domain 1: Leading Learning and Teaching **Standard:** Manage the planning and implementation of the curriculum **Statements:** The principal and other leaders in the school plan for and implement a broad and balanced curriculum using digital technologies that offer new opportunities for learning. They are committed to ensuring that the school curriculum is implemented in a way that provides valuable learning experiences designed to exploit the potential of digital technologies.	School leaders plan to implement MASTERPIECE in order to provide valuable learning experiences which both exploit the potential of digital technologies and facilitate a broad and balanced curriculum with new opportunities for thematic teaching.	
Domain 1: Leading Learning and Teaching **Standard:** Foster teacher professional development that enriches teachers' and pupils' learning **Statement:** The principal and other leaders in the school support teachers' continuing professional development to develop teacher competence in the use of digital technologies, to support high-quality teaching and learning.	Teachers are encouraged and supported to engage with professional development which supports their engagement with MASTERPIECE.	
Domain 2: Managing the Organisation **Standard:** Manage the school's human, physical and financial resources so as to create and maintain a learning organisation **Statements:** The board of management ensures the provision and maintenance of digital teaching aids and equipment to a good standard. Physical learning spaces have been designed or adapted to harness and optimise the use of a range of digital technologies for learning.	All required digital technologies (e.g. LEGO Education materials & digital devices etc.) are available to the teacher and pupils. Considerations are made to the maintenance of this equipment. Considerations have been made to the layout of the classroom/multi-purpose space to best facilitate the Engineering Design Process and engagement with the MASTERPIECE learning activities.	DOMAIN 2

Leadership and Management		
Detail from DLF	**Guidance**	
Domain 3: Leading School Development **Standard:** Manage, lead and mediate change to respond to the evolving needs of the school and to changes in education **Statement:** The principal and other leaders in the school are informed by national policy and technological developments, and see their relevance to the school.	School leaders support and encourage teachers in use of FIRST LEGO League Explore due to its clear alignment with policy and relevance to the school.	DOMAIN 3
Domain 4: Developing Leadership Capacity **Standard:** Empower staff to take on and carry out leadership roles **Statements:** The principal and other leaders in the school encourage teachers to take on leadership roles and to lead the use of digital technologies for learning, teaching and assessment, and are willing to distribute significant leadership responsibilities. They develop organisational structures to facilitate and encourage the sharing of practice and peer mentoring in the use of digital technologies for learning, teaching and assessment.	School leaders encourage teachers to participate in MASTERPIECE. Teachers are then facilitated to share their experiences and expertise with colleagues in order to enable another teacher and class to participate in MASTERPIECE.	DOMAIN 4

Table 7 b. Connections between MASTERPIECE and the DLF and SSE.

The Seven Key Competencies of the new Primary Curriculum Framework

In order to support learners interacting with and engaging in the social world of their home, school and community, the Irish Primary Curriculum Framework includes seven 'key competencies' which are inextricably interconnected. These competencies were identified specifically in order to support and enable learners to develop a deep appreciation for the natural world and an understanding of how the world works. It is envisaged that this approach will enable learners to develop the essential knowledge, skills, concepts, dispositions, attitudes and values to adapt and deal with a range of situations, challenges and contexts in support of broader learning goals. These seven key competencies are presented in Figure 4.

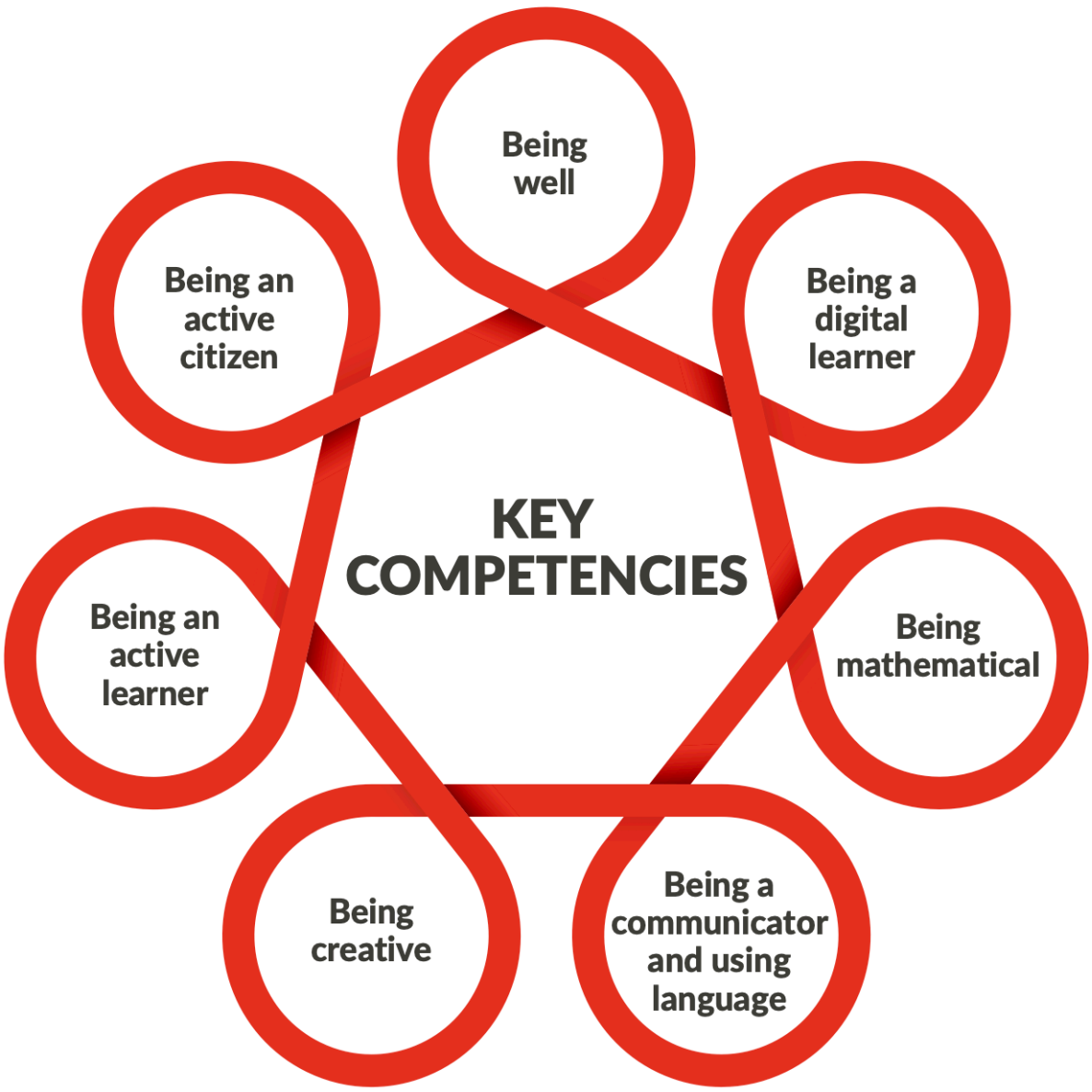


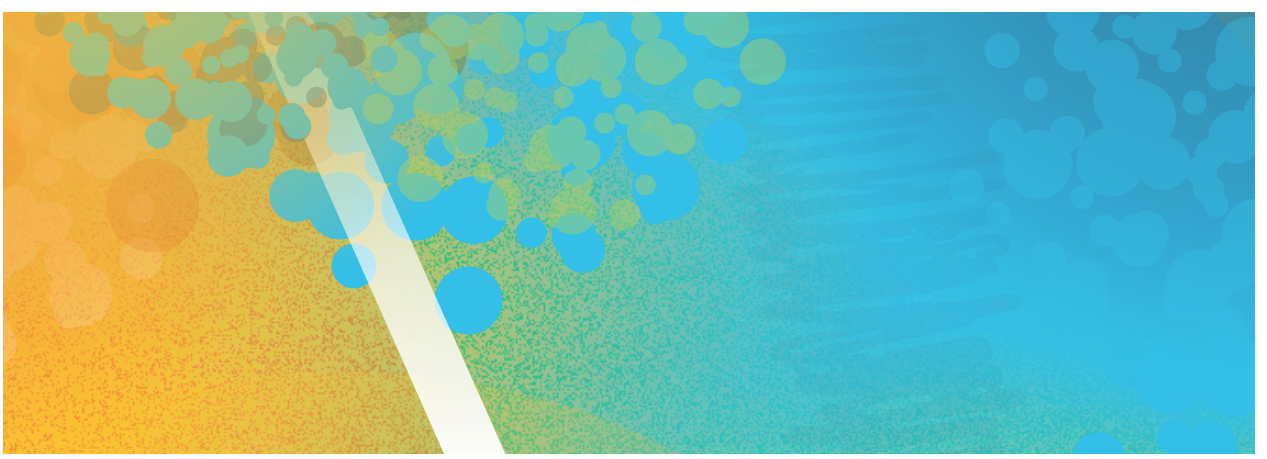
Figure 4. The Seven Key Competencies of the Primary Curriculum Framework.

This *FIRST* LEGO League Explore MASTERPIECE Teacher Guide has been designed to support the development of all seven of the key competencies of the Primary Curriculum Framework in an integrated way as presented in Figure 5 and outlined below:

The '**Being an Active Citizen**' competency fosters within learners the knowledge, skills, concepts, attitudes, values and dispositions that motivate and empower them as citizens to take positive actions to live justly with regard to the rights of others. It enables learners to question, critique and understand how aspects of our lives can be improved. It places democratic practices at the centre of the learning process, fostering respect and appreciation for diversity of thoughts, opinions and ways of living. Through engaging in *FIRST* LEGO League Explore MASTERPIECE, learners are facilitated in understanding the uniqueness and diversity of people pertaining to their passions, hobbies and interests. *FIRST* LEGO League Explore MASTERPIECE enables learners to share their passions, hobbies and interests in creative and captivating ways. By creating their own 'masterpiece', learners are working collaboratively to identify ways of sharing their unique passions, hobbies and interests with others. The '**Being an Active Citizen**' competency is embedded within *FIRST* LEGO League Explore MASTERPIECE in that the challenge and associated lessons develop learners' understanding, respect and appreciation for diversity of thoughts, opinions and ways of living.

The '**Being Creative**' competency focuses on recognising and nurturing learners' innate creativity, providing learners with opportunities for meaningful creative experiences through exploring and expressing ideas and reflecting on experiences. *FIRST* LEGO League Explore MASTERPIECE holds that learners are creative, and as such, should be encouraged to be curious, open-minded and imaginative. It comprises the attributes of **Being Creative** such as participating in and enjoying creative experiences, being curious, being imaginative, being innovative, using creative processes and exploring alternative ways of communicating, culminating in them sharing their passions, hobbies and interests in creative and captivating ways. Fostering children's creativity impacts positively on their motivation and well-being.

The '**Being a Digital Learner**' competency in the Primary Curriculum Framework aims to support learners in becoming creative, confident and critical users of digital technology. Throughout *FIRST* LEGO League Explore MASTERPIECE, learners will develop their knowledge, skills, concepts, attitudes, values and dispositions through problem-solving, experimenting and creating, using a wide range of digital technologies, collaborative planning, coding and communication software. *FIRST* LEGO League Explore MASTERPIECE develops learners' responsible, safe and ethical use of technology by embedding digital technologies in the learning process.

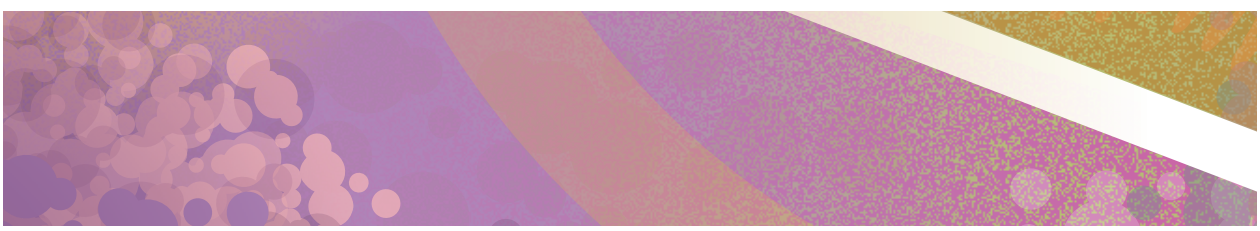


The '**Being Mathematical**' competency aims to aid learners in developing and applying mathematical thinking to solve a range of problems in everyday situations. In order to participate in today's world, learners need to be able to think and communicate quantitatively, to make sense of data, to have spatial awareness and to recognise and understand patterns and sequences. Being mathematical involves learners drawing upon a range of knowledge, skills, concepts, attitudes, values and dispositions as they recognise and interpret real-world information presented mathematically. Core attributes of the '**Being Mathematical**' competency are inherently ingrained throughout the lessons for *FIRST* LEGO League Explore MASTERPIECE. Throughout MASTERPIECE, learners are challenged to solve problems and make sense of real-world context situations using mathematics by recognising relationships, connections, patterns, as well as interpreting and processing information and data.

According to the new Primary Curriculum Framework, the '**Being a Communicator and using Language**' competency develops learners' understanding and enjoyment of interacting with others. Communicating and using language means being able to understand, interpret and use different forms of communication including gesture, expression, spoken language, printed text, broadcast media, and digital media. *FIRST* LEGO League Explore MASTERPIECE involves learners engaging purposefully with different text types including spoken, print and electronic formats. Here learners are encouraged to share and reflect upon their experiences, thoughts, ideas and feelings in a variety of ways, as well as learning how to observe, listen to, interpret and show respect for the perspectives of others.

The '**Being Well**' competency fosters self-awareness and promotes the importance of learners seeing themselves as capable and resourceful. It helps children become positive and engaged in their learning and realise their own uniqueness and potential. It supports healthy relationships with themselves, their peers, their family and the wider world. The Core Values of *FIRST* LEGO League Explore MASTERPIECE facilitate learners in being self-aware and resilient, acting responsibly and showing care towards themselves and others and being persistent and flexible in solving problems. The investigative, problem-based approach of the challenge is conducive towards fostering cooperation, positive team relationships and self-improvement.

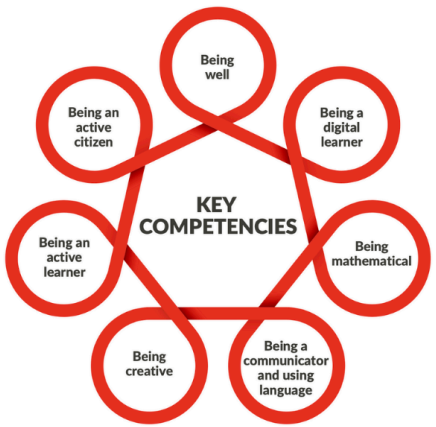
Finally, the '**Being an Active Learner**' competency is aimed at aiding learners to develop themselves as learners, individually and in collaboration with others. It promotes the development of the knowledge, skills, concepts, attitudes, values and dispositions needed for being an active and continuous learner. The structure of *FIRST* LEGO League Explore MASTERPIECE facilitates learners in learning to be learners whereby they learn how to communicate, set personal and collaborative learning goals, solve problems, and manage complex situations. The real-world context of the content and learning activities enables learners to make sense of people and places around them and in the wider world. Through developing this competency, learners also learn to reflect on their learning. Reflection is a major feature of *FIRST* LEGO League Explore MASTERPIECE. Learning with and about others also enables children to develop empathy.



Being an active citizen
- Developing an understanding of, and acting on, the rights and responsibilities of myself and others
- Experiencing learning through democratic practices
- Recognising injustice and inequality and ways to take action
- Developing capacity to make choices and take action in favour of a sustainable future

Being creative
- Participating in and enjoying creative and cultural experiences
- Being curious
- Being imaginative
- Being innovative
- Using creative processes
- Exploring alternative ways of communicating

Being a digital learner
- Communicating and collaborating with others through digital technology
- Accessing, analysing, and managing content using digital technology
- Enabling content creation, problem-solving, and creativity using digital technology
- Interacting ethically, critically, and responsibly with digital technology



Being mathematical
- Understanding the usefulness and beauty of mathematics
- Thinking and communicating mathematically
- Solving problems and making sense of the world using mathematics
- Observing, estimating, predicting, and calculating
- Recognising relationships, trends, connections, and patterns
- Interpreting, processing, and evaluating information and data

Being an active learner
- Playing, learning, and working, both individually and with others
- Developing metacognitive skills and strategies
- Fostering and maintaining positive relationships
- Dealing with conflict
- Respecting difference
- Learning about others
- Caring for and showing empathy towards others

Being a communicator and using language
- Developing understanding and enjoyment of words and language
- Developing expressive language
- Reading for enjoyment and with critical understanding
- Writing for different purposes and for a variety of audiences
- Exploring and creating a variety of texts

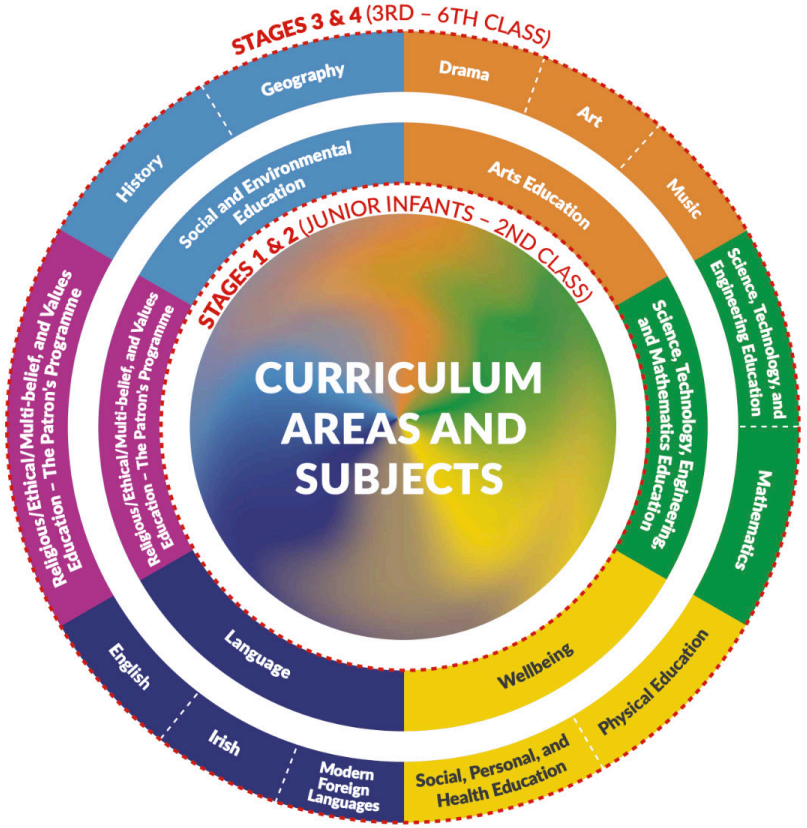
Being well
- Showing awareness of how to make good choices in relation to wellbeing
- Participating with growing confidence and skill in physical activity
- Being self-aware and resilient
- Acting responsibly and showing care towards self and others
- Being spiritual and having a sense of purpose and meaning
- Being persistent and flexible in solving problems
- Being able to assess risk and respond

Figure 5. The Seven Key Competencies of the new Primary Curriculum Framework.

Curriculum areas and subjects of the Primary Curriculum

The curriculum is presented in five broad curriculum areas:

1. Language
2. Science, Technology, Engineering, and Mathematics (STEM) Education
3. Wellbeing
4. Arts Education
5. Social and Environmental Education.



	Language	Science, Technology, Engineering and Mathematics Education	Wellbeing	Arts Education	Social and Environmental Education	Religious / Ethical / Multi-belief, and Values Education - The Patron's Programme
Stages 1 and 2 Junior Infants - 2nd Class	(Irish and English)					
Stages 3 and 4 3rd - 6th Class	Irish English Modern Foreign Languages	Science, Technology and Engineering Mathematics	Social Personal and Health Education Physical Education	Drama Art Music	History Geography	

Concepts and approaches of computational thinking and coding

As discussed by Butler & Leahy (2022) the concept of computational thinking originates in the work of Seymour Papert (1980; 1991) when he introduced the 'idea of the computer being the children's machine that would allow them to develop procedural thinking through programming' (Dede, Mishra & Voogt, 2013, p. 2), enabling them to combine critical thinking with computing power as the foundation for innovating solutions to real-life problems (Tabesh, 2017). In the Irish context the NCCA has been investigating possible approaches to the introduction and development of computational thinking in primary schools (NCCA, 2016; 2017, Millwood et al., 2018).

Computational thinking and coding are a key element of all MASTERPIECE lessons. At the heart of these lessons is a process of testing and learning, whereby learners work logically by changing and testing one variable (or code block) at a time, and documenting this. In so doing, learners can reflect upon the process and debug (or fix) the code that may not be having the intended result. This process can be scaffolded by probing questions from the teacher. The intention is to help learners to think about the problem differently; *"I wonder if…", "how might you…", "have you considered…"*
Examples of guiding questions are provided in each lesson.

While engaging in coding and computational thinking it is important to assist learners in using the correct **terminology** to describe the concepts and approaches they are developing while engaged in learning activities. Table 7 below details five concepts and approaches of computational thinking and coding which are developed across the *FIRST* LEGO League Explore MASTERPIECE lessons.

Concept or Approach	Explanation	Example of the concept or approach in use
Algorithms	Making steps, rules, and/or instructions	Creating the code or programme within the LEGO App (SPIKE Essential or WeDo 2.0). Creating algorithms. Writing instructions
Debugging	Finding and fixing 'bugs' in a logical and methodical manner	Iteratively making small changes to the code or programme and testing the outcome in order to overcome a problem. Creating tests, evaluating programme outputs and statements
Decomposition	Breaking down into parts	Organising information, creating representations of relationships and systems in diagrams e.g. labelling the parts of a plant, creating a mindmap on a topic
Logic	Predicting & analysing	Evaluating for correctness
Tinkering	Trying things out	Creating systems and playing with 'variables'. Experimenting and playing with the code or programme.

Table 8. Five Concepts and Approaches of Computational Thinking developed across the MASTERPIECE lessons.

Other concepts and approaches of computational thinking and coding include:

- Pattern recognition - looking for similarities among and within problems
- Abstraction - focusing on the important information only, ignoring irrelevant detail
- Evaluation - making judgements
- Creating - planning, making and evaluating things
- Persevering - never giving up, being determined, resilient and tenacious
- Collaborating - working with others to ensure the best results

(Adapted from Millwood et al., 2018)

The Barefoot Computing curriculum (**www.barefootcomputing.org**), includes a useful graphic which summarises the key concepts and approaches of computational thinking and coding.

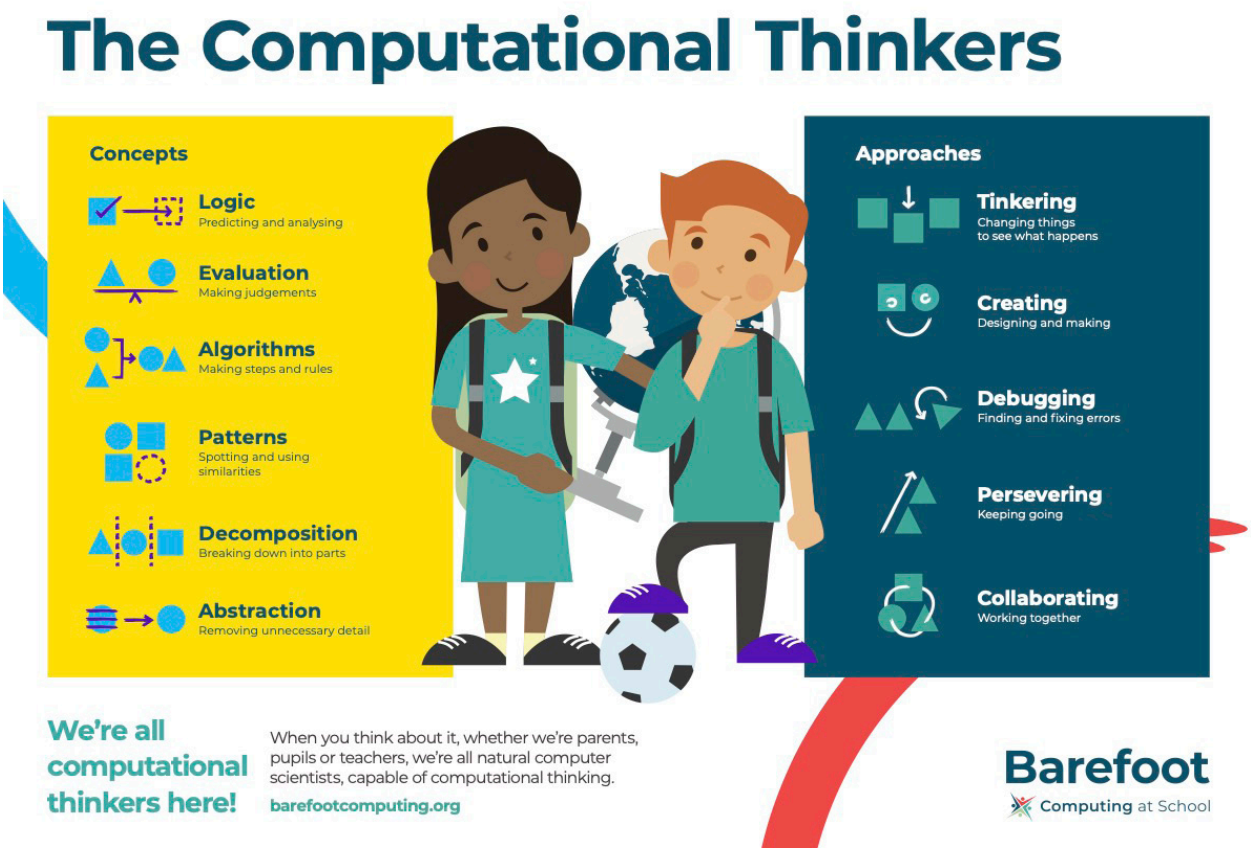


Figure 6. The Computational Thinker: Concepts and Approaches

What Does the Team Need?

LEGO® Education Set

LEGO® Education SPIKE™ Essential Set

Note: Other LEGO Education sets such as WeDo 2.0 are also allowed.

MASTERPIECE℠ Explore Set

Each team will get one MASTERPIECE℠ Explore set. Leave the LEGO® pieces in their plastic bags until the sessions in which they are needed.

Two printed books contain the building instructions for the Explore model. Bags marked 4 include enough pieces to build two additional basic stage models.

Electronic Device

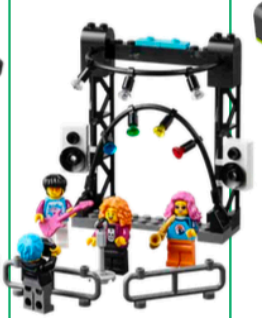
Your team will need a compatible Bluetooth-enabled device like a laptop, tablet, or computer. Scan the QR code to view system requirements and download software.

Scan me for system requirements and software download

Team Poster Supplies

Each team will need a large poster board and various art supplies and materials in Sessions 10-11.

	Basic Stage	Minifigures	Music Concert Pieces	Motor and Hub Pieces	Prototyping Pieces
Bag	1	1	2	3	4
Book	1	1	2	2	-



Tips

- The prototyping pieces and baseplates are used throughout the sessions to build solutions to the design challenges.

Organisation of team

Learners will work together in teams of four to six using elements from a LEGO Education set (SPIKE Essential or WeDo 2.0) and a MASTERPIECE Explore Set. They will collaborate and communicate to build, learn, and play together. Please refer to Figure 7 below for details of Team Roles. Learners should remain in the same teams for all lessons.

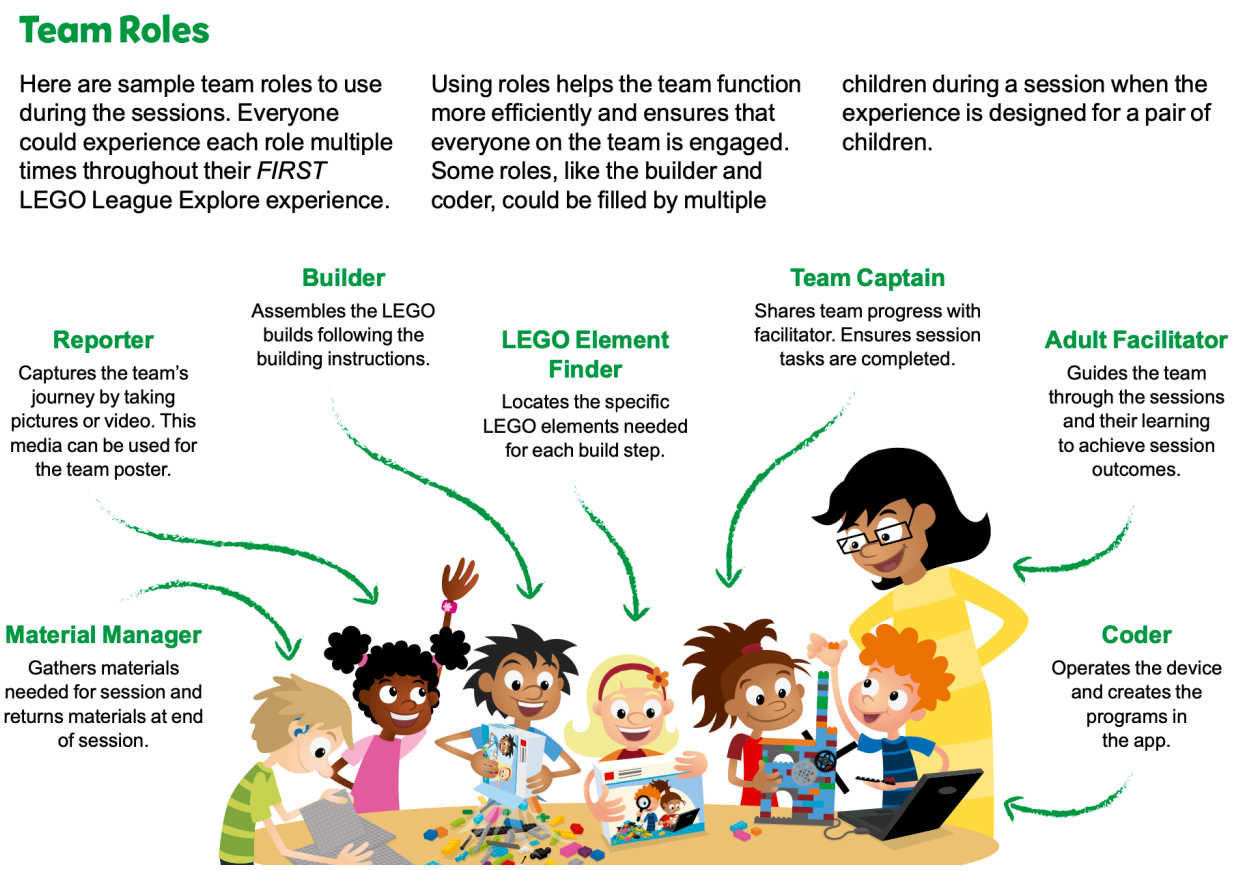


Figure 7. Team Roles

Engaging with Experts

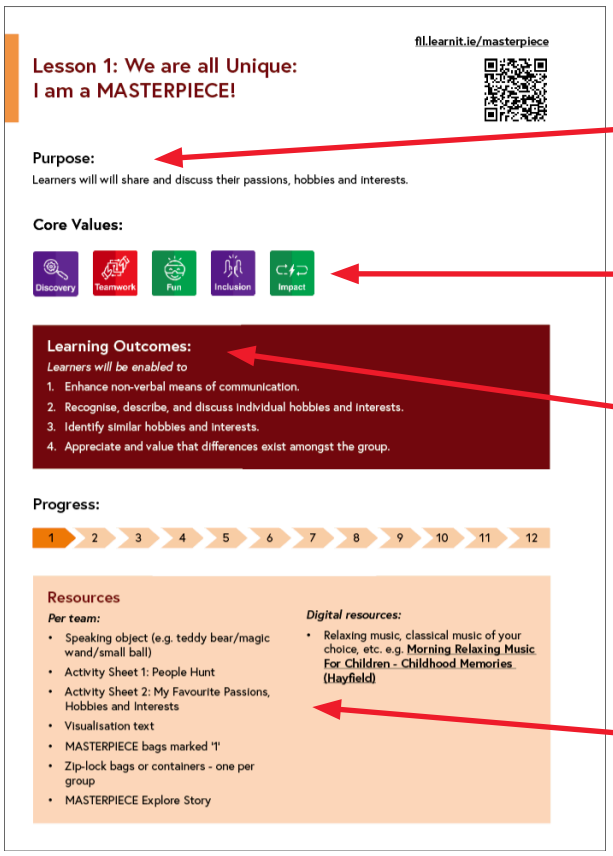
There are opportunities to engage with Experts over the course of the season through school visits, Zoom etc. See Lesson 4 for greater details regarding Experts Behind the Scenes.

Managing Equipment

Here are some recommendations on managing the *FIRST* LEGO League Explore MASTERPIECE materials:

Before	Ongoing	After
If the sets have been previously used - each team checks that they are not missing any elements before completing their first lesson. This can be done by comparing the contents against the cover insert. Designate one LEGO Education Set (SPIKE Essential or WeDo 2.0) and MASTERPIECE Explore Set per team. Where possible, label these to avoid confusion or swapping of sets.	A large lunchbox per team could be used to store the prototyping pieces between lessons. Any LEGO elements found on the floor could be placed in a box on the teacher's desk. Teams missing any elements can then check this box. Move all school bags and personal belongings of learners to the back of the room while completing lessons involving the LEGO materials. This is to avoid any elements accidentally falling into bags or pockets. After building the Explore models, store the printed books containing building instructions for future use.	After the celebration event: Each team checks that their LEGO Education Set (SPIKE Essential or WeDo 2.0) is not missing any elements. Disassemble the MASTERPIECE models and place the pieces (and printed building instructions) into zip lock bags for future use. Prototyping pieces can be resealed into storage containers.

Lesson overview



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Lesson 1: We are all Unique: I am a MASTERPIECE!

Purpose:
Learners will will share and discuss their passions, hobbies and interests.

Core Values:

Discovery | Teamwork | Fun | Inclusion | Impact

Learning Outcomes:
Learners will be enabled to
1. Enhance non-verbal means of communication.
2. Recognise, describe, and discuss individual hobbies and interests.
3. Identify similar hobbies and interests.
4. Appreciate and value that differences exist amongst the group.

Progress:
1 2 3 4 5 6 7 8 9 10 11 12

Resources

Per team:
- Speaking object (e.g. teddy bear/magic wand/small ball)
- Activity Sheet 1: People Hunt
- Activity Sheet 2: My Favourite Passions, Hobbies and Interests
- Visualisation text
- MASTERPIECE bags marked '1'
- Zip-lock bags or containers - one per group
- MASTERPIECE Explore Story

Digital resources:
- Relaxing music, classical music of your choice, etc. e.g. Morning Relaxing Music For Children - Childhood Memories (Hayfield)

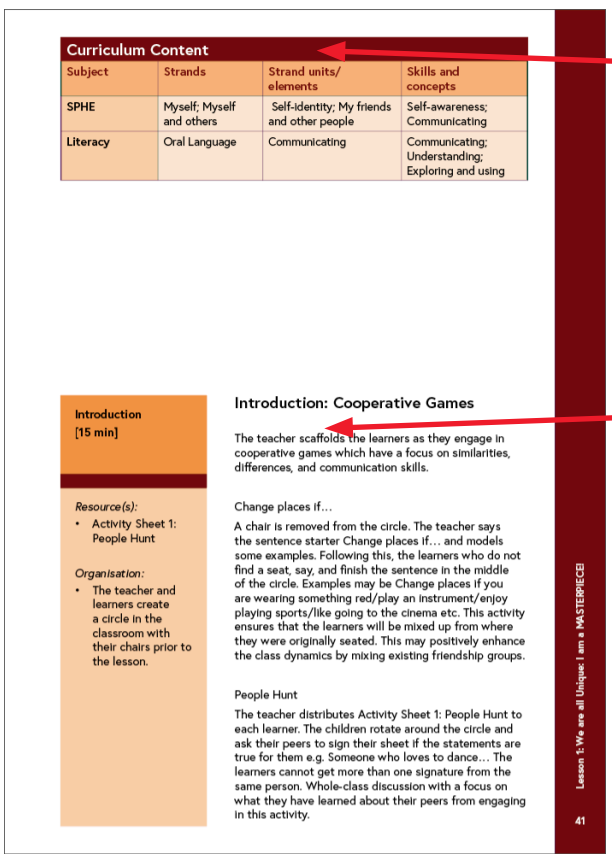
Each lesson follows the same format.

Purpose: The purpose of each lesson is provided.

Core Value: Each lesson will focus on a specific Core Value.

Learning Outcomes: Learning outcomes for each lesson are provided. These are indicative learning outcomes and should be adapted to meet the needs of your learners.

Resources: This includes Team Resources, Digital Resources and any Printable Resources. All digital resources can be accessed via the link provided



Curriculum Content

Subject	Strands	Strand units/ elements	Skills and concepts
SPHE	Myself; Myself and others	Self-identity; My friends and other people	Self-awareness; Communicating
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using

Introduction [15 min]

Resource(s):
- Activity Sheet 1: People Hunt

Organisation:
- The teacher and learners create a circle in the classroom with their chairs prior to the lesson.

Introduction: Cooperative Games

The teacher scaffolds the learners as they engage in cooperative games which have a focus on similarities, differences, and communication skills.

Change places if…

A chair is removed from the circle. The teacher says the sentence starter Change places if… and models some examples. Following this, the learners who do not find a seat, say, and finish the sentence in the middle of the circle. Examples may be Change places if you are wearing something red/play an instrument/enjoy playing sports/like going to the cinema etc. This activity ensures that the learners will be mixed up from where they were originally seated. This may positively enhance the class dynamics by mixing existing friendship groups.

People Hunt

The teacher distributes Activity Sheet 1: People Hunt to each learner. The children rotate around the circle and ask their peers to sign their sheet if the statements are true for them e.g. Someone who loves to dance… The learners cannot get more than one signature from the same person. Whole-class discussion with a focus on what they have learned about their peers from engaging in this activity.

Lesson 1: We are all Unique: I am a MASTERPIECE!

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Curriculum content: This includes reference to (i) strand, (ii) strand units/ elements and (iii) skills and concepts.

Lesson introduction and development: Learning activities, resources, guiding questions and suggested time frame for each key activity provided. Digital resources are also linked throughout this section and will also be available online at

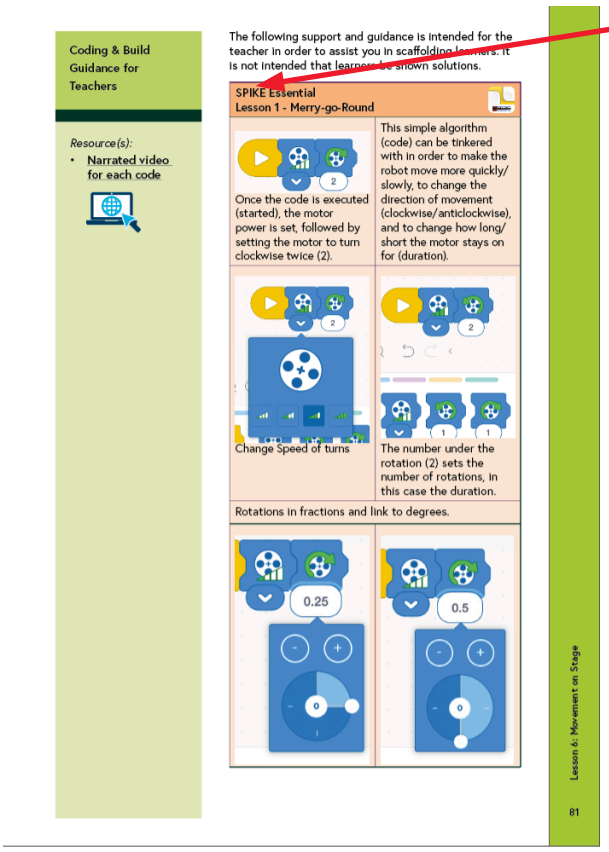
fll.learnit.ie/masterpiece

Icon to indicate visiting a website

Icon to indicate watching a video

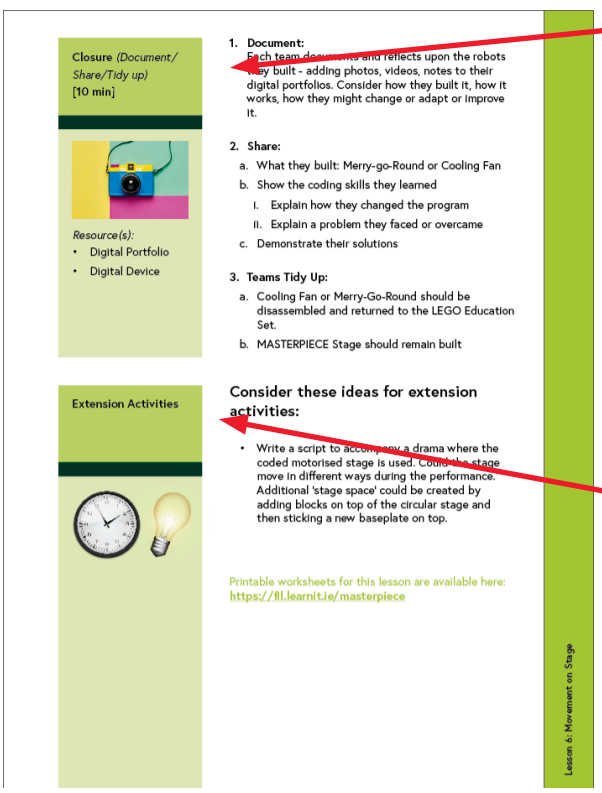
Resource icons:

Resources that require visiting a website or watching a video will have icons under them in the resource section to indicate that a link must be clicked on to access the resource.



Coding and build:

Details of the build and code are provided. Teacher Guiding Questions and Important Points to Note will support the learners' development of computational thinking and coding skills.



Closure:

This is an important feature of every lesson as it allows learners time to reflect upon their new learnings and understandings. The portfolio or learning diary being kept will be invaluable when learners begin to design their Team Models. Further details and teacher guidance is provided in the next section.

Extension activities:

These highlight activities which develop the learners' skills and knowledge in a specific subject area within the context of *FIRST* LEGO League Explore MASTERPIECE. These are optional but recommended extension activities.

Lesson Closures: Document, Share, Reflect

Every lesson ends with an opportunity for learners to document, share, and tidy up. This is a pivotal part of the Engineering Design Process as it enables learners to reflect and think about what they have learned through the lesson, in order to build upon this in future lessons.

These lesson closures have been designed to support learners as they work on their Team Model and Team Poster in the final lessons. By engaging fully with the lesson closures learners will have completed a lot of reflection in advance of the final lessons, which will make these more effective. For example, the builds and coding explored in earlier lessons should be documented and reflected upon so that learners can iterate and develop upon these for their Team Model.

Below is a general overview of what is intended in these lesson closures. Lesson-specific details are provided in the lesson guides that follow in Part B of this guide

Document

It is recommended that learners use digital devices and/or portfolio tools to document the **Engineering Design Process** while exploring the lessons in *FIRST* LEGO League Explore.

The process of documenting their progress and ideas can support the learners in **learning to be learners**, and aids in retention of skills and knowledge.

The use of digital devices and digital portfolio tools is also linked to the **Digital Learning Framework** and the Key Competency of **Being a Digital Learner** in the Primary Curriculum Framework.

Share

Teams are invited to share what they did during the lesson, including demonstrating their model and explaining how their code works. The focus of these sharing lessons is to enable learners to explain their thinking and use the correct vocabulary in their explanations. In the initial lessons the teacher may need to model the types of questions that could be asked. As the class progresses through the lessons, learners from other teams could be called upon to pose questions.

The sharing could be organised in many ways, two recommendations include:

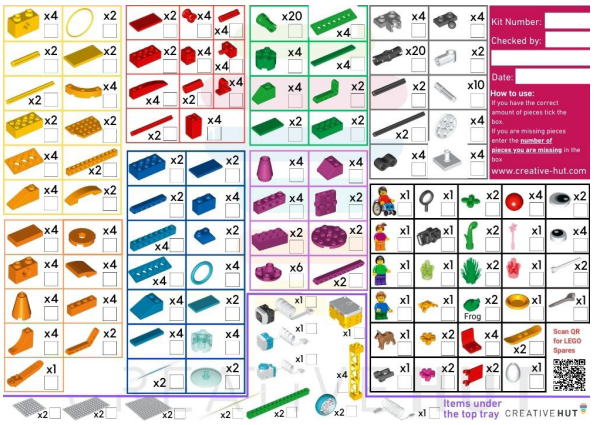
- The team who are sharing bring their LEGO model and digital device to the front of the class - option to connect to the digital display/ Interactive Whiteboard.
- The presenting team stays at their work area and all other learners physically move to this work station for the duration of the sharing.

Tidy up

It is recommended that each team be assigned a specific LEGO Education Set (SPIKE Essential or WeDo 2.0) for the duration of *FIRST* LEGO League Explore.

It is important to build up an expectation of learners that each team deconstructs and replaces all parts into the correct section of their LEGO Education Set at the end of each lesson, if appropriate. This will facilitate the following lessons to run smoothly, and avoid the loss of required pieces.

As illustrated in the picture, the LEGO Education Materials (SPIKE Essential or WeDo 2.0) have specific sections for different categories of pieces, with these pictured on the stickers and on the cover insert.



WeDo 2.0 Element Overview

SPIKE Essential Element Overview

Don't forget to share your progress with us where possible through:

X.com (Twitter): *@FLLUK, @Learnit_Ireland, @scienceirel, @DCU*

Instagram: *@TheIET, @learnit_eire, @scienceireland, @dublincityuniversity*

And use the Hashtag: *#FLLIRE*

Further help and support to schools

Help and support is available to teachers and schools. The **Oide** and **Oide Technology in Education** are available to provide a range of supports to teachers and schools, including training, technical support, and ongoing sustained school support. Where available, sustained support is recommended as it provides for ongoing training and support to teachers engaged in *FIRST* LEGO League Explore.

> Oide Sustained School Support is a deeper form of teacher professional learning aimed at building internal capacity and enabling schools to drive and embed change as independent communities of learners. The support is provided over a period of time, as part of a deliberately planned process, involving the school and teachers working towards clear and agreed-upon goals. In this context, our advisors will support teachers to collaboratively reflect, identify strengths and needs before deciding on the best way forward for your school.
>
> (PDST, 2021)

Visit **oide.ie** for further information, and to request school support.

Help and support is also available from your local **Education Centre**. This support can include training sessions, cluster groups of schools and teachers, and the loan of equipment and devices. Visit their website for further information, including details of upcoming training events.

LEGO Education Support: For replacement parts, additional kits, workshops and teacher CPD visit our partners **www.creative-hut.com**.

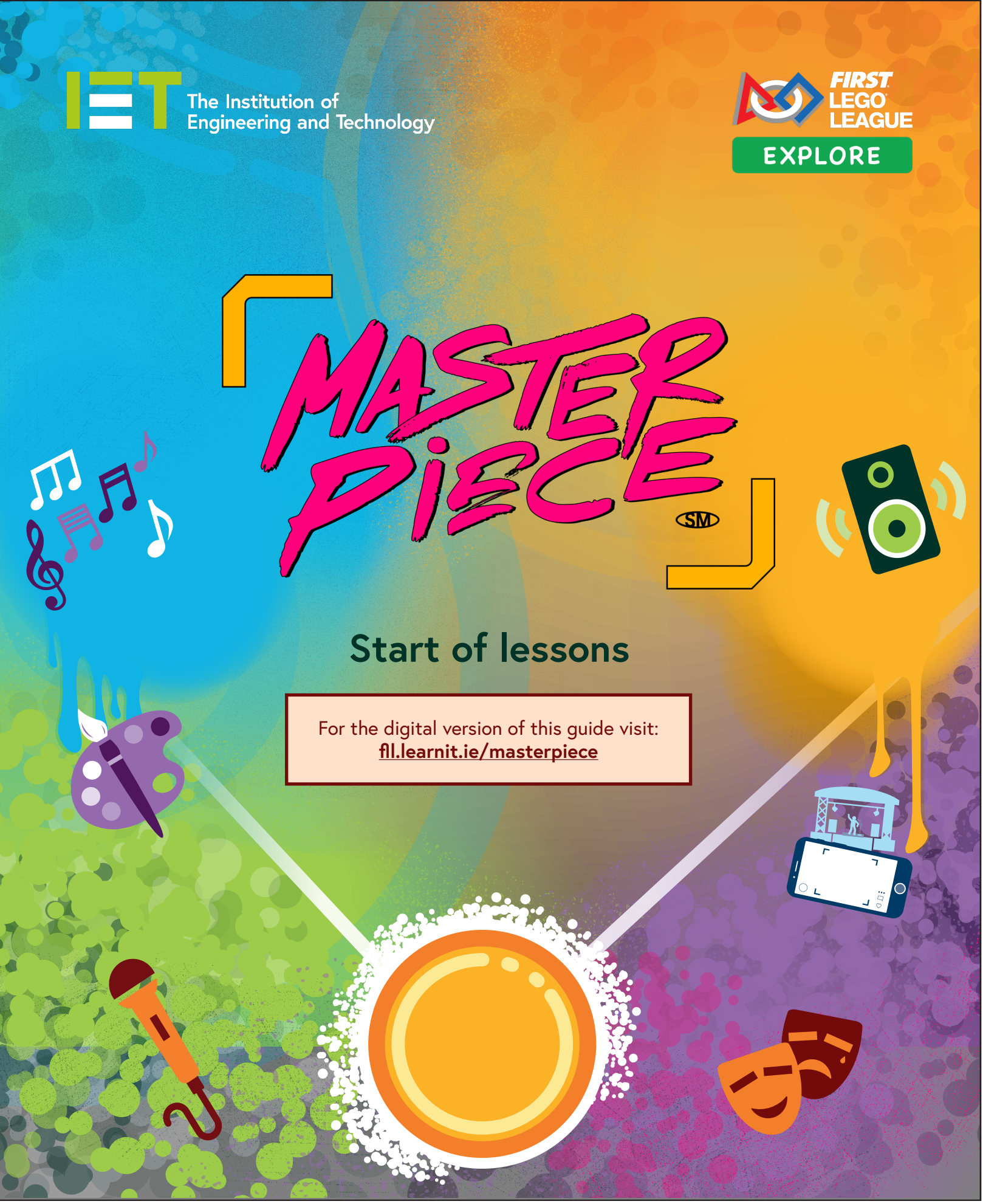
The Institution of Engineering and Technology

FIRST LEGO LEAGUE EXPLORE

MASTER PIECE℠

Start of lessons

For the digital version of this guide visit:
fll.learnit.ie/masterpiece



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MASTER PIECE℠ Learnit DCU Science Foundation Ireland SFI For what's next

Lesson overview

Lesson 1: We are all Unique - I am a MASTERPIECE!

Learners will share and discuss their passions, hobbies and interests.

Time: 1 hour | Page: 38

Lesson 2: Developing my Passions, Hobbies and Interests

Learners will share and discuss their passions, hobbies and interests while recognising and appreciating that each person may have different interests.

Time: 1 hour **| Page: 44**

Lesson 3: Performing and Presenting in the Past - The Colosseum

Learners will explore how the Romans used technology to enhance performances and presentations in the past, captivating audiences in the Colosseum.

Time: 1 hour **| Page: 48**

Lesson 4: Experts Behind the Scenes

Learners will explore different jobs in the arts which allow for sharing in creative and captivating ways.

Build: MASTERPIECE stage

Time: 1 hour **| Page: 54**

Lesson 5: Sound all Around

Learners will explore how sound makes an impact on an audience.

Build: MASTERPIECE music concert stage

Time: 1 hour **| Page: 62**

Lesson 6: Movement on Stage

Learners will explore how movement can be used in performance spaces like stages to make an impact on an audience.

Build: Cooling Fan OR Merry-go-Round MASTERPIECE rotating stage

Time: 1 hour **| Page: 70**

Lesson 7: Museum Exhibition

Learners will explore how museums use digitally enhanced displays to make exhibits more interactive.

Build: Spy Robot OR Animal Alarm

Time: 1 hour **| Page: 82**

Lesson 8: Visual Effects

Learners will explore how visual effects like Green Screening can be used to share ideas in creative and captivating ways.

Build: Milo the Science Rover OR Snowmobile

Time: 1 hour **| Page: 90**

Lesson 9: Setting the Stage

Learners will form teams and decide what hobby, interest or passion their team will share in creative and captivating ways

Time: 1 hour **| Page: 100**

Lesson 10: Team Model and Poster

Learners will work in teams to create their Team Models and Posters.

Time: 3+ hours **| Page: 108**

Lesson 11: Let's Share - Preparation for Celebration Event

Learners will prepare to share their MASTERPIECE at a Celebration Event.

Time: 1 hour **| Page: 118**

Lesson 12: Let's Reflect

Learners will reflect upon the MASTERPIECE lessons, their Team Model and Poster, and their understanding of how their passions, interests and hobbies can be shared in creative and captivating ways.

Time: 1 hour **| Page: 122**

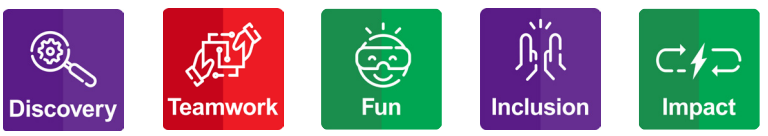
fll.learnit.ie/masterpiece

Lesson 1: We are all Unique: I am a MASTERPIECE!

Purpose:

Learners will will share and discuss their passions, hobbies and interests.

Core Values:



Learning Outcomes:

Learners will be enabled to

1. Enhance non-verbal means of communication.
2. Recognise, describe, and discuss individual hobbies and interests.
3. Identify similar hobbies and interests.
4. Appreciate and value that differences exist amongst the group.

Progress:

1 2 3 4 5 6 7 8 9 10 11 12

Resources

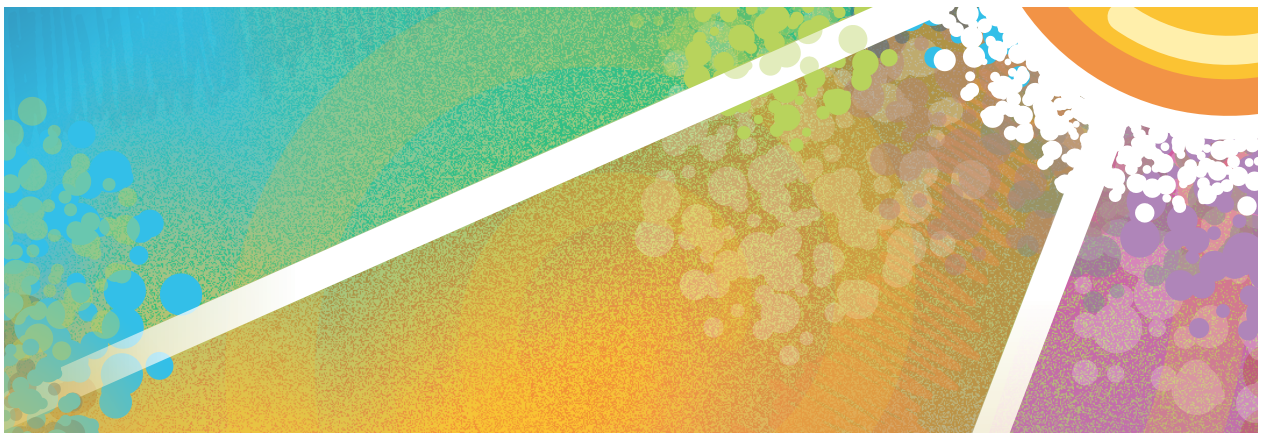
Per team:

- Speaking object (e.g. teddy bear/magic wand/small ball)
- Activity Sheet 1: People Hunt
- Activity Sheet 2: My Favourite Passions, Hobbies and Interests
- Visualisation text
- MASTERPIECE bags marked '1'
- Zip-lock bags or containers - one per group
- MASTERPIECE Explore Story

Digital resources:

- Relaxing music, classical music of your choice, etc. e.g. **Morning Relaxing Music For Children - Childhood Memories (Hayfield)**

Curriculum Content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
SPHE	Myself; Myself and others	Self-identity; My friends and other people	Self-awareness; Communicating
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using



Introduction
[15 min]

Resource(s):

- Activity Sheet 1: People Hunt

Organisation:

- The teacher and learners create a circle in the classroom with their chairs prior to the lesson.

Introduction: Cooperative Games

The teacher scaffolds the learners as they engage in cooperative games which have a focus on similarities, differences, and communication skills.

Change places if…

A chair is removed from the circle. The teacher says the sentence starter Change places if… and models some examples. Following this, the learners who do not find a seat, say, and finish the sentence in the middle of the circle. Examples may be Change places if you are wearing something red/play an instrument/enjoy playing sports/like going to the cinema etc. This activity ensures that the learners will be mixed up from where they were originally seated. This may positively enhance the class dynamics by mixing existing friendship groups.

People Hunt

The teacher distributes Activity Sheet 1: People Hunt to each learner. The children rotate around the circle and ask their peers to sign their sheet if the statements are true for them e.g. Someone who loves to dance… The learners cannot get more than one signature from the same person. Whole-class discussion with a focus on what they have learned about their peers from engaging in this activity.

Introduction [Continued]

Circle-Time:

- See Guidance for Teachers section at end of lesson for further guidance

Birthday Line (taken from Walk Tall 6 p.61)

The learners are tasked with sequencing themselves in the circle according to their birthday date. However, they cannot orally share their date with their peers. They must complete the task in silence drawing on non-verbal means of communication e.g. using fingers to display numbers. The teacher signals where January and June are in the circle to scaffold the task. If there are a number of children born in the one month, they have to line up in order within that month – for example someone born on the 5th March should be before someone born on the 10th or 20th March in the line. The game is complete when everyone has slotted into a place in the line silently. The teacher can then ask each person, starting at the beginning of the line (January) to state their birthday to see if they have got it right!

Development [40 min]

Resource(s):

- MASTERPIECE Explore Story
- Activity Sheet 2: My Favourite Passions, Hobbies and Interests
- LEGO bags marked '1'
- Zip-lock bag or container for each group

Development: Introduction to MASTERPIECE Programme (Teacher Explanation)

Teachers should explain to learners that they are going to be working on a project over the next few weeks that focuses upon sharing their passions, hobbies and interests in creative and captivating ways using LEGO.

Use the MASTERPIECE Explore Story for discussion to aid in sharing the purpose of the MASTERPIECE Explore programme with the learners:

The purpose of this program is that the learners will engage in 14 lessons where they will share their passions, hobbies and interests in creative and captivating ways. By working through a meaningful, authentic and problem-solving process, learners will design, build and code, in order to create unique solutions made with LEGO elements and powered by a LEGO Education Set (SPIKE Essential or WeDo 2.0); this will be their MASTERPIECE.

The remainder of this first lesson focuses upon learners thinking about and sharing their passions, hobbies and interests.

Development [Continued]

My favourite passions, hobbies and interests

Each learner receives **Activity Sheet 2: My Favourite Passions, Hobbies and Interests.** They record their favourite passions, hobbies and interests through use of drawings and vocabulary.

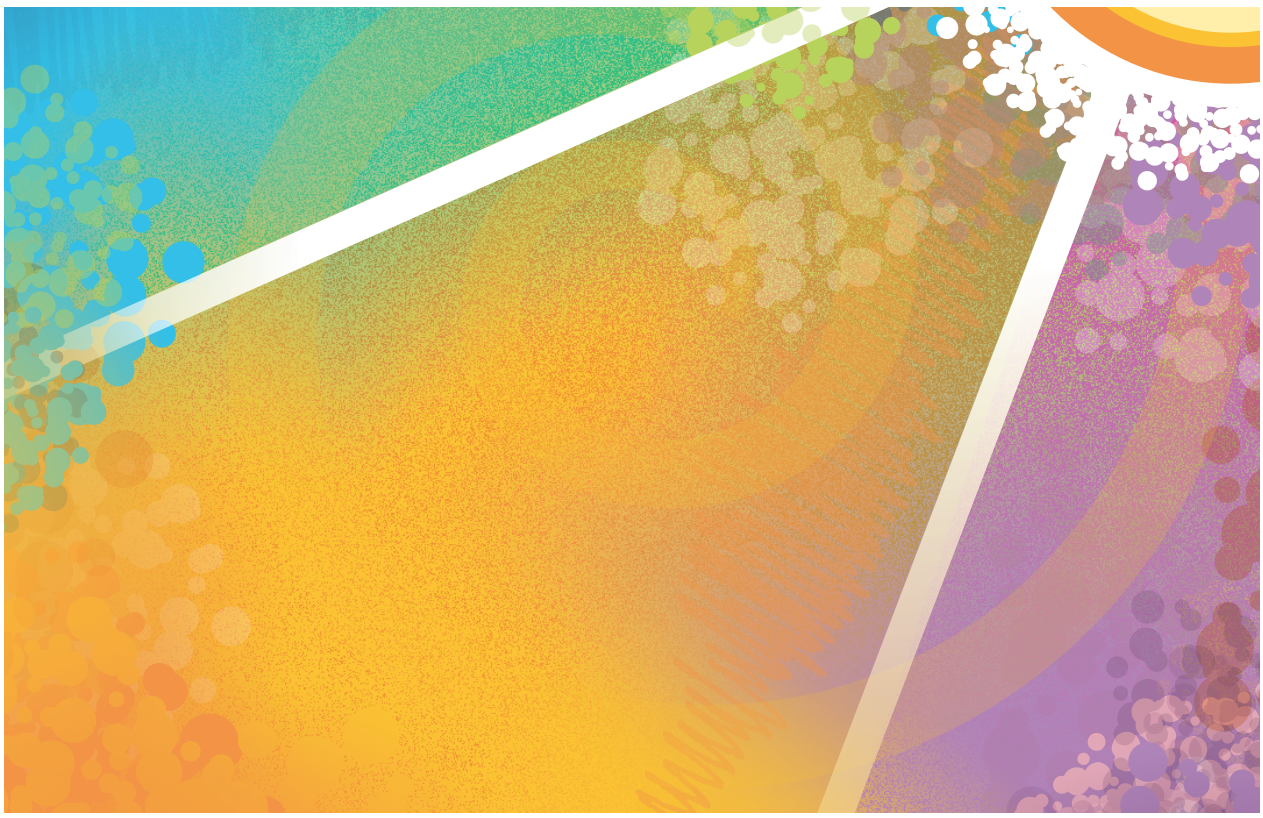
Each learner is assigned a partner seated to the right or left of them in the circle. The teacher allows the learners some time to share their recordings with their partner and flags that in a few moments they will pass around the speaking object.

When they hold the speaking object, each child will introduce their partner and share one item from their sheet with the rest of the class. For example, *This is Abdul. One of Abdul's favourite hobbies is playing Minecraft*. The learner then passes the speaking object to their partner. This is repeated around the circle until everyone has responded.

Whole-class discussion through use of open forum questions.

<u>Open Forum:</u>

- *Why is it important to have hobbies and interests?*
- *Did you notice any similar ones?*
- *Any different ones?*
- *Are there any new hobbies and interests which you would like to try in the future?*



Development
[Continued]

Prototyping using LEGO elements

Explain to learners that they will be given some LEGO elements (bags marked '1') and they are to try to represent their passion, hobby, or interest using these LEGO pieces.

Divide learners into small groups (4) and provide each group with the bags marked '1'.

After a few minutes, ask learners to explain how their prototype represents their passion, hobby or interest. This could be done within their small groups, or more broadly.

IMPORTANT: once this activity is completed, instruct each group to gather their LEGO elements and place them in a zip-lock bag or storage box; these will be used in Lesson 4.

Closure
[5 min]

Resource(s):

- Relaxing Music
- Visualisation text

Closing Activity: Visualisation

The teacher invites the learners to become comfortable in their chair and reads the visualisation out loud. Relaxing music may also be played in the background during this closing activity.

Guidance for Teachers

Circle-Time

If you have not used the methodology of Circle-Time (CT) before in your classroom, the following framework and guidelines may be helpful. CT follows a clear structure: 1. Opening Activity; 2. Round; 3. Open Forum; 4. Closing Activity. Prior to engaging in CT, it is key to remind or create ground rules with the learners e.g. Be a good listener… Be respectful to peer responses…

It is also important for the teacher to remind the learners of the Pass rule when using the speaking object. If a learner does not wish to respond when they are holding the speaking object, they say Pass and the speaking object moves on to the next child.

Extension Activities

Consider these ideas for extension activities:

- Direct learners to discuss passions, hobbies and interests with family and friends outside of school.
- Provide each learner with a square of paper which each will decorate with their hobby, passion or interest. These can then be laid out as a collage and displayed in the classroom.

Printable worksheets for this lesson are available here: https://fll.learnit.ie/masterpiece

Lesson 2: Developing my Passions, Hobbies and Interests

Purpose:

Learners will share and discuss their passions, hobbies and interests while recognising and appreciating that each person may have different interests.

Core Values:

Discovery | Teamwork | Fun | Inclusion | Impact

Learning Outcomes:

Learners will be enabled to

1. Recognise and appreciate that each person is a unique individual
2. Explore their own uniqueness through their hobbies and interests
3. Consider how they develop their hobbies and interests

Progress:

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12

Resources

Per team:

- Paper/copybook and colouring pencils and/or markers

Digital resources:

- Digital Voting/Response Tool (e.g. **Mentimeter**, **Sli.do**)

Curriculum Content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
SPHE	Myself	Self-identity; Relating to others	Self-Awareness; Communicating
Drama	Drama to explore feelings, knowledge and ideas, leading to understanding	Exploring and making drama; cooperating and communicating in making drama	The Fictional Lens; Place; Belief
Visual Art	Drawing	Making Drawings; Looking and responding	An awareness of line; An awareness of form; An awareness of space
Maths	Data	Representing and Interpreting data	Applying and problem solving; Integrating and connecting; Reasoning; Communicating and expressing
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using

Introduction
[10 min]

Resource(s):

- Paper/copybook and colouring pencils and/or markers

Introduction: Our Passions, Hobbies and Interests

The teacher will generate a discussion based on the work of the previous lesson and ask some guiding questions:

- *Do we all have the same passions, hobbies and interests?*
- *Why do people have different hobbies or interests?*
- *What would it be like if we all had the same hobbies or interests?*
- *How do we treat people who have different hobbies or interests to us?*

The teacher will discuss how there is such a variety of hobbies and interests and everyone can have different or similar in various combinations - and that this makes them a masterpiece!

Learners could be asked to revisit the activity sheet they completed in the previous lesson to remind them of their passions, hobbies and interests.

Unique handprints

The Learners will sketch their handprint which is unique to them, and fill in words or pictures into the handprint that represent their hobbies and interests.

Development
[40 min]

Our Passions, Hobbies and Interests

The teacher will generate a discussion on what our hobbies and interests look like in action and what we do to develop and cultivate them

The teacher will give some examples.

- *I like reading so I go to the library each month and pick out 3 books to read*
- *I play soccer and I go to practice every Saturday*
- *I like playing Minecraft and I practice playing after my homework*

Learners Paired Activity: Think/Pair/Share: The teacher will ask learners to work in pairs to think and discuss their hobby or interest in action - and the teacher will ask some learners to share with the class. The learners can use their handprint to choose one or two hobbies or interests in action.

Learners Group Activity: The teacher will ask the learners to work in their teams for the follow-up activity which will ask the learners to create a freeze-frame of their hobby or interest in action. Learners create an image using their bodies – with no movement. A good way to explain a freeze-frame is that it is like pressing the pause button on a remote control, taking a photo or making a statue. The learners can choose one hobby or interest from their handprint and create a freeze-frame for it with their group members. Each group member can do the same.

Whole class presentation: Each group will present their freeze-frames

The teacher will ask some guiding questions after the activity.

- *What hobbies looked interesting to you?*
- *Did you learn anything new about your classmates?*
- *Can you develop new hobbies and interests as you grow older?*

Closure
[10 min]

Resource(s):

- Relaxing Music
- Visualisation text

Visualising the Passions, Hobbies and Interests in our Class

Create an overall summary of the passions, hobbies and interests in the class. This could take the form of a word-cloud using a digital voting tool (e.g. **Mentimeter**), a bar chart, a tally chart, etc. The idea is to create a visual representation of the variety and similarities of interests in the class.

Teacher to invite learners to examine the responses gathered:

- *Are there any patterns or similarities in the passions, hobbies and interests?*
- *What differences can you see?*
- *Could these be grouped in any way? What types of categories or labels could be used?*
- *Are there any categories or labels missing that you would expect?*

Following this discussion, remind the class that by the end of the MASTERPIECE challenge they will work in teams to share their passions, hobbies and interests in creative and captivating ways.

We have thought about and spoken about our passions, hobbies and interests; the next lessons will help us learn how to share them in creative and captivating ways.

Extension Activities

Consider these ideas for extension activities:

- Scratch project to share their hobby/caitheamh aimsire
- Explanatory Writing relating to 'my passion, hobby or interest'

Lesson 3: Performing and Presenting in the Past - The Colosseum

Purpose:

Learners will explore how the Romans used technology to enhance performances and presentations in the past, captivating audiences in the Colosseum.

Core Values:

Teamwork | Fun | Discovery

Learning Outcomes:

Learners will be enabled to

1. Identify an example of a historical place purposefully designed to put on a show for people in the past.
2. Identify innovative technological and architectural features found in the Colosseum.
3. Understand how these technological and architectural features helped facilitate the gladiatorial contests and public spectacles performed in the Colosseum.
4. Explain why the Colosseum is considered one of the greatest feats of Roman architecture ever built.

Progress:

1 2 3 4 5 6 7 8 9 10 11 12

Resources

Per team:

- Flipchart paper/Whiteboards & markers
- Digital device (for adding to digital portfolio)
- Image of the outside of the Colosseum and an aerial overview of the Colosseum
- Worksheet: Ancient Roman architects: considerations and possible solutions
- Worksheet: Rank the different technological and architectural features of the Colosseum from most to least significant

Digital resources:

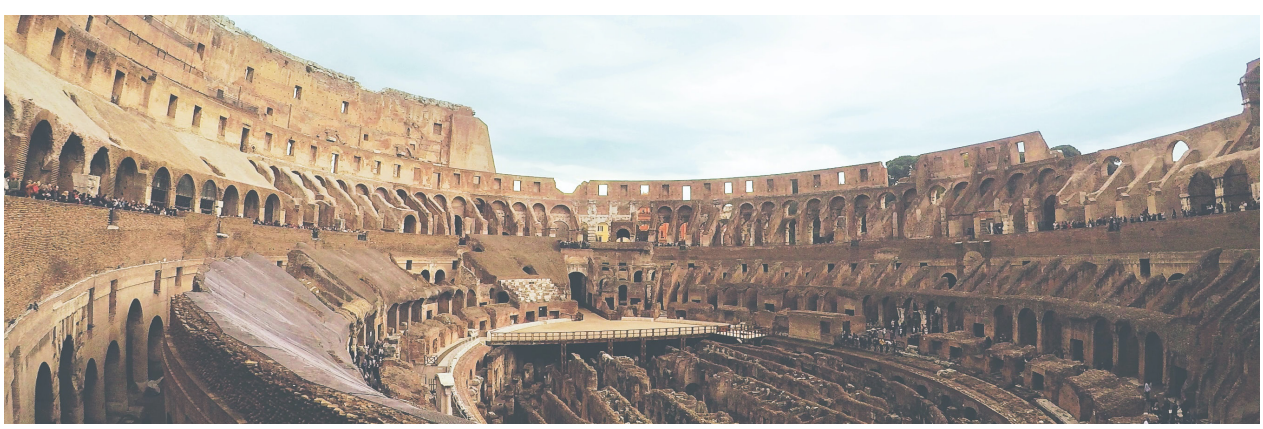
- Google Maps Project: **The Design and Construction of the Colosseum**

Additional useful links:

- Video: **How water might have been brought into the Colosseum**
- Video: **How the Colosseum arena floor might have been flooded**
- Video: **How the Velarium worked**
- Video: **What the Colosseum looked like in Roman times**
- Video: **The Colosseum reconstructed**
- Weblink: **Interactive 3D model of the Colosseum**
- Weblink: **The architecture and technology of the Colosseum**
- Weblink: **Underneath the Colosseum arena**
- Weblink: **How Ancient Romans lifted animals into the Colosseum**

Curriculum Content

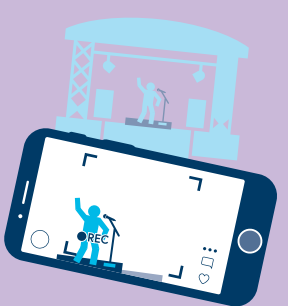
Subject	Strands	Strand units/ elements	Skills and concepts
History	Early peoples and ancient societies	Romans	Time and chronology; Using evidence; Change and continuity; Synthesis and communication; Cause and effect
Literacy	Reading and Writing	Communicating	Communicating; Understanding; Exploring and using



Introduction
[10 min]

Resource(s):

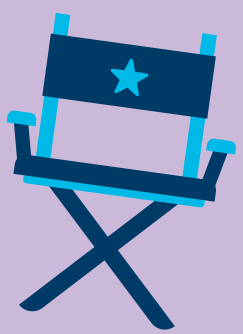
- Images for discussion



Introduction: Generating Ideas and Enquiry Questions on the Colosseum

The teacher provides the learners with three images of the Colosseum - one showing the Colosseum from the outside and the other images providing an aerial overview of the Colosseum.

Introduction [Continued]



In groups, the learners are asked to study these images carefully and to generate as many questions as they can think of. The teacher will not provide the learners with any information about the building prior to the learners completing this task.

The three images could be:

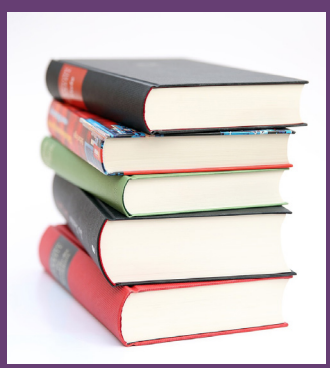
- Shared digitally with each group
- Printed per group
- Shared on the teacher's IWB

The learners are asked to consider generating a range of who, what, where, when, how and why questions. The teacher may model some questions with the learners prior to them working within their groups e.g.:

- *Who built this place?*
- *What was it built for?*
- *Where is this place?*
- *When was this place built?*
- *How was this place built?*
- *Why was this place built?*

Once the learners have completed generating their questions, these questions are shared with the rest of the class. The teacher will facilitate discussion and provide answers to some of the generated questions at this point of the lesson. The teacher will leave answering the question of how the Colosseum was built until the development part of the lesson.

Information on the Colosseum for Teachers:



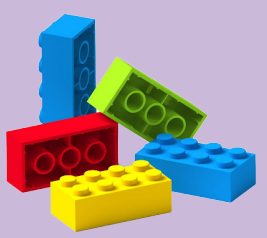
The Colosseum is the largest standing amphitheatre ever built and found in the centre of the city of Rome, Italy. Construction began under the emperor Vespasian in 72 AD and was completed in 80 AD under his successor and heir, Titus. Further modifications were made to the Colosseum during the reign of Domitian. The three emperors who were patrons of the work are known as the Flavian dynasty, and the Colosseum was named the Flavian Amphitheatre.

The Colosseum was used for gladiatorial contests and public spectacles including animal hunts, executions, re-enactments of famous battles, dramas based on Roman mythology, and for a brief time mock sea battles. The Colosseum is an example of fine engineering and demonstrates the technological advancement of the Romans. The Colosseum draws its name from the Colossus, a colossal statue of Emperor Nero that is situated near to the amphitheatre.

Development
[30 min]

Resource(s):

- Worksheet: Ancient Roman architects: considerations and possible solutions
- **Google Maps Project Link**
- Digital Device
- Optional: video/ web links



The teacher informs learners that the Colosseum is one of the greatest feats of Roman architecture ever built and that it is the largest Roman amphitheatre in the world.

In order to build the Colosseum the engineers at the time had to consider a number of things such as how to seat and cater for over 50,000 spectators, how to get the performers to and from the arena, and what technology to use to enhance the show and the experience for the spectators.

Scenario Activity: Learners as Architects in Ancient Rome

The teacher informs the learners that they are going to take on the role of architects and have been employed by the Emperor in the design and construction of the Colosseum. The learners need to work in groups to think of solutions to the considerations listed in the worksheet at the end of this lesson: **Worksheet: Ancient Roman architects consideration and possible solutions**

The teacher should allow the learners sufficient time to discuss each of these considerations and to formulate possible solutions.

Once the groups have finished this task the learners can discover how Roman architects actually did solve these considerations using this **Google Maps Project Link** with 8 'stops' containing information and images. This can be accessed by individuals/pairs/groups on digital devices, allowing for learners to actively progress and explore at their own pace.

The learners could also use the following links and videos to get a better understanding of innovations and technology used by the ancient Romans in the design and construction of the Colosseum.

[For links see *'Additional useful links'* on the chapter title page]

As learners work through the **Google Maps Project Link** and the additional links provided they can be instructed to record the actual solutions the Ancient Roman architects implemented in their design and construction of the Colosseum on the **Worksheet: Ancient Roman architects: considerations and possible solutions**. Please note: This worksheet could also be presented on an Interactive Whiteboard to facilitate the sharing of findings with the class.

Closure *(Document/ Share/Tidy up)*
[10 min]

Resource(s):

- Digital Portfolio
- Digital Device
- Worksheet: Rank the different technological and architectural features of the Colosseum from most to least significant

The learners are asked to consider and discuss the question of:

How effective was the architecture and technology used in the construction of the Colosseum to stage gladiatorial contests and public spectacles to approximately 50,000 spectators?

In groups, the learners complete a simple ranking exercise debating and ranking the different technological and architectural features of the Colosseum from most to least significant using Worksheet: Rank the different technological and architectural features of the Colosseum from most to least significant.

The teacher finishes the lesson by discussing with the groups why they ranked the technological and architectural features in the order that they did.

Guiding Questions:

- *What feature of the Colosseum impressed you the most?*
- *What do you think people in Ancient Rome thought of the Colosseum when it was first built?*
- *What features of the Colosseum are still in use today/are no longer in use? If these features are no longer in use today why is this so?*
- *If you were able to add one additional feature to the Colosseum what would it be?*

Extension Activities

Consider these ideas for extension activities:

- Investigate and explore the Circus Maximus in Rome and compare with what they have learned about the Colosseum.
- Investigate and explore modern arenas and performance spaces such as Bord Gáis Energy Theatre, Croke Park, Thomond Park and compare with the Colosseum (e.g. dressing rooms and tunnels under the stands, orchestra band performance space below the stage, etc.). Learners could identify how these buildings are designed and any relevant technology used to enhance performances and presentations to captivate audiences.

Printable worksheets for this lesson are available here: **https://fll.learnit.ie/masterpiece**

Lesson 4: Experts Behind the Scenes

Purpose:

Learners will explore different jobs in the arts which allow for sharing in creative and captivating ways.

Core Values:

Teamwork | Fun | Discovery

Learning Outcomes:

Learners will be enabled to

1. Learners will investigate the work of experts behind the scenes whose role is to enhance performances and presentations (sound engineer, stage manager, museum curator, visual effects director).
2. Learners will identify aspects of these experts' jobs and the associated equipment and technology they use that may help them in sharing in creative and captivating ways.

Learners will build:

- Basic Stage (Book 1 & Bag 1)
- Mini Figures (Book 1 & Bag 1)

Progress:

1 2 3 4 5 6 7 8 9 10 11 12

Resources

Per team:

- MASTERPIECE Explore Set
- MASTERPIECE Mat
- Digital Devices (for groups watching videos of the experts)
- Digital Device (for adding to Digital Portfolio)
- Note Taking Template for recording notes on their expert to share with their group.

Digital resources:

- MASTERPIECE Explore Story
- Sound Engineer **Sound Engineer VIDEO**
- Stage Manager **Stage Manager VIDEO**
- Museum Curator **Museum Curator VIDEO**
- Visual Effects Director **Visual Effects Director VIDEO**

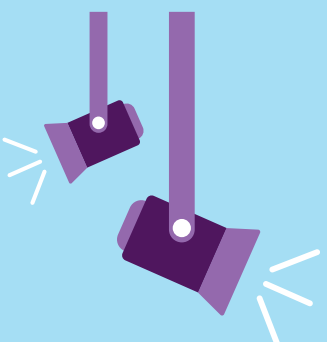
Curriculum Content

Subject	Strands	Strand units/ elements	Skills and concepts
Geography	Human environments	People at work	Geographical Investigation Skills: Questioning, Observing, Analysing, Recording and Communicating
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using

Introduction
[20 min]

Resource(s):

- LEGO MASTERPIECE: Basic Stage (Book 1 & Bag 1)



Introduction: Experts Behind the Scenes

Teacher introduces the lesson by referring to the previous lesson:

- In our last lesson we learned about the Colosseum and how people used different technology and design to enhance and improve the public spectacles for all in the audience.
- What kinds of jobs can you think that people had behind the scenes in the Colosseum to improve the performances? (e.g. people that controlled the animals, people that managed the stage or arena and where the performers entered/exited etc.)
- What kind of technology and equipment were these people using?

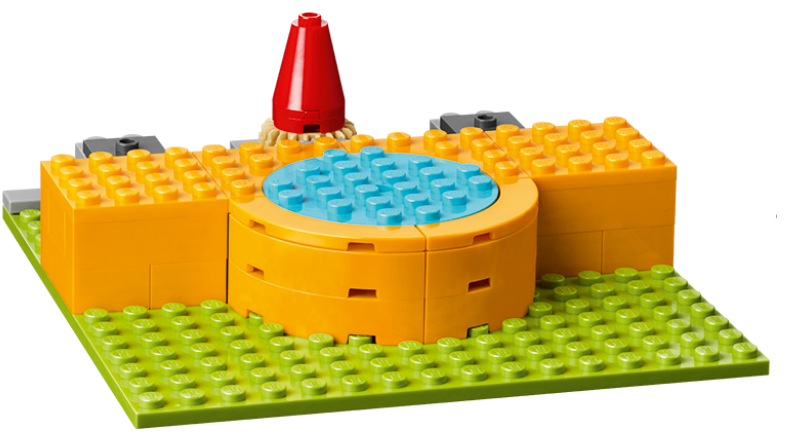
Teacher asks the class to consider if we have a type of place that is similar to the Colosseum for sharing in our town or area? Following a brief discussion and listing of places where people share their passions in our local area (e.g. local community hall, performance stage in school, sports grounds), the teacher can explain to the class that one way people can share their passions, hobbies and interests is on a stage.

- Are there any places or buildings in our own locality where people perform or present their passions?

Explain to the class that we are now going to build a stage made of LEGO as an example of one type of space for sharing.

Task: Build the Basic Stage

Learners follow the instructions in Book 1 in the Explore Set to build the basic stage .



Introduction [Continued]

Guiding Questions:

- *What do those large gears do?*
- *How does the stage turn?*
- *How would you describe the way the stage turns?*

The basic stage uses a series of three gears to allow the blue section of the stage to turn when the red cone is turned.

Once each group has completed building their LEGO stage, ask them to consider what types of jobs people might have to do behind the scenes for a stage performance?

Development [30 min]

Resource(s):

- Image 1 for Discussion
- LEGO MASTERPIECE: Mini Figures (Book 1 & Bag 1) 5 minutes
- Digital Device per group
- Weblinks for each expert
- Experts Behind the Scenes printable
- Note Taking Template

Development: Investigating the Jobs of Experts Behind the Scenes

The class will read the Explore Story, introducing Izzy who has a passion for skateboarding and who is looking to share her interest in skateboarding in a captivating way. Izzy meets four experts to learn from them and their roles and the equipment and technology they use to enhance performances and presentations.

Development [Continued]

Task: Assemble the Minifigures

The teacher divides the learners into groups of four. Each group is given the LEGO pack comprising the pieces for the minifigures of the four experts and their equipment. The groups assemble the LEGO minifigures.

Task: Researching the Experts

Each individual group member will be assigned an 'expert' minifigure to investigate and role play:

1. Sound Engineer
2. Stage Manager
3. Museum Curator
4. Visual Effects Director

The Experts Behind the Scenes printable can be used to help learners distinguish their expert from the other minifigures.

Learners will then group together to watch the short video clip and make notes using the Note Taking Template on the work of their expert (e.g. all sound engineers will group together to learn about the job of a sound engineer). They will use this information when they return to their group of four to share the role of their expert with their group members.

Sources of information for each expert can be found here. Videos can be viewed on digital devices (tablets/ laptops). Teacher as a facilitator circulates among the class and aids groups and learners as appropriate using the key questions below.

Investigating Jobs:

- Sound Engineer **Sound Engineer VIDEO**
- Stage Manager **Stage Manager VIDEO**
- Museum Curator **Museum Curator VIDEO**
- Visual Effects Director **Visual Effects Director VIDEO**

Development [Continued]

Guiding questions:

- *What expert are you researching?*
- *What does their job entail?*
- *What technology do they use to enhance performances and presentations?*
- *How might what you have learned help you to share your own passions/hobbies/interests in creative and captivating ways?*

For the sharing activity each minifigure is placed on the LEGO mat at their designated location (i.e. sound engineer on the music icon; stage manager on the drama icon; museum curator on the building icon; and visual effects director on the film strip icon). Each group member will take turns to place the LEGO minifigure of their expert on the stage and explain what their job is like and the equipment and technology they use to enhance performances and presentations (e.g. sound engineer). This is the jigsaw approach in that each group member brings their own newly acquired knowledge back to their group to share with other members (hence putting the pieces of the jigsaw together).

Following sharing within each group the teacher might reflect upon each of the experts and their role in sharing passions, hobbies and interests in captivating and creative ways.

Development [Continued]

Guiding questions:

- *What does each expert's job entail?*
- *What technology did each expert use to enhance performances and presentations?*
- *How might what you have learned help you to share your own passions/hobbies/interests in creative and captivating ways?*

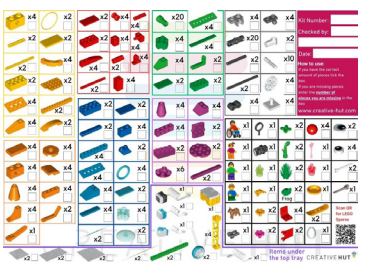
Closure *(Document/ Share/Tidy up)* **[10 min]**

Return to Section A p. 33 to read more about the process of using a Digital Portfolio to document the engineering design process.

1. **Document:**
   Each team documents and reflects upon the stage they built - adding photos, videos, notes to their digital portfolios. Consider how they built it, how it works, how they might change or adapt or improve it.

2. **Share:**
   a. What they did in the lesson

3. **Teams Tidy Up:**
   a. The stage and minifigures should stay assembled and be returned to a designated storage space.
   b. All other parts should be disassembled and stored safely, preferably in a labelled box per team.



Extension Activities

Consider these ideas for extension activities:

- Exploring a local community/performance space (such as drama society space, local venue/stage, local community hall, school hall/stage, gallery, museum) and identifying different technology (e.g. sound systems, lights, stage design, props, etc.)
- Interviewing people (via video, audio recording or writing answers) who work in a local performance space (including community hall, museum, gallery, etc.) and investigating their jobs, how they got to work there, how these aspects may inspire children in sharing their own 'masterpieces' in captivating ways. These interviews could even be shared on a class podcast and shared with the entire class and other classes.

Printable worksheets for this lesson are available here: **https://fll.learnit.ie/masterpiece**

Lesson 5: Sound all Around

Purpose:

Learners will explore how sound makes an impact on an audience.

Sound Engineer
Noah

Core Values:

Teamwork | Fun | Discovery

Learning Outcomes:

Learners will be enabled to

1. Listen to and describe music in various styles and genres.
2. Understand how musical elements of pulse, dynamics, and tempo can be used to make an impact on an audience.
3. Recognise and identify specific sounds (e.g. the sound of a football hitting the net, the sounds of cooking, etc.).
4. Listen to learners' own compositions and the compositions of others (recordings or live performances) and evaluate in terms of personal response and expressive qualities.
5. Explore ways of making sounds using manufactured and home-made instruments/items.
6. Add the music concert pieces to the basic stage.

Learners will build:

- Music Concert (Book 2 & Bag 2)

Progress:

1 2 3 4 5 6 7 8 9 10 11 12

Resources

Per team:

- MASTERPIECE Explore Set
- MASTERPIECE Prototyping pieces
- MASTERPIECE Mat
- Digital Device

Digital resources:

- **Sunrise** by Edvard Grieg
- **Storm Movement** from Symphony No. 6 by Ludwig van Beethoven.
- Music composition tools: **Chrome Music Lab**
- Online Recording/Editing Tools: **Vocaroo** (very easy); **Sodaphonic** (easy); **Audacity** (more advanced)

Curriculum Content

Subject	Strands	Strand units/ elements	Skills and concepts
Music	Listening and Responding	Listening and responding to music	A sense of pulse; A sense of dynamics; A sense of tempo
Science	Energy and Forces	Sound	Observing
SPHE	Myself	Self-identity; Relating to others	Self-Awareness; Communicating
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using

Introduction
[10 min]

Resource(s):

- **What's the sound activity**

Introduction to Sounds

Remind learners about how in the last lesson we learnt a little bit about the work of four experts who work behind the scenes. Today's lesson is focused on one of these experts. Can they guess which based upon our first activity?

Learners listen to the sounds and try to identify the passion/hobby/interest.

What's the sound activity

Guiding questions:

- *Describe the sound? (e.g. high/low; repetitive; snap; swish; swoosh; creek; bang; pounding; pulsing; thump; throb)*
- *What do you think the sound is? Why?*

In pairs, learners discuss what their own passion/hobby/interest sounds like.

Teacher to explain that today's lesson is centred around the work of the Sound Engineer.

Development
[40 min]

Resource(s):

- MASTERPIECE Explore Set
- MASTERPIECE Mat

Add music concert pieces to the main stage [10 minutes]

Ask the class if they can remember what they built with LEGO in our last lesson (a stage). Explain that we are going to build some new parts of the stage so that it has the technology needed by the Sound Engineer (e.g. speakers).

Development [Continued]

Resource(s):

- The Magic Of Making Sound
- How the Sounds in 'Transformers' Movies are made
- How Horse Sounds are Made

Working in groups of four, learners follow the instructions in Book 2 to add the music concert pieces to the basic stage built in Lesson 4. Place the concert stage on the mat near the music notes.

Guiding questions:

- *What kind of sounds could you play through the speakers to represent your passion/hobby/interest?*
- *What song/songs could be used to represent your passion/hobby/interest?*
- *How could you captivate the audience using sound?*

Sound to accompany my passion/ hobby/interest [30 minutes]

Here learners will compose sounds/music to accompany their passion/hobby/interest. The sound/music should be used to captivate and entertain the audience. Three options are presented below. Learners can engage in either option and focus on sounds which can be used to captivate an audience when presenting their 'masterpiece'.

Option A: Foley artists

The below videos provide examples of how foley artists work with sound engineers to produce everyday sound effects that are added to movies to enhance the audio experience for the audience. These sound effects can be anything from breaking glass, squeaky doors or footsteps. The learners watch Video A or B below. Each video is about 6 minutes long.

Video A: **The Magic Of Making Sound**

Video B: **How the Sounds in 'Transformers' are made**

Learners then consider what sound effects would enhance their presentation of their 'masterpiece'. Take this example of a foley artist making horse sounds for a movie (Video C). Could this be used to illustrate a learner's interest in horse riding/show jumping?

Video C: **How Horse Sounds are Made**

(Please note only the first 1 minutes 10 seconds is required for this)

Development [Continued]

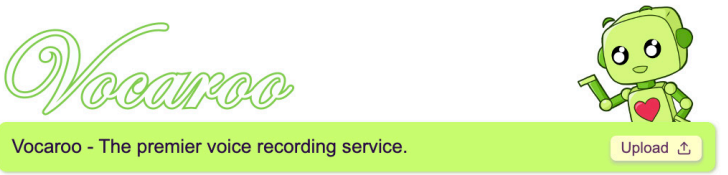
Resource(s):

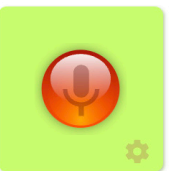
- Online Recording/ Editing Tools: **Vocaroo** (very easy); **Sodaphonic** (easy); **Audacity** (more advanced)

Guiding questions:

- *How does the foley artist create different sounds?*
- *What everyday objects do the foley artists use?*
- *What must a foley artist consider before creating the sound effects?*
- *Think about your passion/hobby/interest. What sound effects could you create to enhance your presentation of your 'masterpiece'?*

Learners then work in pairs to create sound effects to accompany their 'masterpiece' presentation. Please note that the learners can use everyday objects, body and voice percussion. The following software can be used to record and share the sound effects: **Vocaroo** (very easy to use), **Sodaphonic** (easy tvo use), or the built-in sound recorder app present on most digital devices.





Press the button to start recording!

Development [Continued]

Resource(s):

- **Sunrise** by Edvard Grieg
- **Storm Movement** from Symphony No. 6 by Ludwig van Beethoven
- **Chrome Music Lab**

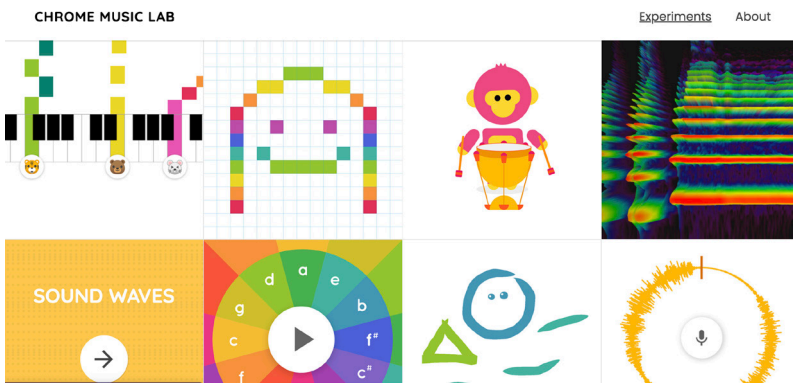
Option B: Music/Composition

Introduce the learners to the two excerpts they will hear: "Sunrise" by Edvard Grieg and the "Storm" movement from Symphony No. 6 by Ludwig van Beethoven. Ask the learners to pay attention to different instruments being used and to how the musicians are playing them. Learners should then consider how the composition captivates the audience and creates a sunset/storm. Play an excerpt from each piece.

Guiding questions:

- *What are the two pieces about?*
- *How did the composers create a sunset and a storm? (Note: the same instruments were used in both excerpts).*
- *How did the pulse in both pieces compare? (active pulse or less active pulse, fast-moving notes as opposed to slow-moving notes).*
- *Compare the tempo (how fast or slow the beat of the music is).*
- *Compare the dynamics (how loud or soft the musicians are playing their instruments).*
- *How is music used to make an impact*
- *for an audience?*

Learners then work in pairs to create a musical composition to accompany their 'masterpiece' presentation. This easy-to-use software can help learners to be creative in adding a sound to their composition. The compositions can also be recorded and shared with the class: **Chrome Music Lab**



Development [Continued]

Resource(s):

- Online Recording/ Editing Tools: **Vocaroo** (very easy); **Sodaphonic** (easy); **Audacity** (more advanced)

Option C: Record group singing/soundtrack

Guiding questions:

- *What kind of songs does your team/class enjoy singing?*
- *What makes them so enjoyable? Think about the pulse (fast-moving notes or slow-moving notes), tempo (the beat of the music) and dynamics (how loud or soft different parts of the song might need to be).*
- *How could you add impact to your song?*

Work with your team, or as a whole class, to sing a song that you think others would enjoy. Consider adding in some simple sound effects you think would create impact (e.g. clapping). You can record your song using simple in-built apps on your digital devices or by using some online recording tools such as **Sodaphonic** (mentioned above) or **Audacity** (for more advanced use). You might like to use the recording later on in your project.

Closure *(Document/ Share/Tidy up)*
[10 min]

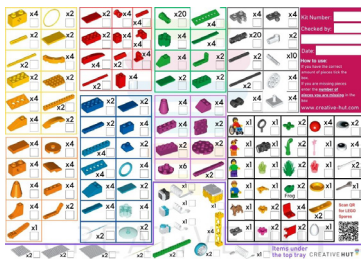
Resource(s):

- Digital Portfolio
- Digital Device

1. **Document:**
   Each team documents and reflects upon the MASTERPIECE stage they built - adding photos, videos, notes to their digital portfolios. Consider how they built it, how it works, how they might change or adapt or improve it.

2. **Share:**
   a. What they did in the lesson
   b. Explain how their sound/music/composition enhances the learners' presentation of their 'masterpiece'.

3. **Teams Tidy Up:**
   a. Leave the MASTERPIECE stage assembled.
   b. All other parts should be disassembled and stored safely, preferably in a labelled box per team.



Extension Activities

Consider these ideas for extension activities:

- Share photos of music venues in your community that the learners may have seen before (e.g. Taylor Swift Croke Park Dublin, Cork Concert Hall, Ed Sheeran Thomond Park Limerick). Discuss what other technology was added to the concert stage. *Examples of the technology include the lights, speakers, screens and other music equipment.*
- Learners explore how sound travels.

fll.learnit.ie/masterpiece

Lesson 6: Movement on Stage

Purpose:

Learners will explore how movement can be used in performance spaces like stages to make an impact on an audience.

Stage Manager
Sam

Core Values:

Teamwork | Innovation | Fun | Discovery

Learning Outcomes:

Learners will be enabled to

1. Identify different kinds of stages and how they are used to showcase events
2. Explore theatre-style stages and how they are used as a space for performance
3. Design, build and code a LEGO robot to explore rotations using motor coding blocks
4. Develop a deeper understanding of code by testing and adapting prototypes

Learners will build:

LEGO SPIKE Essential

- Lesson 1 - Merry-Go-Round

LEGO WeDo 2.0

- Cooling Fan

Progress:

1 2 3 4 5 6 7 8 9 10 11 12

Resources

Per team:

- LEGO Education Set (SPIKE Essential or WeDo 2.0)
- Digital Device
- Printable: Protractor Overlay for Stage + BluTack
- MASTERPIECE mat (optional)

Digital resources:

- **Virtual Tour of Famous World Stages**
- **Famous Sporting Stadiums**
- **What is Theatre? video**

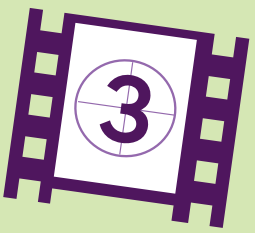
Curriculum Content

Subject	Strands	Strand units/ elements	Skills and concepts
Maths	Number; Shape and Space	Fractions; Decimals; 2D / 3D shapes; Lines and angles	Applying and problem-solving; Communicating and expressing; Integrating and connecting; Reasoning; Implementing
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using
SPHE	Myself and others	My friends and other people , Relating to others	Communication; Cooperation; Decision-making

Introduction
[10 min]

Resource(s):

- Virtual Tour of Famous World Stages
- Famous Sporting Stadiums
- What is Theatre? video



Introduction

In this lesson, learners will build on what they learned in lesson 3 the Colosseum in Rome by exploring different kinds of stages around the world that are used to showcase events (e.g. theatre; concerts; musicals; sports etc.). Below are some resources that you can use.

1. Places to perform: Virtual Tours of Famous World Stages/Stadiums.

- Visit this interactive **weblink** to take 360° tours of these venues.
- Visit this interactive **weblink** to view world famous sporting arenas.

Guiding questions:

- *Have you ever been to a performance (indoor or outdoor; cultural, theatrical, sporting, etc.)? Share your experience with the class.*
- *What do we mean when we talk about the spaces and places where performances can take place (e.g. stages: amphitheatre; concert arena; stadium; theatre etc.)*
- *Take a look at some famous world stages. What do these stages have in common and how might they be different from each other? (shape; position; space; audience; size; multi-use)*

2. Expert: Stage Manager

Remind the class about our experts behind the scenes. Today's lesson focuses upon the work of the Stage Manager. Allow learners a moment to think-pair-share their understandings of the work of a Stage Manager. Most places to perform will have someone working as a stage manager, or doing a similar job. The main type of space a Stage Manager works in is a Theatre.

Introduction
[Continued]

3. What is a theatre?

Watch this **2 min video** from PBS Learning Media to explore a theatre and learn more about it.

Guiding questions:

- *From the virtual tour, we can see that many stages are like different kinds of theatres - indoor and outdoor.*
- *Watch this short video and discuss some of the things that you think are important about theatres (e.g. the stage; the sets; the performers; the different kinds of jobs etc.).*
- *When you are planning to share your hobbies and passions, what will you need to keep in mind?*

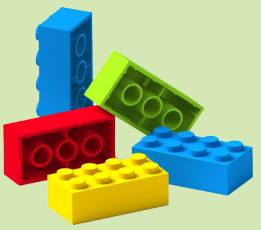
4. Considering our MASTERPIECE stage

Ask each group to take a look at the MASTERPIECE stage they have already made. Thinking about the work of a Stage Manager:

- Are there any parts of it that can move?
- Can any parts be repositioned?
- What about sound and lighting cues?

Teacher explains to the learners that in this lesson they are going to build and code a moveable stage using LEGO elements. They are going to apply their knowledge of motors to modify their stage so that it can rotate.

Development
(Build)
[40 min]



Classroom Organisation:

- Divide learners into groups of four or fewer while using LEGO materials.

Resource(s):

- MASTERPIECE stage (Already built)
- LEGO Education Set (SPIKE Essential or WeDo 2.0)
- Digital Device

Builds

Purpose of the Builds:

- To introduce learners to the LEGO® Education SPIKE Essential or WeDo 2.0 software and block-based coding.
- To introduce the 'motor' block and explore what happens when the power of the motor is changed.
- Learners modify their stage to make it rotate.

Teacher Tip

Dependent on the class it may be beneficial to explicitly revise or pre-teach the following mathematical concepts:

- Clockwise and anti-clockwise
- Fractions of a circle: half:½: 0.5, and quarter:¼:0.25
- 5th & 6th: Degrees : 360° 180° 90°

Build 1: [20min]

1. In teams, learners engage with the LEGO Education classroom project dependent on which kit they have (follow colour coded table below)
2. Complete challenge activities
3. Share observations and solutions to their challenge activities
4. Add photos and videos of their completed build to their digital portfolio
5. Deconstruct the Merry-go-Round or Cooling Fan.

Development [Continued]

Resource(s):

- **Merry-go-Round**

SPIKE Essential
Lesson 1 - Merry-go-Round

Learners follow detailed instructions to build and code the Merry-go-Round.

Once the basic build has been completed, set the following tasks which challenge them to explore how the coding works and how it can be changed.

Make the merry-go-round:

a. Turn clockwise

b. Turn anti-clockwise

c. Move quicker/slower

d. Move a half turn (180°)

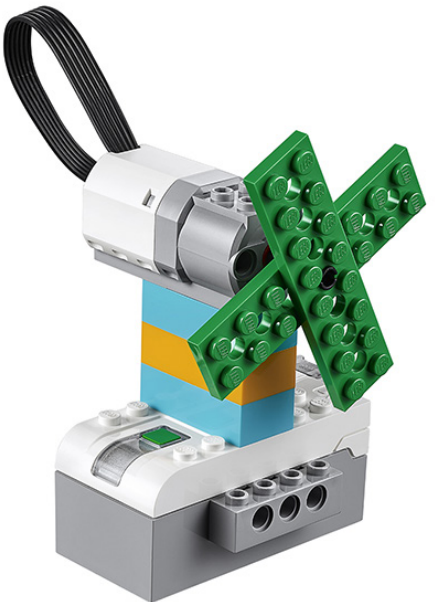
e. Move a quarter turn (90°)

f. Act more like a 'real' Merry-go-Round in a fun-fair (e.g. start slow, speed up, change direction, etc.)

Development [Continued]

Resource(s):

- WeDo Cooling Fan



WeDo 2.0 Cooling Fan

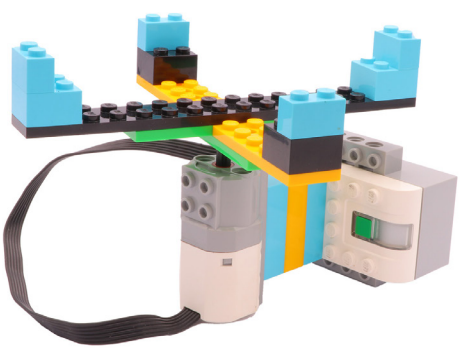
Learners follow detailed instructions to build and code the Cooling Fan.

Once the basic build has been completed, modify the build to turn the Cooling Fan into a basic Merry-go-Round (i.e. lie the robot flat and add chairs to the blades).

Next, set the following tasks which challenge them to explore how the coding works and how it can be changed.

Make the merry-go-round:

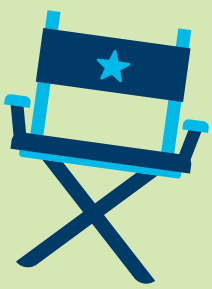
a. Turn clockwise
b. Turn anti-clockwise
c. Move quicker/slower
d. Move a half turn (180°)
e. Move a quarter turn (90°)
f. Act more like a 'real' Merry-go-Round in a fun-fair (e.g. start slow, speed up, change direction, etc.)



Development [Continued]

Resource(s):

- MASTERPIECE set (Bag 3 & Book 2)



Now that learners have developed some of the coding skills and understandings required to motorise their stage, the next build involves motorising the stage built in previous lessons.

Build a Motorised Stage: [15 min]

1. Build the motor and hub base following instructions in Book 2.
2. Connect the motor and hub to the basic stage model.
3. Open the SPIKE/WeDo app. Try the program provided in Book 2 to motorise your model.
4. Write a new program to rotate the centre of the stage where the performer stands.

Guiding questions:

- *How can you motorise the basic stage?*
- *What will you add to your stage to make it unique to your team?*
- *Where will your model go on the mat?*
- *What hobby or interest could you and your team want to share on the stage? How could you do this?*
- *Learners should change the program so that it rotates every 10 seconds.*
- *Build two different scenes on your rotating stage. The scenes can be about what you love to do!*
- *Place your stage on the mat. You could use the theatre icons as building locations!*
- *Share the scenes you built and explain how you coded the model and addressed some challenges.*

The teacher may decide to explicitly explore degrees and fractions using a minifigure placed upon the rotating stage and directing learners to move it differing amounts of degrees or fractions of a rotation.

Development [Continued]

Resource(s):

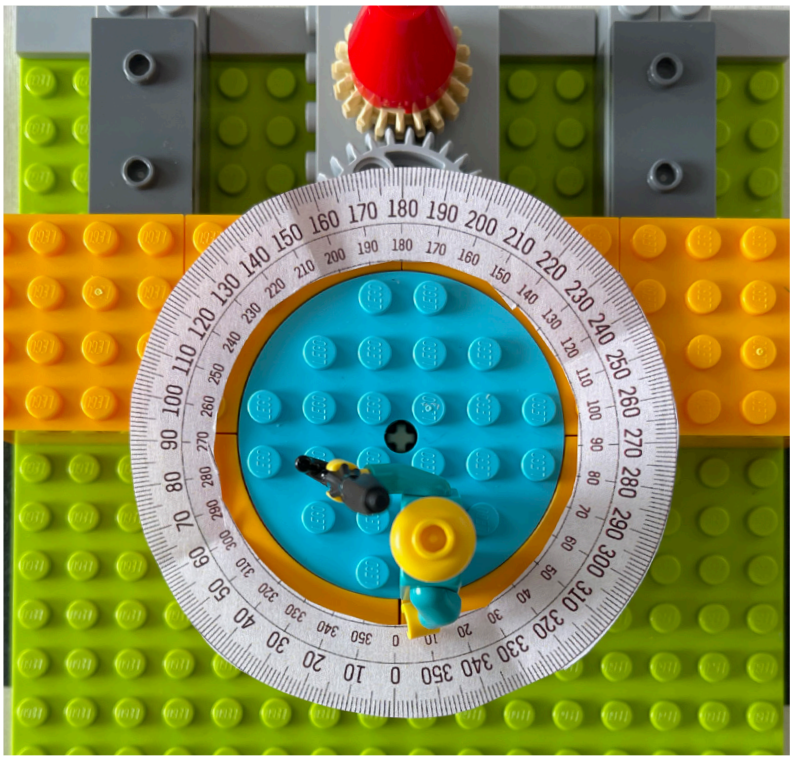
- Printable: Protractor Overlay for Stage + BluTack

***Optional* - Motorised Stage Challenge: [1 min]**

Provide each team with the Printable: Protractor Overlay for Stage and instruct them to lay it over the blue circular stage.

Each team is tasked with creating a short program (algorithm) where their motorised stage is used to share a passion, hobby or interest and meet the following requirements:

- Makes a half turn clockwise OR anticlockwise
- Makes a quarter turn anticlockwise OR clockwise
- Makes two full rotations
- Changes speed (faster to slower, or slower to faster)
- Includes two or more minifigures or LEGO prototypes



Coding & Build Guidance for Teachers

Resource(s):

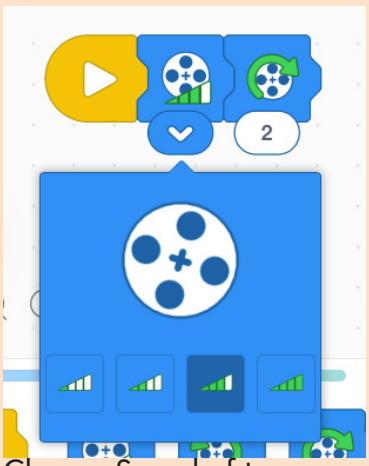
- Narrated video for each code

The following support and guidance is intended for the teacher in order to assist you in scaffolding learners. It is not intended that learners be shown solutions.

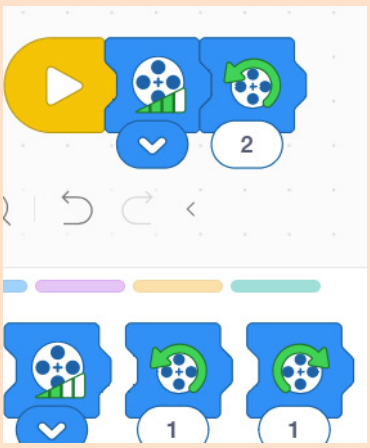
SPIKE Essential
Lesson 1 - Merry-go-Round

Once the code is executed (started), the motor power is set, followed by setting the motor to turn clockwise twice (2).

This simple algorithm (code) can be tinkered with in order to make the robot move more quickly/ slowly, to change the direction of movement (clockwise/anticlockwise), and to change how long/ short the motor stays on for (duration).

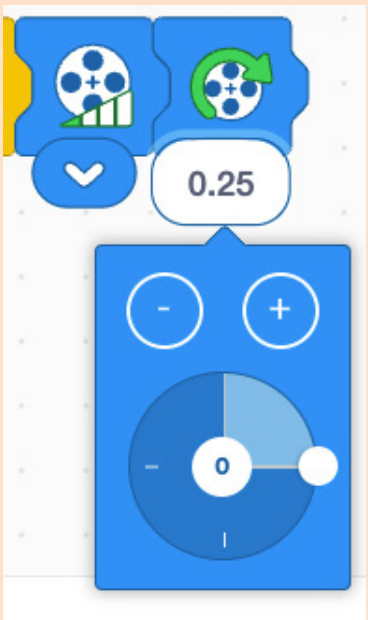


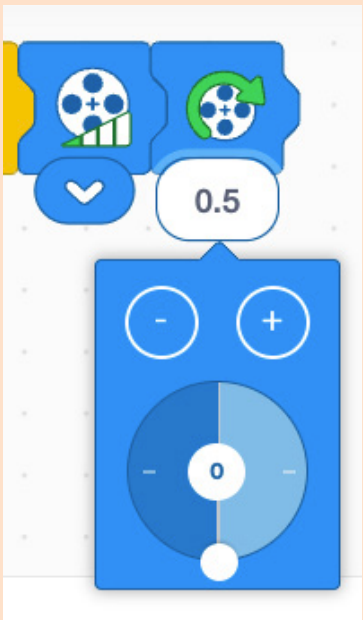
Change Speed of turns



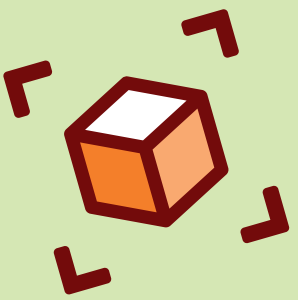
The number under the rotation (2) sets the number of rotations, in this case the duration.

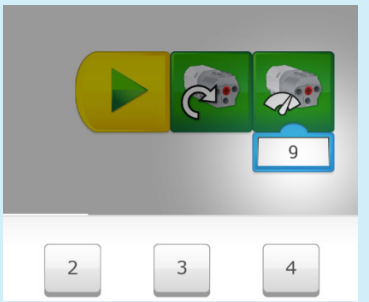
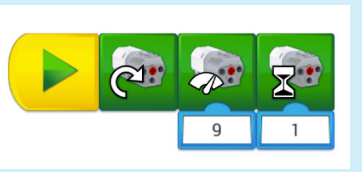
Rotations in fractions and link to degrees.





Coding & Build Guidance for Teachers



WeDo 2.0 Cooling Fan	
 Once the code is executed (started), this robot will turn on the motor at a power of two (2), which will cause the fan to begin moving.	This simple algorithm (code) can be tinkered with in order to make the robot move more quickly/ slowly, to change the direction of movement (clockwise/anticlockwise), and to change how long/ short the motor stays on for (duration).
 Change Speed	  The number under the hourglass is the number of seconds the motor will run.
To get the WeDo cooling fan to make a half or quarter rotation the learners can be asked to think about making it turn more slowly (adjust speed) and for less or more time (duration). The image on the right is one possible solution of a program which has the fan turn one full rotation.	

Guiding questions:

- *Can you change the direction the robot turns?*
- *I wonder what might happen if you change the number under the motor block?*
- *Can you see any blocks that might make the robot stay running for longer?*
- *What is the fastest you can set the robot to turn?*

Closure *(Document/ Share/Tidy up)*
[10 min]

Resource(s):

- Digital Portfolio
- Digital Device

1. **Document:**
   Each team documents and reflects upon the robots they built - adding photos, videos, notes to their digital portfolios. Consider how they built it, how it works, how they might change or adapt or improve it.

2. **Share:**
   a. What they built: Merry-go-Round or Cooling Fan
   b. Show the coding skills they learned
      i. Explain how they changed the program
      ii. Explain a problem they faced or overcame
   c. Demonstrate their solutions

3. **Teams Tidy Up:**
   a. Cooling Fan or Merry-Go-Round should be disassembled and returned to the LEGO Education Set.
   b. MASTERPIECE Stage should remain built

Extension Activities

Consider these ideas for extension activities:

- Write a script to accompany a drama where the coded motorised stage is used. Could the stage move in different ways during the performance. Additional 'stage space' could be created by adding blocks on top of the circular stage and then sticking a new baseplate on top.

Printable worksheets for this lesson are available here:
https://fll.learnit.ie/masterpiece

fll.learnit.ie/masterpiece

Lesson 7: Museum Exhibition

Purpose:

Learners will explore how museums use digitally enhanced displays to make exhibits more interactive.

Museum Curator
Anna

Core Values:

Teamwork | Inclusion | Innovation | Fun

Learning Outcomes:

Learners will be enabled to

1. Explore and appreciate museums that use digitally enhanced interactive displays.
2. Build the LEGO model from the lesson and explore the use of lights and sensors.
3. Identify how lights and sounds are used to make a museum exhibit interactive.
4. Adapt the LEGO model so that it represents the learner's hobby/interest/passion.

Learners will build:

LEGO SPIKE Essential

- Lesson 2 - Animal Alarm

LEGO WeDo 2.0

- Spy Robot

Progress:

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12

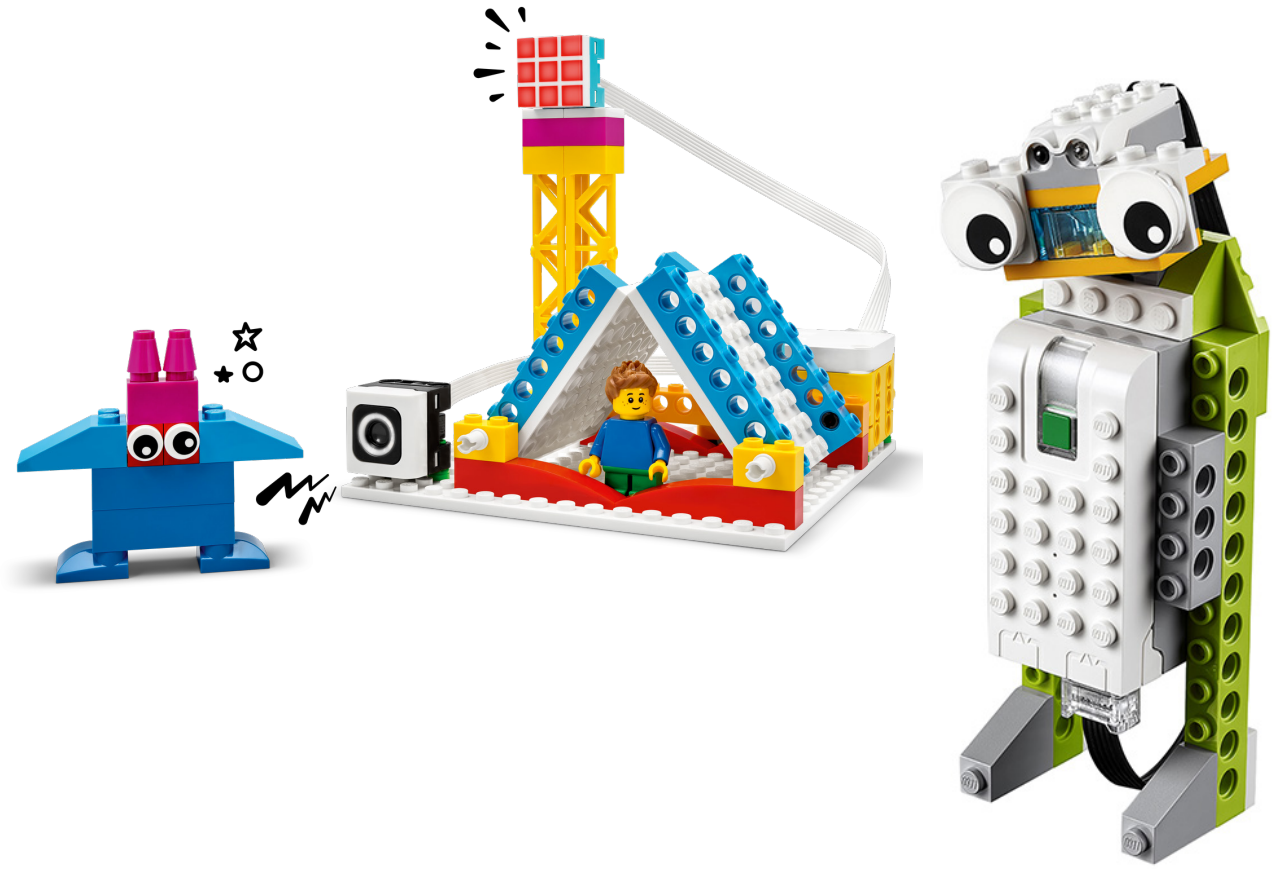
Resources

Per team:

- ***LEGO Education Set (SPIKE Essential or WeDo 2.0)***
- ***Digital Device (for adding to Digital Portfolio)***

Digital resources:

- EPIC Irish Emigration Museum Promotion video (1 minute)
- Robotic Dinosaurs go Wild Interactive Exhibition video (2 minutes)



Curriculum Content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using
Maths	Shape and space	Lines and angles; Rotations	Applying and problem-solving; Communicating and expressing; Integrating and connecting; Reasoning; Implementing
SPHE	Myself	My friends and other people; Relating to others	Communication; Co-operation; Decision-making
History	Life, Society Work and Culture in the Past Continuity and Change over Time	Life in the 18th Century, 19th Century, World Wars or Ireland since the 1950s Clothes, Homes and Houses, Transport	Time and chronology; Using evidence Change and continuity; Synthesis and communication

Introduction
[10 mins]

Resource(s):

- **EPIC Irish Emigration Museum Promotion video (1 minute)**
- **Robotic Dinosaurs go Wild Interactive Exhibition video (2 minutes)**

Introduction to museums and interactive displays

Introduce the learners to museums that use interactive displays to bring their exhibits to life and remind them about the experts that work there:

1. Expert: Museum Curator

Remind the class about our experts behind the scenes. Today's lesson focuses upon the work of the Museum Curator. Allow learners a moment to think-pair-share their understandings of the work of a Museum Curator. Learners explored the role of a Museum Curator in lesson 4. Most museums will have someone working as a Museum Curator, or doing a similar job.

Below you will find two examples of museums that you can use:

2. EPIC: The Irish Emigration Museum (Dublin, Ireland)

EPIC is the world's first fully digital museum. The museum offers digital galleries, motion sensor quizzes, audio books and interactive dance sessions. Allow the learners to watch this **1 minute video** providing an overview of the experience.

Image taken from EPIC: The Irish Emigration Museum.

Guiding questions:

- *Have you visited the EPIC museum? What was it like?*
- *What technologies are used to make this museum more interactive?*
- *What do you think the Museum Curator has to do here?*

3. Robotic Dinosaurs go Wild (Field Museum, Chicago, USA)

The Field Museum is a natural history museum in Chicago which makes a dinosaur exhibition interactive through the use of sensors, face recognition software and sound. Watch this **2 minute video** exploring this museum.

Image taken from Robotic Dinosaurs go Wild (Chicago Tribune).

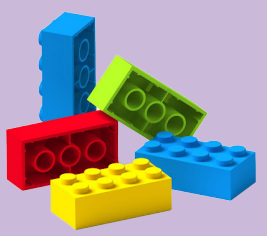
Guiding questions:

- *Discuss how the dinosaurs move/make sounds in the interactive exhibition?*
- *What technologies are used to make this museum more interactive?*
- *What is good about this exhibition? What could be improved?*
- *Does this remind you of any other exhibit you have visited?*
- *How might the Museum Curator's role be similar or different to that of a curator working at EPIC: The Irish Emigration Museum?*

Other Exhibits to explore in groups:

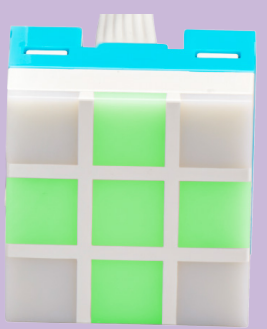
- **Guinness Storehouse** (Dublin)
- **Casino Model Railway Museum Malahide** (Dublin)
- **Titanic Museum** (Belfast)
- **W5 Science Museum** (Belfast)
- **Cavan War Museum** (Cavan)
- **Moynalty Steam Threshing Museum** (Meath)

Development
(Build)
[40 min]



Resource(s):

- MASTERPIECE stage (Already built)
- LEGO Education Set (SPIKE Essential or WeDo 2.0)
- Digital Device
- **Links to the online lessons**

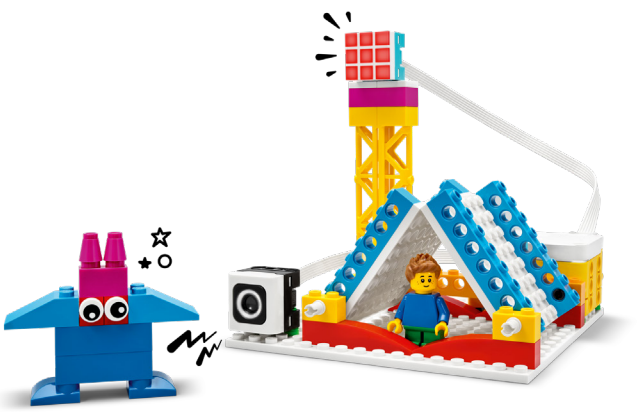


Purpose of the Builds:

- To introduce the sensor and sensor code block.
- Explore how the sensor and sensor code block function.
- Tinker with, and build upon the sensor code to add sound, light to the learner's presentation of their MASTERPIECE.

Sensor Build: [20min]

1. In teams, learners engage with the LEGO Education classroom project:
   a. SPIKE Essential - Lesson 2 - Animal Alarm
   b. WeDo 2.0 - Spy Robot
2. Learners follow detailed instructions to build and code the Animal Alarm OR Spy Robot. . Encourage learners to complete challenge tasks:



SPIKE Essential
Animal Alarm

1. Change the colours displayed by the colour light matrix connected to the hub.
2. Create a 'pixel' image on the colour light matrix (e.g. smile for safe, frown for alarm)
3. Add sound so that when the alarm is activated a sound is also played.
4. Record and add a learner-recorded sound. Sounds recorded from Lesson 5: Sound all Around should be considered here.
5. Write an algorithm that plays a noise and flashes a light when the sensor is activated.
6. Discuss why it is beneficial to have the sensor provide both visual and audio alerts.

WeDo 2.0
Spy Robot

1. Change the sound played when the alarm is activated
2. Record and add a learner-recorded sound. Sounds recorded from Lesson 5 Sound all Around should be considered here.
3. Code the robot to flash a coloured light on the hub when the sensor is activated
4. Change the colour displayed by the hub
5. Write an algorithm (code) that plays a noise and flashes a light when the sensor is activated.
6. Discuss why it is beneficial to have the sensor provide both visual and audio alerts.

Motorise & Enhance the learner's MASTERPIECE::
[20min]

1. In teams, learners modify the SPIKE/WeDo Model from the previous task so that it represents their passion/hobby/interest. The team could use the stage and present their passion/hobby/interest.
   a. Change the program so that it displays a new light pattern.
   b. Change the program so that the model will play a sound when someone approaches your MASTERPIECE.
   c. Change the program so that the model will move when someone approaches your MASTERPIECE. Consider how the stage could rotate to illustrate your passion/hobby/interest. For example, can you get the stage to rotate 270 degrees when the sensor is triggered?
2. Share what you built and explain how you coded the model.

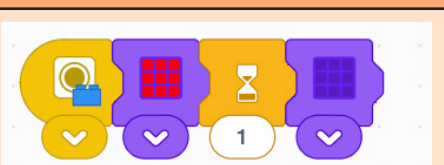
Coding & Build Guidance for Teachers

Resource(s):

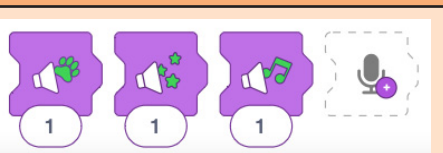
- Narrated video for each code

The overall build and code are very similar, however the different sets use different sensors:

- The LEGO WeDo 2.0 Set uses a **motion sensor**.
  - The motion sensor detects changes in distance from an object within its range in three different ways:
    - Object moving closer
    - Object moving farther away
    - Object changing position
  - e.g. a robot can be programmed to react after something moves within range of its sensor
- The SPIKE Essential Set uses a **colour sensor**.
  - The Colour sensor can be programmed to detect a specific colour and then react to this.
  - e.g. a robot can be programmed to react after a specific colour is detected within range of its sensor

WeDo 2.0 Classroom Project: **Spy Robot**	SPIKE Essential: **Lesson 2 - Animal Alarm**
	
Once the code is executed (started), this robot will wait until the sensor senses motion. It will then start playing an audio file (sound 1).	Once the colour sensor recognises the target colour (blue), the colour light matrix will display a 3x3 grid of red lights. After 1 second has passed, the colour light matrix will not display any lights.

This simple algorithm (code) can be tinkered with in order to make the 'alarm' more effective by including both lights and sound. The additional code blocks for lights in WeDo 2.0 and sound in SPIKE Essential are shown below.

WeDo 2.0	SPIKE Essential
	

Coding & Build Guidance for Teachers

Teacher Tip:
If using the LEGO WeDo 2.0 Set - remember that the sound comes from the digital device, not from the hub. Learners may need to turn up the volume on the device.

Guiding Questions:

- *Can you change the sound the robot makes?*
- *I wonder what might happen if you change the number under the music block?*
- *Can you see any blocks that might make the robot turn on a light?*
- *Can you change the colour of the light?*
- *Can you make the robot play a sound and flash a light one after the other?*
- *I wonder if you could change the order of sound and light?*

Closure (Document/ Share/Tidy up) **[10 min]:**

Resources:

- Digital portfolio
- Digital device

Document:

Each team documents and reflects upon their builds - adding to their digital portfolios etc.

Share:

1. What they built
2. Show the coding skills they learned
   a. Explain how they changed the program
   b. How were sensors used? How did they improve their MASTERPIECE?
3. Describe their improvements to the robot. What light and sound did they add?
4. Demonstrate their solutions

Teams tidy up:

All pieces from the LEGO Education Set should be disassembled and returned.

Extension Activities

Consider these ideas for extension activities:

- Class visit to museums in the local area.
- Create a Classroom Museum displayed on a table in the room. Learners can bring artefacts and everyday items that their parents/grandparents would have used in the past and share with the class, explaining the purpose of the artefact. An explanatory note can be provided and displayed with the artefact.

fll.learnit.ie/masterpiece

Lesson 8: Visual Effects

Purpose:

Learners will explore how visual effects like Green Screening can be used to share ideas in creative and captivating ways.

Visual Effects Director
Emily

Core Values:

Teamwork | Inclusion | Innovation | Fun

Learning Outcomes:

Learners will be enabled to

1. Identify the different kinds of visual effects that can enhance a performance.
2. Explore technology which could be used in very simple ways to create visual effects.
3. Build and code a motorised LEGO vehicle.
4. Apply their coding and building skills to modify / change the vehicle.
5. Develop the ability to create a Green Screen video.

Learners will build:

LEGO SPIKE Essential

- Lesson 3 - Snowmobile

LEGO WeDo 2.0

- Milo the Science Rover

Progress:

1 | 2 | 3 | 4 | 5 | 6 | 7 | **8** | 9 | 10 | 11 | 12

Resources

Per team:

- LEGO Education SPIKE Essential/ WeDo 2.0 set
- Digital Device
- Green Screen

Digital resources:

- **Copyright free image search engine**
- Video resources
  - **Behind the scenes at WICKED - The Musical**
  - **What 8 Disney Live-Action Remakes Looked Like Behind The Scenes | Movies Insider**
  - **All Hollywood VFX Removed! What Movies Really Look Like**
  - **Introduction to Greenscreen videos**
- Green Screen tools - *choose one - best installed on devices in advance*
  - iPad only:
    - **iMovie app** + **How to Create Green Screen Videos on Your iPad using iMovie**
    - **DoInk Greenscreen app** + **Easy-to-Use Green Screen by DoInk App**
  - Windows, Chromebook, Mac, iPad, Android:
    - **WeVideo** + **How to Create Green Screen Videos**
    - **Canva** + **How to Make a Green Screen Video in Canva**
    - **Kapwing**
  - Android, iPad, Chrome
    - **Chromavid** + **Chromavid V 2.0**

Curriculum Content

Subject	Strands	Strand units/ elements	Skills and concepts
Science	Energy and forces; Materials	Forces, Properties and characteristics of materials	Design and make
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using
SPHE	Myself and others	My friends and other people; Relating to others	Communication; Cooperation; Decision-making
Drama	Drama to explore feelings, knowledge and ideas, leading to understanding	Exploring and making drama	The Fictional Lens; Place; Belief

Introduction
[10 min]

Resource(s):

- Behind the scenes at WICKED - The Musical
- What 8 Disney Live-Action Remakes Looked Like Behind The Scenes | Movies Insider
- All Hollywood VFX Removed! What Movies Really Look Like

Visual Effects

Begin the lesson by reminding the class that the last expert behind the scenes that we must meet is the Visual Effects Director.

Expert: Visual Effects Director

Ask learners to think about visual effects (special effects) they may have seen in performances they attended, or have seen in films or on TV. Move to a think-pair-share or class discussion on examples of visual effects.

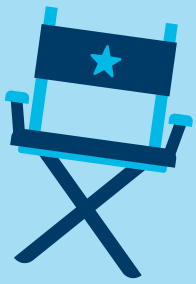
Guiding Questions:

- *What types of work does a visual effects director do? How might you explain what visual effects are?*
- *What kinds of visual effects are used in performances (e.g. coloured/flashing lights; moving objects; music etc.)*
- *How do these effects help to make a performance exciting for the audience? (e.g. suspenseful; energetic; scary etc.)*

Next use one or more of the stimulus videos below which demonstrate how visual effects technology can be used in creative and captivating ways on stage and in film/TV.

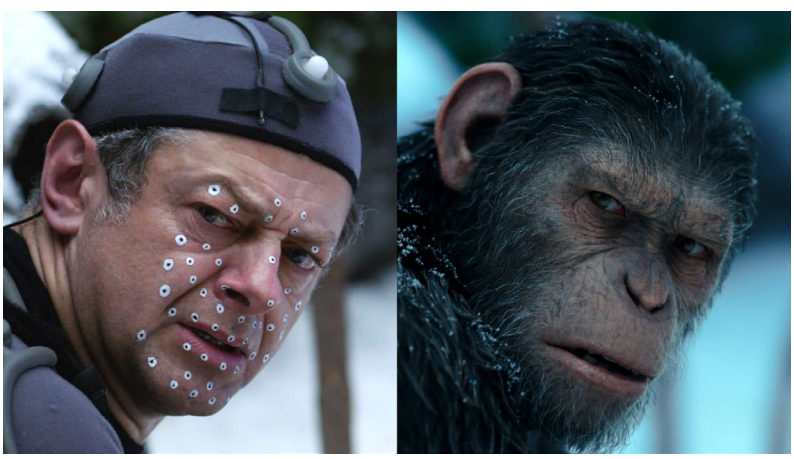
Behind the scenes at WICKED - The Musical. Watch this **3 min video** (YouTube) to learn about how technology is used in creative ways on stage.

Introduction [Continued]



Behind the scenes in Disney live-action remakes. Watch this **8min video** (Youtube) to see examples of how visual effects technology is used in creative ways in TV/film.

Narrated video explaining how visual effects were used in Hollywood movies. Watch this **3:30min video** (Youtube) to see examples of how visual effects technology is used in creative ways in TV/film.



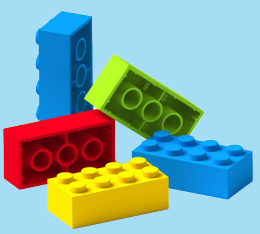
Introduction [Continued]

Guiding Questions:

- *Can you think of any simple "behind-the-scenes" tricks that movie makers or stage managers use to create visual effects?*
- *Watch this short video and discuss how the visual effects were created and used. Would you add or change anything?*
- *If you were to build a stage to showcase your hobbies/passions/interests, what considerations would you make? How might technology help you?*

Teacher explains to the learners that in this lesson they are going to build and code a vehicle using LEGO elements. They are then going to learn how to create their own visual effects using "Green Screen" technology.

Development
(Build)
[30 min]



Resource(s):

- MASTERPIECE stage (Already built)
- LEGO Education Set (SPIKE Essential or WeDo 2.0)
- Digital Device
- **Links to the online lessons**

LEGO Vehicle

Purpose of the Builds:

- To apply their developing understanding of engineering and coding in building and adapting a LEGO vehicle.
- To reinforce learner understanding and experience of using and coding sensors.

Build a Motorised LEGO Vehicle: [30min]

1. In teams, learners engage with the LEGO Education classroom project::
   a. SPIKE Essential - Lesson 3 - Snowmobile
   b. WeDo 2.0 - Milo the Science Rover
2. Learners follow detailed instructions to build and code the Snowmobile or Milo the Science Rover

Development
(Build)
[Continued]

3. Encourage learners to modify the code in order to complete challenge tasks:
   a. Make the vehicle move backwards
   b. Make a turn (Milo is unable to turn without modifications to its design)
   c. Other adaptations of their choosing (a copybook can be used for planning code changes)
4. Sensors and Safety - in groups, ask learners to add a sensor to the LEGO vehicle and complete the following tasks:.
   a. Code their vehicle to stop at an icon on the MASTERPIECE mat.
5. Can you modify the vehicle so that it drives with more or fewer wheels?

Development
(Greenscreen)
[20 min]

Resource(s):

- **Green Screening Introduction Video**
- Digital device
- Green Screening app best suited to your class
- **Copyright free image search engine**

Green Screen Visual Effect

Now that each team has created a LEGO vehicle it is time to learn how to use visual effects in creative and captivating ways.

Begin by showing the class the **Green Screening Introduction Video** (1:30min). This video is related to the 'DoInk' app, but gives a child-friendly explanation of how the process works for most of the apps listed.

Before beginning, each group will need to consider where their scene takes place. Find an appropriate copyright-free image to use as their backdrop.

Each group needs a Green Screen (this could be fabric/ paper; so long as it's a distinctive colour most apps will adjust); a digital device with the app installed (or logged in); their LEGO vehicle.

Select a Green Screen app which is compatible with the digital devices available to your class. On the next page are some apps to consider.

Development
(Greenscreen)
[Continued]

Digital Device	Green Screen app	How-to video
iPad	iMovie app	How to Create Green Screen Videos on Your iPad using iMovie
	DoInk Greenscreen app	Easy-to-Use Green Screen by DoInk App
Chromebook Windows Mac (web-based)	WeVideo	How to Create Green Screen Videos
	Canva	How to Make a Green Screen Video in Canva
	Kapwing	
Android	Chromavid	Chromavid V 2.0

Task each group with creating a photo or short video of their LEGO vehicle with a new backdrop created using the visual effect of a Green Screen (e.g. Milo the Mars Rover driving across the Moon; the Snowmobile driving across a sandy beach, etc.)

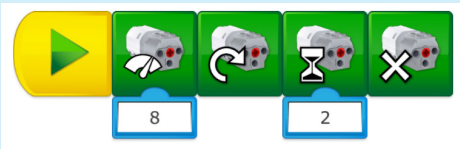
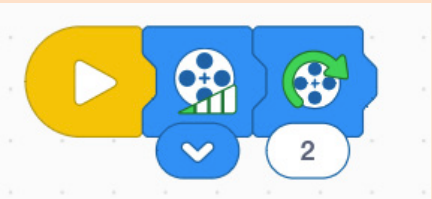
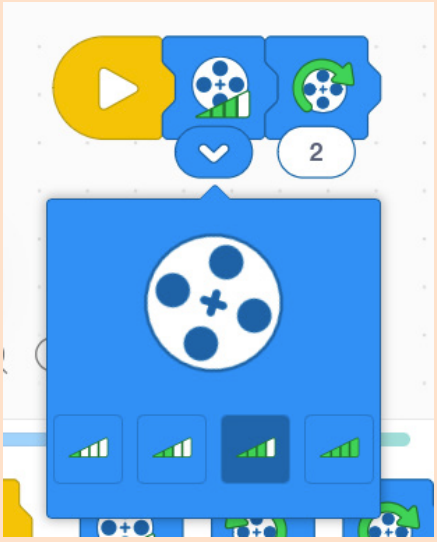
Once groups have mastered the process and created a video or image they are happy with, invite groups to share their creations.

Invite the class to reflect upon how a similar visual effect could be used to enhance the sharing of their passion, hobby or interest.

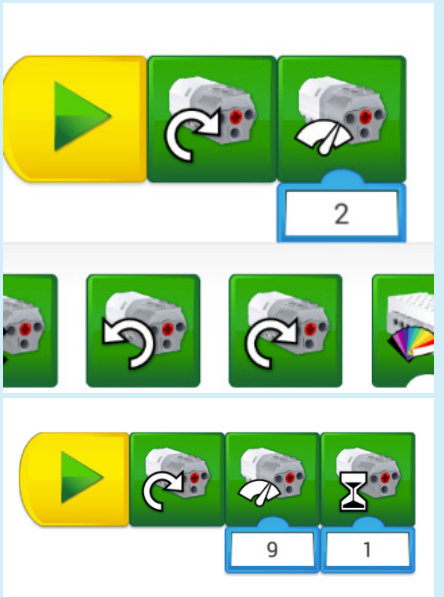
Coding & Build Guidance for Teachers

Resources:

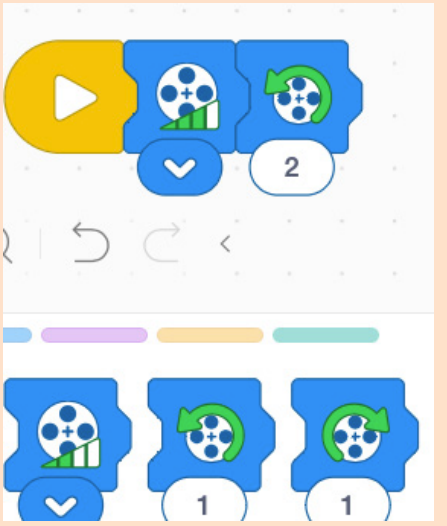
- **Narrated video for code**

LEGO Education WeDo 2.0 Classroom Project: **Milo the Science Rover**	LEGO Education SPIKE Essential **Lesson 3 - Snowmobile**
	
This program begins by setting the engine power at '8'. It then sets the rotation of the motor, clockwise, to move forward. The motor will run for a duration of '2' seconds before stopping.	This program begins by setting the motor power. It then sets the rotation of the motor, clockwise, to move forward. The motor will make two full rotations. Links could be made to each rotation equalling 360 degrees.
This simple algorithm (code) can be tinkered with in order to make the model move more quickly/slowly, to change the direction of movement (clockwise/anticlockwise), and to change how long/short the motor stays on for (duration).	
Change speed	
 The motor power can be increased or decreased	

Change direction and duration

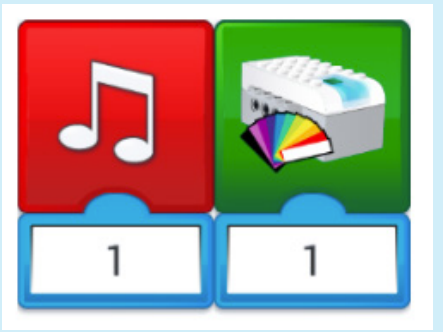


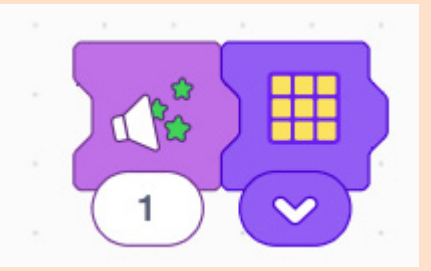
The number under the hourglass is the number of seconds the motor will run.



The number under the rotation (2) sets the number of rotations, in this case the duration.

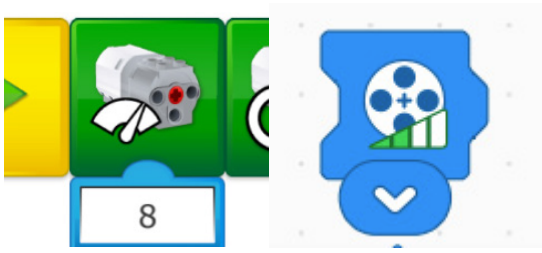
The algorithm could be further adapted to add use of sensors and sound and/or lights. See the Coding & Build guidance in Lesson 8 and/or the SPIKE/WeDo app for further support and examples.





Guiding Questions:

- *Can you tinker with the code in order to make the vehicle run for longer?*
- *Can you change the code to make the vehicle move faster?*
- *I wonder what might happen if you change the number under the motor or duration blocks?*
- *Can you see any blocks that might make the vehicle change direction? (change the rotation from clockwise to anticlockwise)*
- *I wonder if you could make the vehicle play a sound and/or flash a light to warn that it is about to move?*
- *I wonder if you could change the order of sound and light?*



The number under this block sets the power of the motor. Encourage learners to test what happens when this number is changed. Does the robot move faster/slower?

Learners could build upon the code learnt in previous builds:

- The motion sensor or colour sensor could be used to start or stop the robot.
- A sound could be played or a light could flash when the code begins or ends. This idea could link to the reversing warning noise that is a feature on most newer models of cars.

LEGO WeDo 2.0 - Make a turn

Milo the Science Rover is not mechanically capable of turning due to its design. The purpose of this challenge task is to encourage learners to consider the design of a robotic model and any limitations it may face.

Closure (Document/ Share/Tidy up) **[10-15 min]:**

Resources:

- Digital portfolio
- Digital device

Document:
Each team documents and reflects upon their builds - adding to their digital portfolios etc.

Share:

1. What they did in the lesson
2. Show the coding skills they learned
   a. Explain how they changed the program
3. Describe how they adapted the LEGO vehicle to represent an electric car
4. Demonstrate their solutions
5. If they had more time, what other changes might they build/code?

Teams tidy up:
Everything built in this lesson should be disassembled and returned to the LEGO Education Set.

Extension Activities

Consider these ideas for extension activities:

- Stop motion animation using LEGO figures and Green Screen visual effects
- Caitheamh Aimsire: daltaí ag caint faoi na caitheamh aimsire is fearr leo, le cabhair 'Green Screen'

Lesson 9: Setting the Stage

Purpose:

Learners will form teams and decide what hobby, interest or passion their team will share in creative and captivating ways

Core Values:

Teamwork | Inclusion | Innovation | Fun | Impact

Learning Outcomes:

Learners will be enabled to

1. Discuss their hobbies and passions and why it is important to share something about them with others.
2. Identify the different elements that are required in creating a performance.
3. Discuss knowledge and understanding of the MASTERPIECE theme (sharing passions, hobbies and interests in creative and captivating ways).
4. Work collaboratively to brainstorm and plan a team model which shares a hobby, interest or passion in creative and captivating ways.

Progress:

1 2 3 4 5 6 7 8 9 10 11 12

Resources

Per team:

- Materials for planning design: digital tool (e.g. Jamboard/Book Creator/Canva/Slides/Powerpoint, etc.) or paper/copy
- LEGO Education Set (SPIKE Essential or WeDo 2.0)
- MASTERPIECE Explore Set
- MASTERPIECE Mat (optional)
- Prototyping pieces (from MASTERPIECE Set)
- Digital Device

Digital resources:

- **Cillian O'Connor - Britain's Got Talent 2023**
- **Light Balance Kids - America's Got Talent**
- Digital Voting/Response Tool to support planning and brainstorming (e.g. Mentimeter, Sli.do)

Curriculum Content

Subject	Strands	Strand units/ elements	Skills and concepts
Science	Energy and Forces; Materials	Forces; Properties and characteristics of materials	Design and Make
Maths	Shape and Space; Measures	2D / 3D shapes	Applying and problem-solving; Communicating and expressing; Integrating and connecting; Reasoning; Implementing
Literacy	Oral Language	Communicating	Communicating; Understanding; Exploring and using
SPHE	Myself and others	My friends and other people; Relating to others	Communication; Cooperation; Decision-making

Introduction
[10 min]

Resource(s):

- Cillian O'Connor - Britain's Got Talent 2023
- Light Balance Kids - America's Got Talent

Teacher introduces the lesson by reflecting on the MASTERPIECE project to date.

Ask learners to think about their passions, hobbies and interests. This can lead to a think-pair-share, or wider class discussion of the passions, hobbies and interests of learners.

Invite learners to think about what they need to consider in order to share something about them with others. View this **3 min video** for inspiration.

1. Cillian O'Connor, Magician - Britain's Got Talent

Guiding Questions:

- *What is this young boy's passion? How does he share this passion with others? What did you learn from hearing his story?*

Discuss the different elements needed to showcase hobbies, interests or passions and excite an audience. Below is a **2 minute video** that can be used.

2. Light Balance Kids - America's Got Talent

Introduction [Continued]

Guiding Questions:

- *Thinking back over all that you have learned so far, what are the main things that you will need to keep in mind when you are creating your 'master-piece'? Example: Types of stages; use of lighting; technology that can move e.g. a camera and create special effects; music; the role of the different experts etc.*
- *Watch the video of "Light Balance Kids" sharing their passion - dance. What did you see? What did you like best? How does the audience react? What ideas does it give you for creating your MASTERPIECE? How can technology help you?*

Development [45 min]

Resource(s):

- Digital Device
- **Direct links to the online lessons**

- Digital response gathering tool (e.g. **Mentimeter**
- LEGO Education Set
- MASTERPIECE Set
- Additional LEGO pieces
- Digital Portfolio (reflections, photos and videos of previous builds and code)
- A4 paper or relevant copybook for planning

Forming Teams:

1. Ask learners, if they could share one of their passions, hobbies or interests with others, what would it be?
   a. Using an appropriate digital response gathering tool (e.g. **Mentimeter**), invite learners to record their chosen passion, hobby or interest.
   b. Using the listed passions, hobbies and interests, hold a discussion about similarities or commonalities of interests.
2. With interests discussed, invite learners to think about how best to share these in creative and captivating ways; could ways we learnt about in previous lessons be used (e.g. sound, lighting, movement, etc).
   a. Invite learners to think-pair-share their ideas. Encourage pairs to think about how their partner's idea might also be used to share their own interest.
3. Remind the class that these team models are created in teams. This means we must find a way to divide the class into teams of **no more than four learners**. Based on the discussion and sharing of passions, interests and hobbies, could the class think of ways to divide and group themselves? Are there any people with the same or similar passions, interests or hobbies?

Development [Continued]

At this point teams should be formed based upon shared interests, or based upon the teacher's judgements of social dynamics, needs, etc.

Guiding Questions:

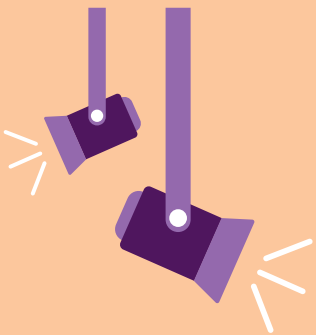
- *What passions, interests and hobbies did we discussed previously?*
- *Did everyone have similar interests? Why not?*
- *What ways did other people share their passions, interests and hobbies?*
- *Think back to lesson 3, how did people in Ancient Rome capture people's attention?*
- *When we looked at the work of experts behind the scenes, what creative and captivating approaches were used?*
- *How might you share your passion, hobby or interest?*
- *How could your partner's idea be adapted to share your interest?*

Planning for Team Model & Team Poster

1. Teacher explains to learners that they are now going to use all that they have learnt through the MASTERPIECE lessons in order to create a Team Model to "share their passions, hobbies and interests in creative and captivating ways"

2. Explore: In teams, learners will:
   a. Agree upon a passion, interest or hobby to focus on sharing in creative and captivating ways.
   b. Discuss what it is about the passion, interest or hobby that 'hooks' them, and what it is they want to share with others.
   c. Brainstorm ideas of how a LEGO model could help them share their passion in creative and captivating ways.
      i. Encourage learners to reflect on the contents of their digital portfolio to support them: photos and videos of previous LEGO builds and the code used could inspire ideas.
      ii. Remind teams that their LEGO model must include motorised parts and sensors *(at least one)*

Development [Continued]



The following are ideas which could scaffold teams in brainstorming their Team Models.

- Could their model let people experience their passion? (e.g. horse riding: the model moves up and down and simulates the experience of being on a horse, sound effects of galloping)
- Could their model explain their passion? (e.g. a model which demonstrates a specific sporting skill)
- Could their model involve a famous person explaining the passion? (e.g. soccer player model which moves and talks through their love of the game).
- How does your passion make you feel, and could the model help others to feel like that? (e.g. the excitement at a concert could be recreated with sound, lighting and movement of a model on stage)

The teacher will remind learners that additional LEGO elements could be brought in and used in building their team model (see important points to note).

3. Plan: Each team must draw a detailed plan of their design. Ask the learners to consider:
   a. What parts do you need?
   b. Could you adapt a part of one of the models you've encountered in previous lessons? (e.g. stage; animal alarm)
   c. Could one of the Explore models be adapted?
   d. Think about and record the coding skills you will use. Use the coding skills you have developed through previous builds (look at photos of code documented in your digital portfolios)
   e. How will your model use motorised parts and sensors? Planning could be done using a digital device or pen and paper.

Guiding Questions:

- *How could you share your passion, hobby or interest in creative and captivating ways?*
- *How could you adapt and innovate upon ideas used by the experts (e.g. sound, lighting, movement, visual effects, etc.)*

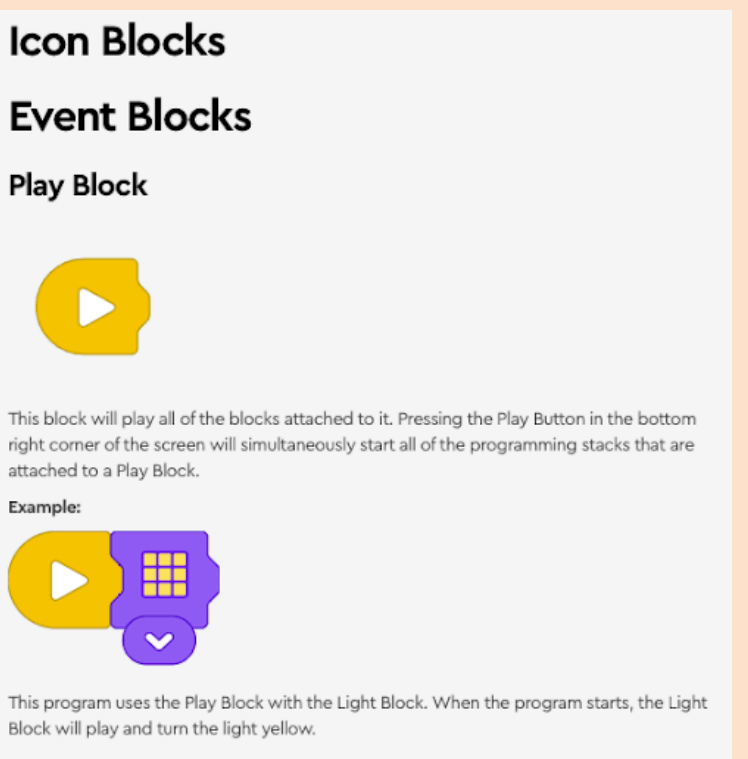
Coding & Build Guidance for Teachers

Learners should be scaffolded in brainstorming and planning their team model through questioning and supports including their digital portfolio entries and the guidance found below:

The LEGO WeDo 2.0 app includes a **program library** and **build library** which demonstrates ways in which learners could build and code their model in order to achieve different outcomes.

This can be accessed by clicking on the 'lightbulb' icon in the top left of the app

The SPIKE Essential app **help section** (bottom left corner of the app) includes a helpful detailed explanation for each of the Icon Blocks used to create code.



Teacher questioning and scaffolding will assist teams in creating innovative models. The more learners are questioned, the more they will be encouraged to think about the what/how/why of their prototypes/ models that represent their ideas. The following Guiding Questions could be adapted to support your class.

Coding & Build Guidance for Teachers

Guiding Questions:

- *What part of your model could you motorise?*
- *What would you like it to do? How can you motorise it to do this?*
- *What sensors could you use? How might these sensors be used?*
- *Could we test and improve this?*
- *How does your model share your passion in a creative way?*
- *I wonder if you could make use of skills you've encountered in other builds? Could your digital portfolio have ideas you could build on?*
- *Could your model make use of light and/or sound?*
- *Could you tinker with your code in order to make it work faster/slower?*
- *Could your model play an original sound? How could you record your own original sounds?*
- *I wonder if you could change the order of sound and light?*
- *Have you spoken to other Teams to see how their model and code works?*
- *Could you learn from any of the other teams?*

Closure (Document/ Share/Tidy up) **[5 min]**

Resource(s):

- Digital portfolio
- Digital device

Document:

Each team documents and reflects upon their ideas for their team build - taking photographs of any sketched ideas.

Share:

1. What they are planning to build
2. How they are planning to code their model
   a. Explain how it will move
   b. How sensors will be used
3. Describe how they plan to use the creative and captivating approaches they've learnt about. What types of technologies will they use?

Teams tidy up:

If teams have begun to prototype these can either be dismantled, or returned to the designated space for their team's model.

Lesson 10: Team Model & Poster

Purpose:

Learners will work in teams to create their Team Models and Posters.

Be advised that the time required for creating a Team Model & Poster will vary by class level and experience. On average this lesson may take approximately three hours.

Core Values:

Team Poster Requirements:

Divided into three sections which describe the team's journey throughout the lessons:

1. Explore - focused on their newfound knowledge and understandings of creative and captivating ways of sharing their passions, hobbies and interests.
2. Create and Test - focused upon their builds and coding
   a. Previous builds: how these helped develop understanding of coding and computational thinking
   b. Team Model
   c. How they tested and improved their build and code
3. Share - Supporting information relating to their passion, hobby or interest. For example: equipment required; rules or instructions; benefits or outcomes from involvement; notable historical moments relating to passion/hobby/interest.

Team Model Requirements:

1. Include motorised parts and sensors (at least one)
2. Use LEGO coding (SPIKE/WeDo 2.0 app)
3. Should fit on a table, be sturdy and be easily transportable (to be brought to Celebration Event)
4. There is no requirement to use the MASTERPIECE Mat, or to include Explore models. If Explore models are used it is encouraged that they be adapted.

Progress:

Learning Outcomes:

Learners will be enabled to

1. Discuss knowledge and understanding of the MASTERPIECE theme (sharing passions, hobbies and interests in creative and captivating ways).
2. Work collaboratively to build and code a Team Model that shares their passions, hobbies and interests in creative and captivating ways.
3. Collaboratively design and label a Team Model.
4. Work collaboratively to plan and design a Team Poster which describes their team's journey through the sessions and supports their Team Model.
5. Communicate the purpose of their Team Model, specifically: how it shares their passions, hobbies and interests in creative and captivating ways.

Learners will build:

- Each team will build a LEGO model of their own design which includes motorised parts and sensors (at least one).

Resources

Per team:

- Materials for planning design: digital tool (e.g. Jamboard/Book Creator/Canva/Slides/Powerpoint, etc.) or paper/copy
- LEGO Education Set (SPIKE Essential or WeDo 2.0)
- MASTERPIECE Explore Set
- MASTERPIECE Mat (optional)
- Prototyping pieces (from MASTERPIECE Set) (optional)
- Digital Device
- Poster paper OR digital poster software (e.g. Canva, Slides, **piktochart**)
- Digital Portfolio which includes reflections, photos and videos of their building, coding and computational thinking to date
- Markers/crayons/colouring pencils

Digital resources:

- Team Build Checklist

Optional:

- The Team Model can use extra LEGO bricks, minifigures, baseplates and other LEGO elements in addition to the LEGO Education Set and MASTERPIECE Set.
- Additional multimedia resources can also be used to support their project (e.g. video, presentation, interactive materials).

Curriculum Content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Mathematics	Shape and space; Measures	2-D shapes; 3-D shapes; Time	Applying and problem-solving; Communicating and expressing; Integrating and connecting; Reasoning; Implementing
Science	Energy and Forces; Materials	Forces; Properties and characteristics of materials	Design and make
Literacy	Oral Language Writing	Communicating	Communicating; Understanding; Exploring and using
Visual Arts	Construction; Drawing	Making constructions; Making drawings	An awareness of line; An awareness of form; An awareness of space
SPHE	Myself and others; Myself and the wider world	My friends and other people; Relating to others; Developing citizenship	Communication; Co-operation; Decision-making

Introduction
[10 min]

Resource(s):

Introduction

1. Teacher introduces the session by reflecting on the MASTERPIECE project to date.
   a. Beginning with discussions of the passions, hobbies and interests of learners.
   b. Followed by thinking about how people share their passions, hobbies and interests in interesting and captivating ways.
   c. Finally, what passion, hobby or interest each group is focused upon sharing.
2. Teacher reminds learners that they are now going to use all that they have learnt through the MASTERPIECE sessions in order to **create a Team Model** to **"share their passions, hobbies and interests in creative and captivating ways".**
3. Restate the requirements for Team Models & Posters

Introduction
[Continued]

Team Model Requirements:

1. Include motorised parts and sensors (at least one)
2. Use LEGO coding (SPIKE/WeDo 2.0 app)
3. Should fit on a table, be sturdy and be easily transportable (to be brought to Celebration event)
4. There is no requirement to use the MASTERPIECE Mat, or to include Explore models. If Explore models are used it is encouraged that they be adapted.

Team Poster Requirements:

Divided into three sections which describe the team's journey throughout the lessons:

1. Explore - focused on their newfound knowledge and understandings of creative and captivating ways of sharing their passions, hobbies and interests.
2. Create and Test - focused upon their builds and coding
   a. Previous builds: how these helped develop understanding of coding and computational thinking
   b. Team Model
   c. How they tested and improved their build and code
3. Share - Supporting information relating to their passion, hobby or interest. For example: equipment required; rules or instructions; benefits or outcomes from involvement; notable historical moments relating to passion/hobby/interest.

Guiding Questions:

- *What passions, interests and hobbies did we discuss previously?*
- *Did everyone have similar interests? Why not?*
- *What ways did other people share their passions, interests and hobbies?*
- *How did people in Ancient Rome capture people's attention?*
- *How might you share your passion, hobby or interest?*
- *How could your partner's idea be adapted to share your interest?*

Development
(Build)

Resource(s):

- LEGO Education Set
- MASTERPIECE Set
- Additional LEGO pieces
- Digital Device
- Digital Portfolio (reflections, photos and videos of previous builds and code)
- A4 paper or relevant copybook for planning

The focus for the remainder of this lesson is on the creation of a Team Model & Poster. It is likely that teams will work at different paces and require different levels of support and scaffolding.

Some groups may need to complete their discussion or plan for their team model, others may be ready to begin iteratively building their team model.

Some teams may elect to focus on the Team Model first, followed by the Team Poster. Others may work on both simultaneously. There is no 'correct' approach or order.

Team Model:

In teams, learners build the design using the prototyping pieces and any other LEGO elements available. Learners ensure that their Team Model meets the Team Model requirements:

1. Include motorised parts and sensors (at least one)
2. Use LEGO coding (SPIKE/WeDo 2.0 app)
3. Should fit on a table, be sturdy and be easily transportable (for future celebration event to share and communicate ideas)
4. Teams are encouraged to take inspiration from the builds encountered so far in order to develop an original motorised part in their model.
5. Remind teams to document their progress as they go as this will be used on their Team Poster.

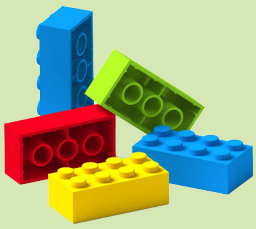
Make Team Poster:

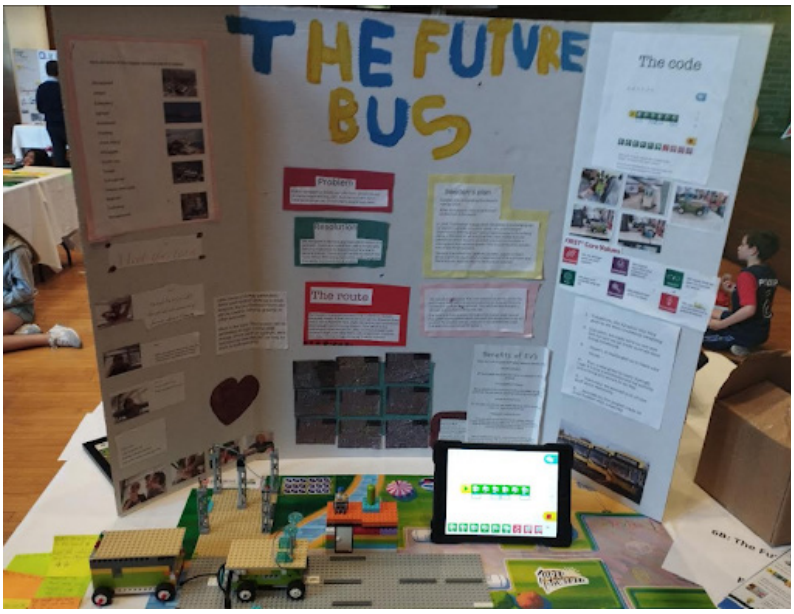
Alongside building their Team Model, teams are tasked with creating a Team Poster which supports their Team Model in sharing their passion in creative and captivating ways. Team Posters should meet the requirements listed at the beginning of this lesson.

Suggested headings include:

1. **Team Name:** Each poster should include the Team Name.
2. **Our Model:** Include a detailed drawing of the Team Model, including explanation of how they decided upon their model, and how this changed over time (iteration).
3. **Our Coding Programme:** What programme did the team use for their model? Can you add this here?
4. **Core Values:** Provide examples of how your team has used the Core Values throughout the sessions.
5. **Our Passion/Interest/Hobby:** information to support their team model

Development [Continued]





Development [Continued]

--- Suggested break between lessons ---

Following completion of Team Models and Team Posters:

Evaluate: Encourage the learners to reflect on their build with their team:

1. How does their Team Model share their passion, hobby or interest in creative and captivating ways?
2. What part of your model is motorised, and how have you coded this?
3. What sensors have you used, and how do they improve your model?
4. What other things would you like to add?
5. What are the strengths and the weaknesses of your design? (particularly structural - is the model sturdy enough to be moved)
6. What will your model teach, show or demonstrate about your passion?
7. What creative and captivating approaches have you used in your model?

The following **checklist of questions** can support assessment while teams share their models and run their code:

1. Is power running continually?
   a. Does it start/stop - is there a pattern?
2. Is there a motorised part?
   a. What does it represent?
   b. Does it work as intended?
3. Are sensors used?
   a. For what purpose?
   b. Does it work as intended?
4. Does it make a sound?
   a. Is this sound linked to motion or as a safety feature?
   b. Could self-recorded sound be used?
5. Are there any flashing lights?
   a. What do these lights symbolise or represent?
6. Could ideas from other teams be adapted to improve your team's model?

Closure (Document/ Share/Tidy up)
[5 min]

Resource(s):

- Digital portfolio
- Digital device

Document:

Each team documents and reflects upon their builds - adding to their digital portfolios etc.

Share:

1. Teams share their completed Team Models and Posters with the class
2. Teams demonstrate what passion, hobby or interest their model and poster share in creative and captivating ways.
3. Teams explain the program and how sensors and motors are used as part of their build.

Teams tidy up:

1. The Team Model will remain assembled from this point forward until the event and should be placed in the designated storage space.
2. Any unused pieces should be returned to the correct box and stored - this includes LEGO Education Set, prototyping pieces, and any LEGO elements supplied by learners.

Coding & Build Guidance for Teachers

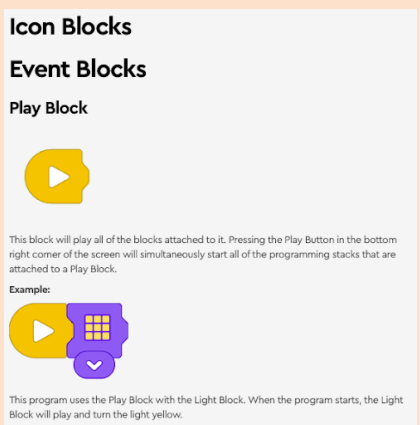
There is no specific code or build in this session.

The programs encountered to date should be adapted and innovated upon. Further assistance and guidance can be found below.

The LEGO WeDo 2.0 app includes a **program library** and **build library** which demonstrates ways in which learners could build and code their model in order to achieve different outcomes.

This can be accessed by clicking on the 'lightbulb' icon in the top left of the app

The SPIKE Essential app **help section** (bottom left corner of the app) includes a helpful detailed explanation for each of the Icon Blocks used to create code.



Coding & Build Guidance for Teachers

Teacher questioning and scaffolding will assist teams in creating innovative models. The more learners are questioned, the more they will be encouraged to think about the what/how/why of their prototypes/ models that represent their ideas. The following Guiding Questions could be adapted to support your class.

Guiding Questions:

- *What part of your model could you motorise?*
- *What would you like it to do? How can you motorise it to do this?*
- *What sensors could you use? How might these sensors be used?*
- *Could we test and improve this?*
- *How does your model share your passion in a creative way?*
- *I wonder if you could make use of skills you've encountered in other builds? Could your digital portfolio have ideas you could build on?*
- *Could your model make use of light and/or sound?*
- *Could you tinker with your code in order to make it work faster/slower?*
- *Could your model play an original sound? How could you record your own original sounds?*
- *I wonder if you could change the order of sound and light?*
- *Have you spoken to other teams to see how their model and code works?*
- *Could you learn from any of the other teams?*

Important points to note

As each class is unique, please decide upon the best way of grouping learners.

If learners are allowed to bring in LEGO elements, it is advised that either:

- Any LEGO elements contributed will become part of the class materials and not be returned.
- A clear record is kept of what a learner contributed so that it can be returned following completion of the project.

The teams will apply coding concepts throughout these sessions to create their programs.

As all teams will include learners of differing abilities, these sessions should be **differentiated** as required.

Extension Activities

Consider these ideas for extension activities:

- Aided by media captured during these sessions (images, video, etc.), learners write instructions on how to build their Team Model.
- In teams, learners record a short podcast based upon their experience creating their Team Model. The podcast can be created using an appropriate digital tool (**anchor.fm**, **Vocaroo**, etc). Suggested content: what part of their model is motorised, how a sensor is used, how these were coded, the individual input of each team member, etc.

Lesson 11: Let's Share
Preparation for Celebration Event

Purpose:

Learners will prepare to share their MASTERPIECE at a Celebration Event.

Core Values:

Final Celebration Event

The capstone to the *FIRST* LEGO League Explore project is a Final Celebration Event where teams can present their models and posters to other learners.

Schools and teachers may also opt for a Final Celebration Event within their own school where members of the school community are invited to learn about the solutions proposed by each team.

However the class decides to share their projects and solutions, it is important that all learners get a chance to both present their work, and examine the work of other teams. This is to enable deeper reflection and learning.

Learning Outcomes:

Learners will be enabled to

1. Communicate the purpose of their Team Model and Poster at a Final Celebration Event - how it shares their passion in a captivating and creative way.
2. Discuss their knowledge and understanding of the MASTERPIECE theme.

Progress:

1 2 3 4 5 6 7 8 9 10 11 12

Resources

Per team:

- LEGO Build
- Digital Device (tablet, laptop)
- Show Me Poster

Digital resources:

- **Reviewing Sheet and Questions** for Final Celebration Event
- **Celebration Peer Review Sheet**

Curriculum Content

Subject	Strands	Strand units/ elements	Skills and concepts
Literacy	Oral Language Writing	Communicating	Communicating; Understanding; Exploring and using
Visual Arts	Construction; Drawing	Making constructions; Making drawings	An awareness of form; An awareness of space

Introduction
[10 min]

1. Explain the Final Celebration Event where the learners will showcase their LEGO builds and posters.
2. The key purpose of these events is for learners to share their projects and learn from others. There is an equal focus on sharing the what/why/how of their project, as there is on learning from the projects of others.

Development
[20 min]

1. Explain to learners that they will have three main jobs at the celebration event
   a. Share their Team Model and Team Poster, and be able to explain them
   b. Answer peer review questions
   c. Speak to other teams and learn about their models
2. Share the peer review prompts with learners and begin a discussion around what each question refers to, how might they be answered, etc.
   a. Allow time for teams to discuss potential answers to the peer review questions
3. In teams, learners decide who will present each section of the poster.
   a. Learners review their Team Model and ensure that their code works. Learners decide who will present the Team Model.
   b. In teams, learners discuss what they have learned throughout the MASTERPIECE lessons. Learners should be prepared to share what they have learned at the Final Celebration Event.
   c. Pair teams up so that each team can practise their presentations with other learners.
   d. Sample reviewing sheet and reviewing questions can be used to support the learners during this session.

The *FIRST* LEGO League Explore team have prepared review questions and self-assessment checklists to assist teams in preparing for their Final Celebration Event. These can be accessed below via the **digital resource section**.

The prompt questions in the concept cartoon below could be used to further scaffold teams in their preparations.

Closure (Document/ Share/Tidy up) **[10 min]:**

Resources:

- Digital portfolio
- Digital device

Share:

1. Reflection and assessment (self and peer) of presentations

Teams tidy up:

1. Ensure Team models and Team Posters are stored and ready to be transported to the event.
2. Ensure all devices are fully charged.

Lesson 12: Let's Reflect

Purpose:

Learners will reflect upon the MASTERPIECE lessons, their Team Model and Poster, and their understanding of how their passions, interests and hobbies can be shared in creative and captivating ways.

Core Values:

Learning Outcomes:

Learners will be enabled to

1. Describe their team's journey throughout the MASTERPIECE lessons.
2. Discuss their knowledge and understanding of the MASTERPIECE theme.

Progress:

1 2 3 4 5 6 7 8 9 10 11 12

Resources

Per team:

- Team Model
- Digital Device (tablet, laptop)
- Team Poster

Digital resources:

- Reflection Prompt Questions
- Discussion images for Lesson 12

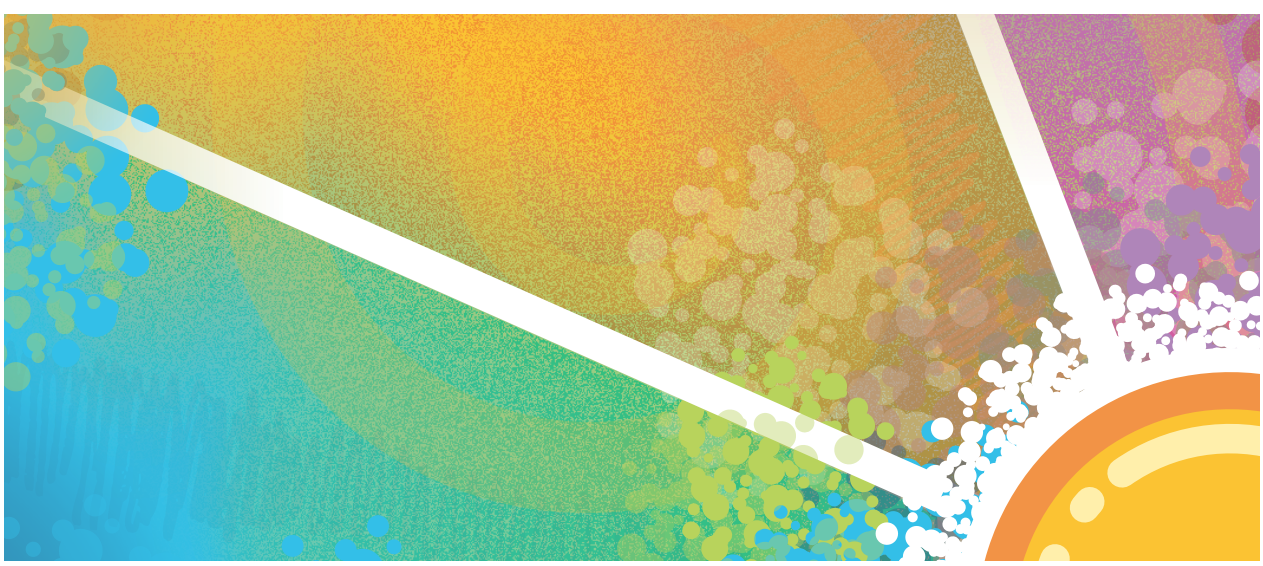
Curriculum Content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Literacy	Oral Language Writing	Communicating	Communicating; Understanding; Exploring and using
Visual Arts	Construction; Drawing	Making constructions; Making drawings	An awareness of form; An awareness of space

Revisiting Masterpiece [25 min]

1. Ask the class to think about their recent Celebration Event. The following prompts could be completed as an oral discussion, think-pair-share, etc.
   a. What did they enjoy most?
   b. Find the most challenging?
   c. Learn from other teams?

2. Revisit the introduction and purpose of MASTERPIECE with learners:
   a. The purpose of this program is that the learners will engage in 12 lessons where they will share their passions, hobbies and interests in creative and captivating ways. By working through a meaningful, authentic and problem-solving process, learners will design, build and code, in order to create unique solutions made with LEGO elements and powered by a LEGO Education Set (SPIKE Essential or WeDo 2.0); this will be their MASTERPIECE

3. Now that we have built Team Models, created Team Posters, and shared our passions at a Final Celebration Event, it is time to reflect on all that we have achieved and learned along the way.



Meta Reflection
[25 min]

Resources:

- Digital devices
- **Prompt questions** to display on IWB

The following prompt questions should be considered by learners following engagement with MASTERPIECE.

These might be discussed orally, in small groups or teams, or independently using a device/paper.

1. What are three things you learnt?
2. What is one thing that you learnt about yourself through completing MASTERPIECE?
3. What part of MASTERPIECE stands out for you? (Your favourite session, build, code?)
4. What will you do differently now as a result of MASTERPIECE?
5. Can you think of an example of when you demonstrated the *FIRST* Core Value of: Teamwork, Inclusion, Innovation, Fun, Discovery, Impact?
6. What would you like to do with your LEGO Education set next?
7. What other real-life issues could we explore through the engineering design process?

Individual/Group Activity:

Following discussion, learners could be tasked with one of the following activities to further their reflection. The finished products could then be shared with the school community.

Record a short video diary of their experiences of MASTERPIECE

Make an audio recording or podcast

Write a short diary entry and type or photograph this for inclusion in their digital portfolio.

Audit Equipment

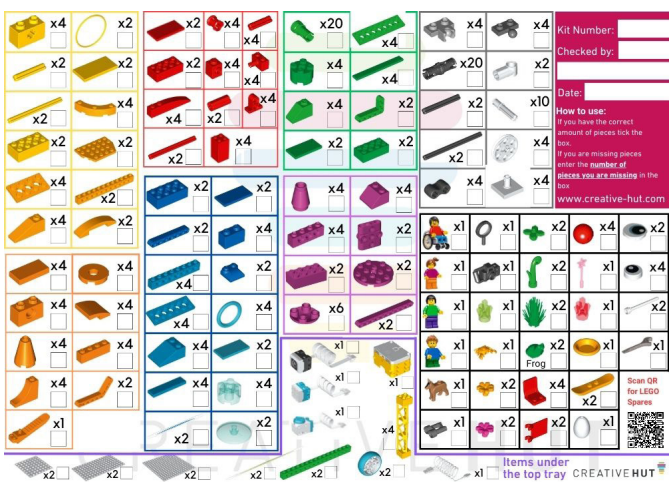
Resources:

- Audit sheets

Any final photos or videos of the Team Model should be taken as the final part of this project is to disassemble and audit the LEGO Education equipment.

All LEGO Education equipment should be disassembled and returned to its correct place.

All elements from the SPIKE Essential or WeDo 2.0 boxes should be returned and audited using the audit sheet. (Find audit sheets at: **fll.learnit.ie/masterpiece**)



If any elements have been lost, replacements can be ordered from: **https://www.lego.com/en-ie/pick-and-build/pick-a-brick**

All LEGO elements from the MASTERPIECE Explore Set should be disassembled and returned to suitable containers (e.g. ziplock bags) for use by a future class. It is highly advised that the Explore models (e.g. stage) be disassembled into separate bags for future use.

Any LEGO elements belonging to learners can be disassembled and returned to them at this point.

References:

fll.learnit.ie/masterpiece

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