The Institution of Engineering and Technology

FIRST LEGO LEAGUE EXPLORE

Teacher Guide For Ireland

Developed by DCU Institute of Education

FIRST® LEGO® League Explore

Presenting: CARGO CONNECT℠

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

Science Foundation Ireland

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.

Meet the team:

Prof Deirdre Butler
Professor
Digital Learning

Nicola Broderick
Assistant Professor
Science Education

Joe Usher
Assistant Professor
Geography Education

Denis Moynihan
Assistant Professor
Digital Learning

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.

Learnit

Niamh Gregory
Explore
Coordinator

Ross Maguire
Project Manager

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.

Contents

Welcome to the CARGO CONNECT℠ Teacher Guide

This CARGO CONNECT℠ Teacher Guide aims to support Irish primary school teachers by illustrating how *FIRST*® LEGO® League Explore CARGO CONNECT℠ (hereafter referred to as CARGO CONNECT℠) aligns with the Irish Primary School Curriculum. Through engaging with the CARGO CONNECT℠ challenges, learners investigate how cargo is transported, sorted and delivered to its destinations; rethink how cargo could be transported from place to place; and propose creative solutions relating to the future of transportation. Grappling with this authentic real-world issue, learners develop a range of knowledge and skills as they learn to design, build and code, in order to create unique solutions made with LEGO® elements and powered by the LEGO® Education WeDo 2.0 or SPIKE™ Essential set.

This CARGO CONNECT℠ Teacher Guide is supplemented and supported by the *FIRST*® LEGO® League Explore Team Meeting Guide and Engineering Notebook. We advise you read pages 3-8 of the Team Meeting Guide before beginning your first CARGO CONNECT℠ classroom session.

This Teacher Guide is organised in two parts:

Part A provides an overview of how CARGO CONNECT℠ aligns with Irish primary school curriculum and policy, including School Self-Evaluation and the Digital Learning Framework.

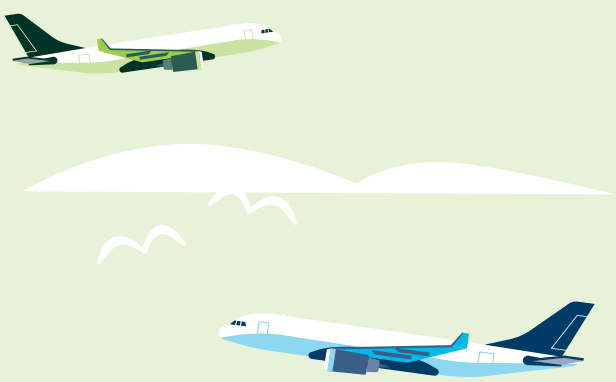
Part B provides general support and advice for teachers getting started with CARGO CONNECT℠. It provides a detailed overview of each of the 12 sessions of CARGO CONNECT℠. Primary curriculum links and skill development opportunities are highlighted in each session. Throughout the sessions, learners will be exploring themes and ideas, creating solutions, testing them, reiterating them and sharing with others what they have learned.

The learning activities are specifically designed with plenty of scope for differentiation so the sessions can be adapted to suit each participating class. Each session clearly outlines resources required, learning activities, guiding questions, as well as how to build and code the models using the WeDo materials. It is important to note that each session has core learning activities that are necessary for the learners to learn about the journey of cargo as it is transported between destinations and explicitly locates CARGO CONNECT℠ in a relevant and meaningful context. Further curriculum links are presented as recommended or suggested learning activities which support the development of the learners' knowledge and skills, thereby enhancing their understanding.

What is *FIRST*® LEGO® League Explore CARGO CONNECT℠?

FIRST® LEGO® League Explore is a non-competitive, hands-on programme geared towards primary school 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, communication, collaboration and design skills through hands-on STEM learning activities. Each year *FIRST*® LEGO® League focuses on a relevant, real-world theme with this year's challenge called CARGO CONNECT℠. Learners work together in teams using elements from the LEGO® Education WeDo 2.0 or SPIKE™ Essential set and CARGO CONNECT℠ Explore set to investigate, create, test and share solutions related to the transportation of cargo from various locations, using different transport modes and processes. In each session, learners are encouraged to collaborate, communicate, build and learn together, while having fun!

This CARGO CONNECT℠ Teacher Guide has been designed with authentic and meaningful curriculum connections. The 12 sessions in this Teacher Guide have been intentionally designed so that learners build their knowledge, understanding and skills, in advance of designing and building their team models, creating posters to accompany their team models, and preparing to present at a showcase event. Figure 1 provides an overview of CARGO CONNECT℠ sessions 1-12.



Sessions 1-7	Context and knowledge	Developing an understanding of computational thinking and coding
Sessions 8-9	Design of team model	Build and code of team model
Sessions 10-11	Planning team poster	Creating team poster
Session 12	Reflecting on the CARGO CONNECT℠ experience	Plan for what teams will share at their final event

Figure 1. CARGO CONNECT℠ sessions 1-12

Core Values of *FIRST*® LEGO® League

FIRST® LEGO® League Explore is underpinned by six *FIRST*® Core Values that are the cornerstones of the program. *FIRST*® envisions that through the Core Values, learners use discovery and exploration in each session and learn that helping one another is the foundation of teamwork. Throughout each session 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 sessions. At certain times during the sessions, you will see one of the Core Value symbols. You can take time to emphasise the Core Value when you see the symbol.

Teamwork	Inclusion	Innovation
We found we were stronger when we worked together.	We respected each other and embraced our differences.	We used creativity and persistence to solve problems.
Fun	Discovery	Impact
We enjoyed and celebrated what we did!	We explored new skills and ideas.	We applied what we learned to improve our world.

Table 1. Core Values of FIRST® LEGO® League

Sustainability and *FIRST*® LEGO® League

CARGO CONNECT℠ provides many opportunities for linking to education for sustainable development. Education for sustainable development empowers learners with knowledge, skills, values and attitudes to make informed decisions and take responsible actions for the protection of the environment. The sustainability symbol (see Figure 2) is used throughout the Teacher Guide session outlines where appropriate so as to draw teachers' and learners' attention to issues pertaining to sustainability. However, it is important to note that not all possible links to sustainability are explicitly highlighted throughout the sessions as it is up to both teachers and learners to decide upon the focus for their *FIRST*® LEGO® League Explore CARGO CONNECT℠ project.

Figure 2. Sustainability symbol

Learning principles behind CARGO CONNECT℠

The engineering design process underpins CARGO CONNECT℠, see Figure 3. Learners are encouraged to think and work like 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), make adjustments, and test again; share with others what you have learned.

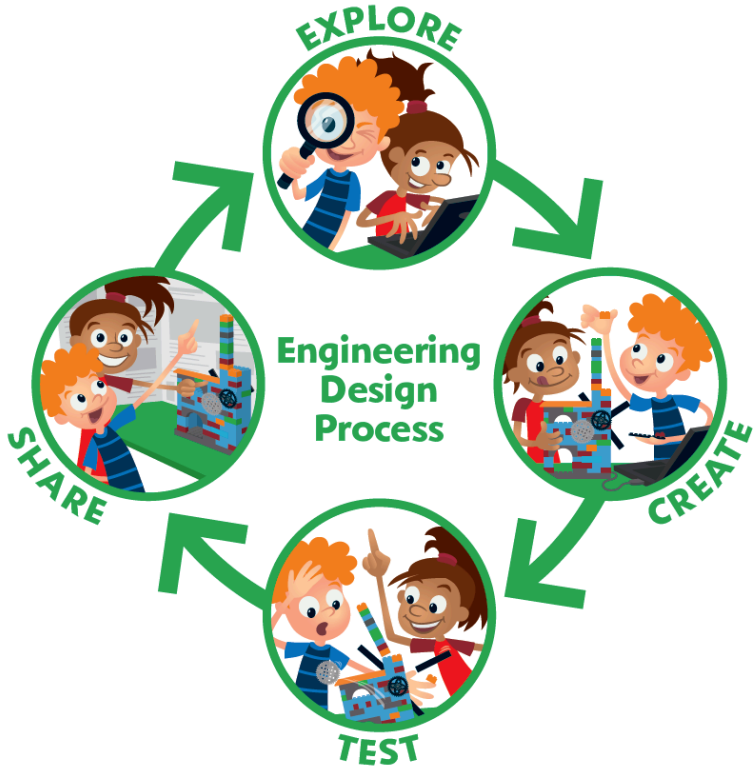
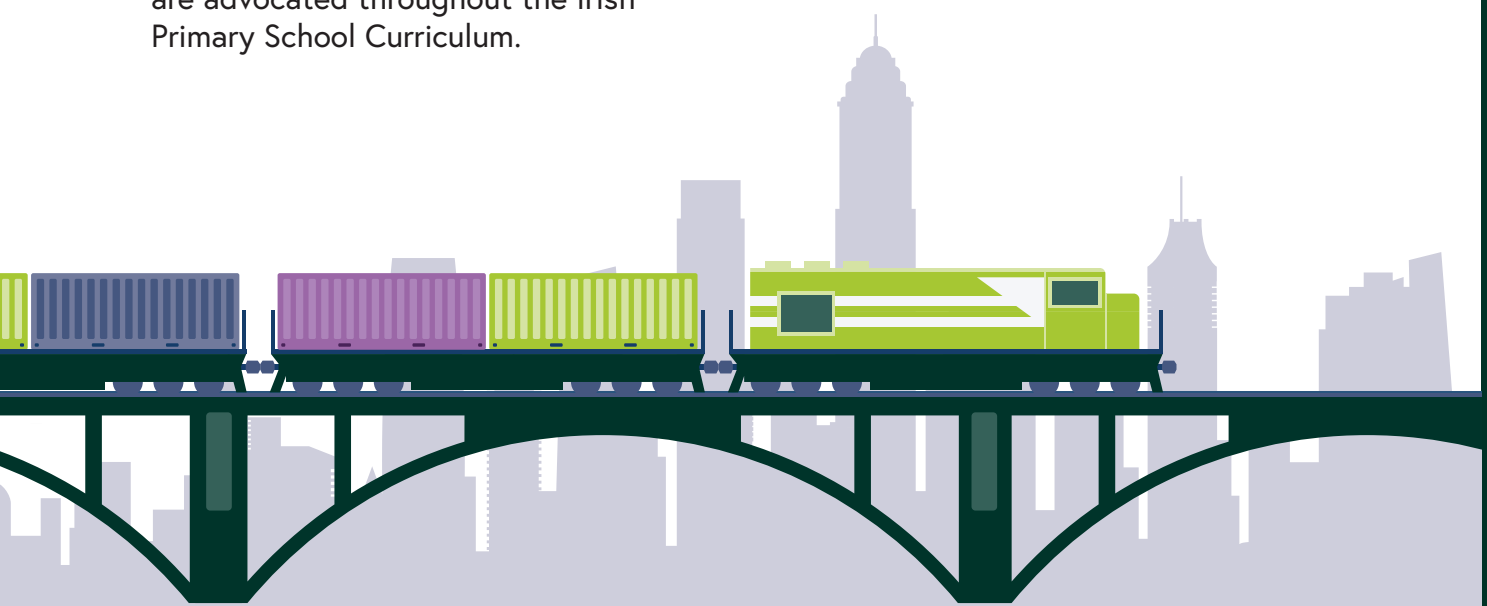


Figure 3. Engineering design process

There is no fixed order for this process. Learners may go through some or all stages several times throughout the sessions. The engineering design process aligns closely with the stages of enquiry-based learning, particularly for science and geography.

The enquiry-based learning process is a learner-centred, experiential, constructivist approach whereby learners are active in their own learning and participate in the leading of investigations through posing questions and generating ideas before creating and collecting data to help develop their understanding. These 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's (2013) framework for enquiry (Figure 4) 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.



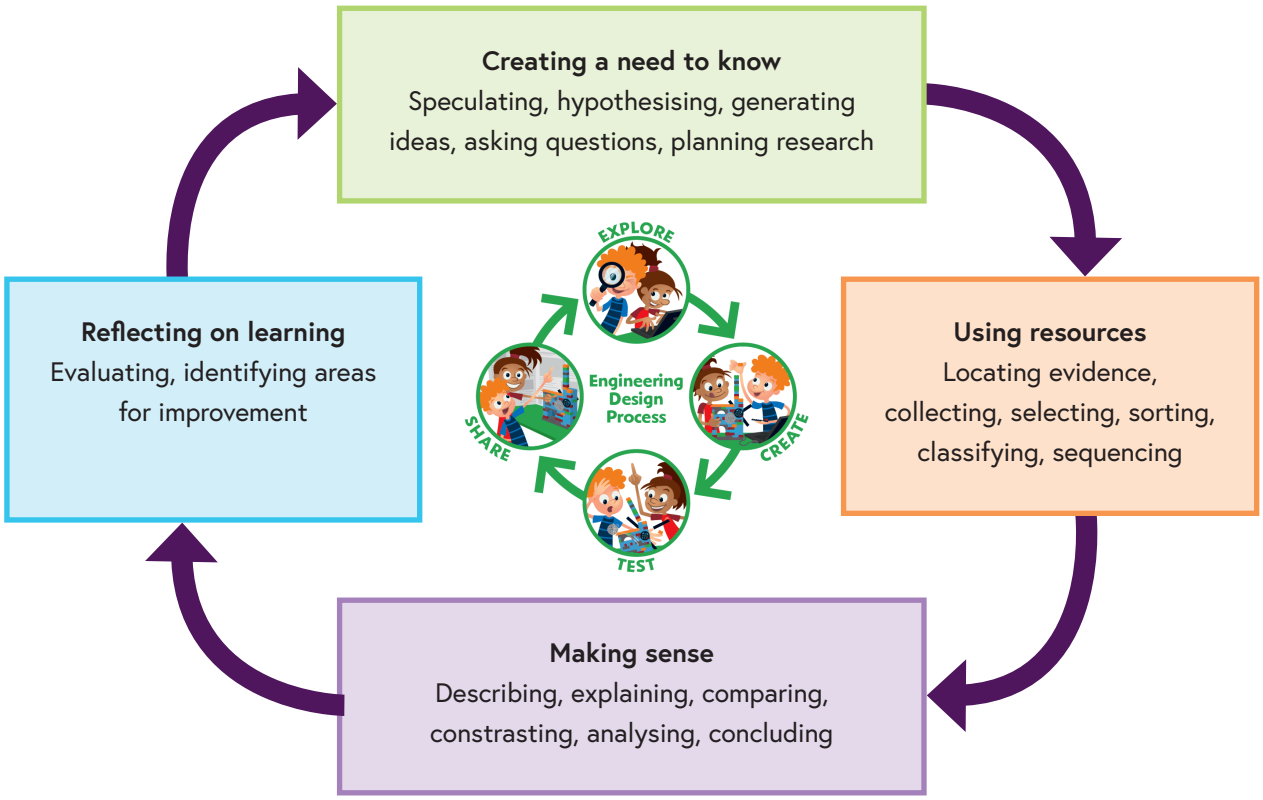


Figure 4. Enquiry-based learning framework (Roberts, 2013)

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 frame. 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, identifying areas where they were successful and areas in need of improvement.

Policy and curriculum connections to CARGO CONNECT℠

CARGO CONNECT℠ has explicit and embedded connections across the **Irish Primary School Curriculum**.

CARGO CONNECT℠ 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** (SSE) process.

Engagement with CARGO CONNECT℠ enables the development of the key competencies of learners as detailed in the **Draft Primary Curriculum Framework**.

CARGO CONNECT℠ has strong connections with a range of recent policy initiatives: **STEM Education Policy Statement 2017-2026**, **National Strategy on Education for Sustainable Development in Ireland**, **Final report on the *Coding in Primary Schools Initiative***.

Table 2. Policy and curriculum connections to CARGO CONNECT℠

How does CARGO CONNECT℠ link with the Irish Primary School Curriculum?

Table 3 below presents the connections to the Irish Primary School Curriculum. Tables 4 and 5 provide a more explicit overview of the curriculum strand and strand unit links in each of the CARGO CONNECT℠ sessions. Figure 5 highlights connections to curriculum skills development.

Irish Primary School Curriculum connections

Geography Human environments; Natural environments; Environmental awareness and care Maps and globes; Geographical investigation skills	**Science** Energy and forces; Environmental awareness and care; Materials Designing and making; Working scientifically	**Mathematics** Measures; Number; Shape and space Applying and problem-solving; Integrating and connecting; Reasoning
Literacy Writing; Reading; Oral language Communicating; Understanding; Exploring and using		**History** Continuity and change over time Working as an historian
Drama Drama to explore feelings, knowledge and ideas, leading to understanding Developing empathy	**Visual Arts** Construction; Drawing An awareness of line; An awareness of form; An awareness of space	**SPHE** Myself and others; Myself and the wider world Communication; Co-operation; Decision-making

Table 3. Irish Primary School Curriculum connections.

Curriculum connections matrix

Curriculum subjects and strands	Pre Session 1	Session 1 Let's Explore	Session 2 Let's Transport	Session 3 Let's Sort	Session 4 Let's Drive	Session 5 Let's Motorise	Session 6 Let's Be Safe	Session 7 Let's Improve	Session 8-9 Build Team Model	Session 10-11 Build Team Poster	Session 12 Let's Share
Geography											
Human environments	•	•	•	•	•	•	•	•	•	•	•
Natural environments	•	•					•	•		•	
Environmental awareness and care	•		•			•					
Science											
Energy and forces		•	•	•	•		•	•	•		
Environmental awareness and care	•		•			•					
Materials			•	•	•	•					
History											
Continuity and change over time			•				•				
Mathematics											
Shape and space		•	•	•	•			•	•		
Measures	•	•			•				•		
Literacy											
Oral language		•	•	•	•	•	•	•	•	•	•

Curriculum subjects and strands	Pre Session 1	Session 1 Let's Explore	Session 2 Let's Transport	Session 3 Let's Sort	Session 4 Let's Drive	Session 5 Let's Motorise	Session 6 Let's Be Safe	Session 7 Let's Improve	Session 8-9 Build Team Model	Session 10-11 Build Team Poster	Session 12 Let's Share
Literacy											
Writing	•	•		•	•	•		•	•	•	
SPHE											
Myself							•				
Myself and others	•	•	•	•	•	•	•	•	•	•	•
Myself and the wider world	•	•	•	•	•	•	•	•	•	•	
Visual arts											
Construction		•	•	•	•			•	•	•	•
Drawing		•	•	•	•			•	•	•	•
Drama											
Drama to explore feelings, knowledge and ideas, leading to understanding	•			•		•		•	•		•
Music											
Composing					•						
Performing					•						

Table 4. Curriculum connections matrix

Skills and concepts curriculum connections

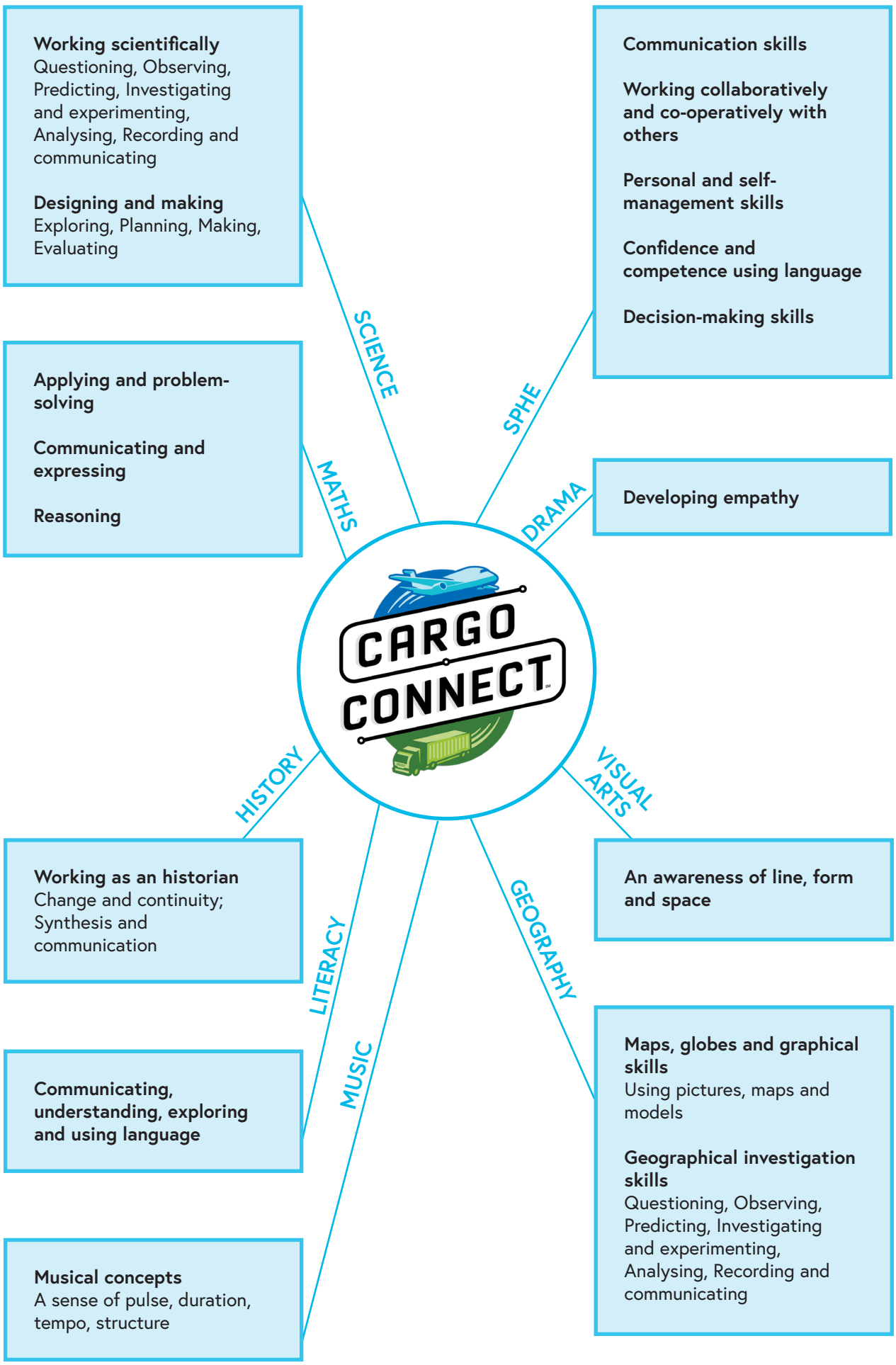


Figure 5. CARGO CONNECT℠ skills and concepts curriculum connections

CARGO CONNECT℠ curriculum connections

Session	Pre Session 1	Session 1 : Let's Explore	Session 2: Let's Transport	Session 3: Let's Sort
Overview of the session	Learners examine journeys of everyday products (ie food) from production through transportation to consumption. This sets the curricular context for the CARGO CONNECT℠ sessions.	Learners examine how cargo is loaded and delivered using different modes of transportation and technology and investigate different delivery routes.	Learners examine how transport is changing, identifying various modes of transport used for different purposes in the transportation of cargo and the role of technology in these changes.	Learners develop an understanding of the purpose and workings of a sorting centre and the different forms of technology used in sorting cargo packages efficiently.
Curriculum connections	**Geography** Strand: Human environments Strand unit: People living and working in the local area/a contrasting part of Ireland; People and other lands **Drama** Strand: Drama to explore feelings, knowledge and ideas, leading to understanding Strand unit: Exploring and making drama; Reflecting on drama, Co-operating and communicating in making drama **Literacy** Strand: Oral Language Strand unit: Communicating; Understanding; Exploring & using language **Mathematics** Strand: Measures; Data	**Geography** Strand: Human environments Strand unit: People living and working in the local area/a contrasting part of Ireland **Science** Strand: Energy and forces Strand unit: Forces **Mathematics** Strand: Shape and space; Measures Strand unit: 2-D shapes; 3-D shapes; Time **Literacy** Oral Language; Writing Strand unit: Communicating; Understanding; Exploring & using language	**Geography** Strand: Human environments Strand unit: People living and working in the local area/a contrasting part of Ireland **History** Strand: Continuity and change over time Strand unit: Transport **Mathematics** Strand: Shape and space Strand unit: 2-D shapes; 3-D shapes **Science** Strand: Energy and forces; Materials Strand unit: Forces; Properties and characteristics of materials	**Geography** Strand: Human environments. Strand unit: People living and working in the local area/a contrasting part of Ireland; People and other lands; Trade and development issues **Science** Strand: Energy and forces; Materials Strand unit: Forces; Properties and characteristics of materials **Mathematics** Strand: Shape and space. Strand unit: 2-D Shapes; 3-D Shapes **Literacy** Strand: Oral Language Strand unit: Communicating; Understanding; Exploring and using language
Skills development	• Geographical investigation skills: Questioning; Predicting; Investigating and experimenting; Analysing; Observing; Recording and communicating • Maps and globes	• Geographical investigation skills • Maps and globes • Working scientifically: Measuring; Questioning • Applying and problem-solving; Communicating and expressing	• Maps and globes • Geographical investigation skills • Working as an historian • Working scientifically; Designing and making • Applying and problem-solving; Communicating and expressing	• Maps and globes • Geographical investigation skills • Working scientifically • Applying and problem-solving • Communicating and expressing • Communicating; Understanding; Exploring and using

Session	Session 4: Let's Drive	Session 5 : Let's Motorise	Session 6: Let's Be Safe	Session 7: Let's Improve
Overview of the session	Learners build and code a motorised LEGO® robot in order to deliver cargo to the sorting centre.	Learners determine what products are transported in the cargo containers and how packages get transported in and out of their community.	Learners consider and design ways to safely transport cargo.	Learners consider and design ways to improve access and efficiency of the cargo journey and sorting process.
Curriculum connections	**Geography** Strand: Human environments Strand unit: People living and working in the local area/a contrasting part of Ireland; People and other lands; Trade and development issues **Science** Strand: Energy and forces, Materials Strand unit: Forces; Properties and characteristics of materials **Mathematics** Strand: Shape and space; Measures Strand unit: 2-D shapes; 3-D shapes; Time **Music** Strand: Performing Strand unit: Composing	**Literacy** Strand: Oral language Strand unit: Communicating; Understanding; Exploring & using language **Geography** Strand: Human environments Strand unit: People living and working in the local area/a contrasting part of Ireland; People and other lands; Trade and development issues **Science** Strand: Materials Strand unit: Properties and characteristics of materials	**Geography** Strand: Human environments Strand unit: People living and working in the local area/a contrasting part of Ireland; People and other lands; Trade and development issues **Science** Strand: Energy and forces Strand unit: Forces **History** Strand: Eras of change and conflict Strand unit: Traders, explorers and colonisers from Europe **SPHE** Strand: Myself Strand unit: Safety and protection	**Geography** Strand: Human environments Strand unit: People living and working in the local area/a contrasting part of Ireland; People and other lands; Trade and development issues **Literacy**: Strand: Oral Language Strand unit: Communicating **Visual Arts** Strand: Construction; Drawing Strand unit: Making constructions, Making drawings **Mathematics** Strand: Shape and space Strand unit: 2-D shapes; 3-D shapes **Science** Strand: Energy and forces; Materials Strand unit: Forces; Properties and characteristics of materials
Skills development	• Geographical investigation skills • Working scientifically • Applying and problem-solving; Communicating and expressing	• Communicating; Understanding; Exploring and using language • Using maps and globes • Geographical investigation skills • Working scientifically: Designing and making	• Using maps and globes • Geographical investigation skills • Working scientifically; Designing and making • Working as an historian • Personal and self-management skills	• Geographical investigation skills • Working scientifically • Applying and problem-solving; Communicating and expressing • An awareness of line; An awareness of form; An awareness of space • Communicating; Understanding; Exploring and using language

Session	Sessions 8-9: Build Team Model	Sessions 10-11: Make Team Poster	Session 12: Let's Share
Overview of the session	In teams, learners create a team model that shows *'The journey of cargo to their destinations'*.	In teams, learners plan, design and create their team poster.	In teams, learners plan for how they will share their team model and team poster at the final event.
Curriculum connections	**Mathematics** Strand: Shape and space; Measures Strand unit: 2-D shapes; 3-D shapes; Time **Science** Strand: Energy and forces; Materials Strand unit: Forces; Properties and characteristics of materials **Literacy** Strand: Oral language Strand unit: Communicating **Visual Arts** Strand: Construction; Drawing Strand unit: Making constructions, Making drawings **SPHE** Strand: Myself and others Strand unit: My friends and other people, Relating to others	**Literacy** Strand: Oral language Strand unit: Communicating; Understanding; Exploring and using language **Visual Arts** Strand: Construction; Drawing Strand unit: Making drawings; Making constructions	**Literacy** Strand: Oral language Strand unit: Communicating; Understanding; Exploring and using language **Visual Arts** Strand: Construction; Drawing Strand unit: Making drawings; Making constructions
Skills development	• Applying and problem-solving; Communicating and expressing • Working scientifically; Designing and making • An awareness of line; An awareness of form; An awareness of space • Communication; Co-operation; Decision-making	• Communicating; Understanding; Exploring and using language • An awareness of form; An awareness of space	• Communicating; Understanding; Exploring and using language • An awareness of form; An awareness of space.

Table 5. CARGO CONNECT℠ curriculum connections

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

As part of the process of 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 and Learning dimension, and one standard from the Leadership and Management dimension. For each standard there are a number of statements of effective practice and highly effective practice.

This CARGO CONNECT℠ 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.

Figure 6 gives an overview of the connections between CARGO CONNECT℠ and the DLF and SSE.

Teaching and Learning

Learner Outcomes

- Pupils enjoy learning, are motivated to learn and expect to achieve as learners
- Pupils demonstrate the knowledge, skills and understanding required

Learner Experiences

- Pupils engage purposefully in meaningful learning activities
- Pupils reflect on their progress and develop a sense of ownership of and responsibility for their learning

Teachers' Individual Practice

- The teacher has the requisite subject knowledge, pedagogical knowledge and classroom management skills
- The teacher selects and uses planning, preparation and assessment practices that progress pupils' learning

Teachers' Collaborative Practice

- Teachers value and engage in professional development and professional collaboration
- Teachers work together to devise learning opportunities for pupils across and beyond the curriculum
- Teachers contribute to building whole-staff capacity by sharing their expertise

Leadership and Management

Leading, Learning and Teaching

- Promote a culture of improvement, collaboration, innovation and creativity in learning, teaching, and assessment
- Manage the planning and implementation of the curriculum
- Foster teacher professional development that enriches teachers' and pupils' learning

Managing the Organisation

- Manage the school's human, physical and financial resources so as to create and maintain a learning organisation

Leading School Development

- Manage, lead and mediate change to respond to the evolving needs of the school and changes in education

Developing Leadership Capacity

- Empower staff to take on and carry out leadership roles

Figure 6. CARGO CONNECT℠ Digital Learning Framework (DLF) and School Self-Evaluation (SSE) connections

For a school beginning to use LEGO® WeDo 2.0 resources 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 CARGO CONNECT℠, pupils will use appropriate digital technologies (WeDo 2.0 and digital devices) 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 (eg tablet/camera) and a portfolio tool (eg Google Sites/SeeSaw, etc) to document the engineering design process while exploring the challenge question in CARGO CONNECT℠.
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 CARGO CONNECT℠ learning activities (from the Team Meeting Guide and this resource book) 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 CARGO CONNECT℠ with pupils. Teachers are encouraged and facilitated to share their CARGO CONNECT℠ practice with colleagues.

For schools who have previously engaged with LEGO® 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.

Digital Learning Framework for Primary Schools

	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 CARGO CONNECT℠, pupils will use appropriate digital technologies (WeDo 2.0 and digital devices) 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 (eg tablet/ camera) and a portfolio tool (eg Google Sites/SeeSaw, etc) to document the engineering design process while exploring the challenge question in CARGO CONNECT℠
	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 CARGO CONNECT℠ challenges, pupils will use a range of digital technologies (WeDo 2.0, tablet/laptop, etc) to demonstrate knowledge, skills and understanding in the form of team models, team posters and other tasks included in CARGO CONNECT℠.
	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 CARGO CONNECT℠ 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 CARGO CONNECT℠ challenge question and tasks, pupils use digital technologies (tablet/ laptop etc) for sourcing, exchanging of information to develop understanding and support the creation of their team model and team poster (ie pupils will research logistics and international trade in order to design their team model).
	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 CARGO CONNECT℠ challenge question and a focus on the engineering design process enable pupils to engage in self-directed learning activities which involve 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 CARGO CONNECT℠ learning activities which incorporate digital technologies (WeDo 2.0, tablet/laptop, camera) 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 CARGO CONNECT℠ learning activities (from meeting guide and this resource book) 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 development (PDST/Learnit/DCU) in order to develop confidence and competence in making use of the WeDo 2.0 and CARGO CONNECT℠ 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 (PDST/Learnit/DCU) in order to develop confidence and competence in making use of the WeDo 2.0 and CARGO CONNECT℠ 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 (ie staff meetings) to discuss and determine how the CARGO CONNECT℠ resources and equipment can be used effectively for TLA.

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 CARGO CONNECT℠ with pupils. Teachers are encouraged and facilitated to share their CARGO CONNECT℠ 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 CARGO CONNECT℠ 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 CARGO CONNECT℠.	
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 (WeDo 2.0, tablet/laptop, CARGO CONNECT℠ Explore Class Pack) are available to the teacher and pupils. Considerations are made for the maintenance of this equipment. Considerations have been made for the layout of the classroom/multi-purpose space to best facilitate the engineering design process and engagement with the CARGO CONNECT℠ 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 CARGO CONNECT℠ 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 the CARGO CONNECT℠ project. Teachers are then facilitated to share their experiences and expertise with colleagues in order to enable another teacher and class to participate in the CARGO CONNECT℠ project.	DOMAIN 4

The proposed Draft Primary Curriculum Framework

In order to support learners interacting with and engaging in the social world of their home, school and community, as well as the natural world around them, the draft primary curriculum in Ireland includes seven 'key competencies' which are inextricably interconnected. The **Draft Primary School Curriculum** sets out a framework intended to pursue broader learning goals beyond traditional subjects. The framework is developed around a core set of key competencies which are seen as useful across a range of learning contexts and situations (Figure 7). A key competency is a 'broad concept and encompasses skills, dispositions, attitudes and values, as well as knowledge about the context in which the competency is learned and demonstrated. …[it] is a learner's capacity to act in response to the demands of a more complex situation or task' (McGuinness, 2018, p. 39).

The 'importance of maintaining the visibility of key competencies within subjects and in making connections across subjects' is essential, 'if the transversal impact of competencies is to be realised' (McGuinness. 2018, p. 39). Consequently, all of the key competencies need to be considered and embedded firmly into planning learning experiences in the primary classroom.

Figure 7. The seven key competencies of the Draft Primary Curriculum Framework.

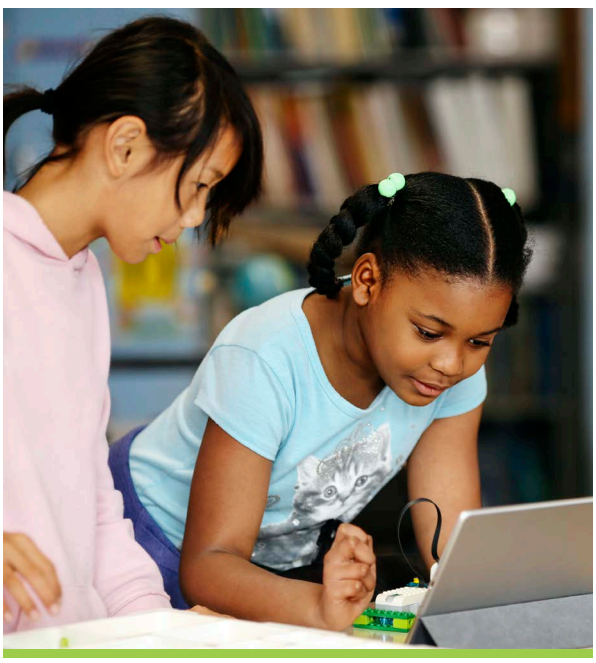
This CARGO CONNECT℠ Teacher Guide has been designed to support the development of the seven key competencies of the Draft Primary Curriculum Framework in an integrated way as described below:

'**Being an active citizen**' 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 and sustainably. It enables learners to question, critique and understand what is happening in the world and how aspects of our lives can be improved. It places democratic practices at the centre of the learning process. Through engaging with CARGO CONNECT℠, learners are facilitated in understanding the interconnectedness and interdependence of people and places both locally and globally. CARGO CONNECT℠ encourages and enables learners to question and critique our production and consumption patterns and the transportation patterns of cargo at small and large scales, learners are working collaboratively together to identify and solve problems, and make decisions through democratic practices. '**Being an active citizen**' is embedded within CARGO CONNECT℠ in that the challenge and associated lessons

develop learners' capacity and foster their ability to contribute positively and compassionately towards the creation of a more sustainable and just world.

'**Being creative**' 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. A key tenet underpinning CARGO CONNECT[SM] is that learners are creative learners, and as such, should be encouraged to be curious, open-minded and imaginative. The learning activities are designed so that learners are encouraged to communicate, share and challenge each others' ideas; to reflect upon new learnings and their own experiences; to think critically about innovative realistic solutions to real world problems associated with the transportation and distribution of cargo locally as well as globally; and to share their learning by exploring alternative ways of communicating.

'**Being a digital learner**' fosters learners' ability to collaborate and thrive in a world increasingly immersed in technology and supports learners in becoming creative, confident and critical users of digital technology as they engage creatively and effectively in their learning. Throughout CARGO CONNECT[SM], learners will develop their knowledge, skills, concepts, attitudes, values and dispositions through problem-solving, experimenting and



creating, using a wide range of digital technologies including digital mapping, collaborative planning, coding and communication software. In turn their confidence in using a range of digital technologies to harness their imagination and expand their creative thinking and creative expression increases. By empowering learners to be active digital citizens, the CARGO CONNECT[SM] learning materials not only develop learners' responsible, safe and ethical use of technology but enable them to critically engage and contribute in a digitally connected and interdependent world.

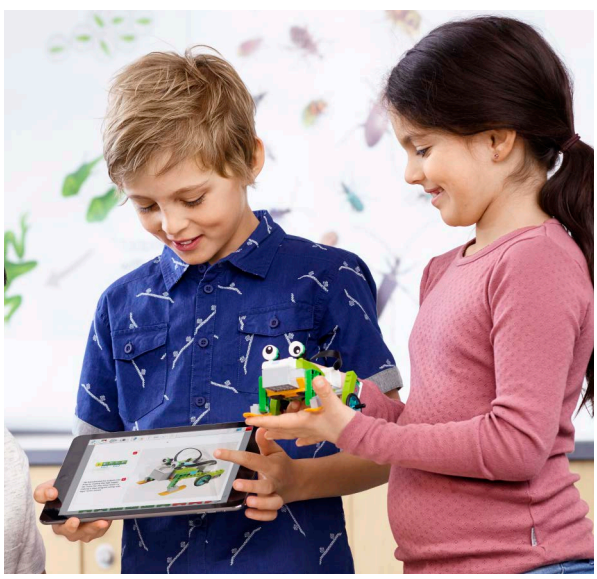
'**Being mathematical**' involves developing and applying mathematical thinking to solve a range of problems in everyday situations. In order to participate in today's world, learners need to be able to think and communicate quantitatively, to make sense of data, to have spatial awareness and to recognise and understand patterns and sequences. Core attributes of the '**Being mathematical**' competency are inherently ingrained throughout the sessions for CARGO CONNECT[SM], as learners are challenged to solve problems and make sense of real-world situations using mathematics by recognising relationships, trends, connections and patterns and interpreting and processing information and data.

'**Communicating and using language**' 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. CARGO CONNECT℠ involves learners engaging purposefully with different text types including spoken, print and electronic formats. 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.

'**Fostering wellbeing**' focuses on self-awareness and promotes the importance of learners seeing themselves as capable and resourceful. It helps learners 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 CARGO CONNECT℠ 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 co-operation, positive team relationships and self-betterment.

Finally, '**Learning to be a learner**', supports 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 CARGO CONNECT℠ is designed to scaffold learners in learning to be learners, as they learn how to communicate, set personal and collaborative learning goals, solve problems, and manage complex situations and challenges. The real-world context of the challenge and learning activities enables learners to make sense of people, things 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 CARGO CONNECT℠. Learning with and about others also enables learners to develop empathy.



Concepts and approaches of computational thinking and coding

Curriculum areas and subjects of the Draft Primary Curriculum

The redeveloped curriculum will be presented in five broad curriculum areas.

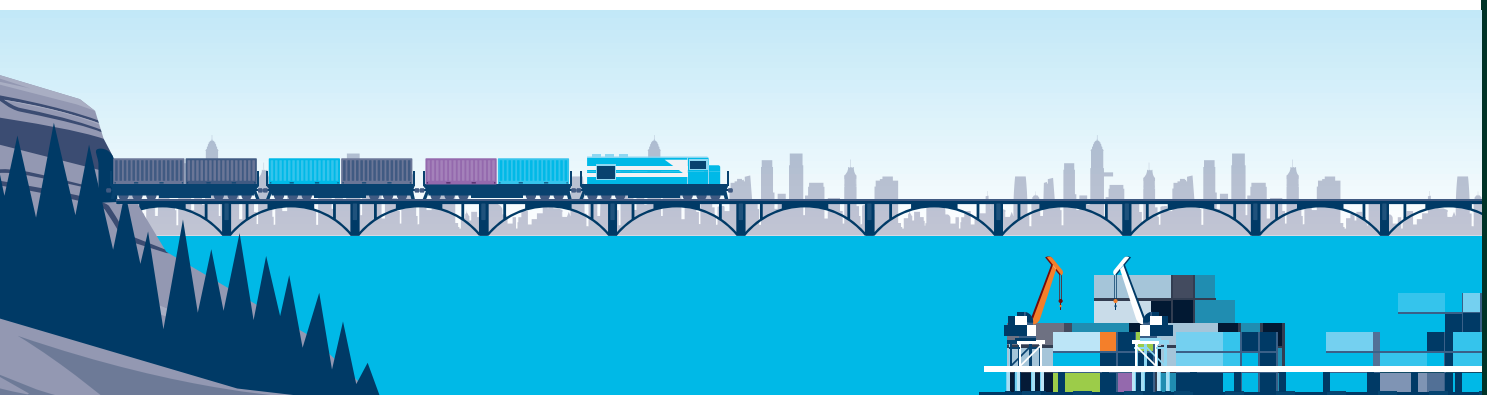
These are:

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

Stages 1 and 2 Junior Infants - 2nd Class	Language (Irish and English)	Mathematics Science and Technology Education	Wellbeing	Arts Education	Social and Enviromental Education	Religious/ Ethical/ Multi Belief Education - Patrons Programme
Stages 3 and 4 3rd - 6th Class	Irish English Modern Foreign Languages	Mathematics Science and Technology	Physical and Health Education Social, Personal and Values Education	Visual Arts Music Drama (And other aspects e.g. Dance, Film and Digtal Media)	History Geography	Religious/ Ethical/ Multi Belief Education - Patrons Programme

The NCCA worked with 40 schools between 2017 and 2019 as part of the Coding in Primary Schools Initiative. The findings from that initiative have informed thinking in relation to Mathematics, Science and Technology Education.

See **www.ncca.ie/en/primary/primary-developments/coding-in-primary-schools/research** for the final report on the coding initiative.



Computational thinking is about looking at a problem in a way in which a computer can help us to solve it. This is a two-step process:

1. First, we think about the steps needed to solve a problem.
2. Then, we use our technical skills to get the computer working on the problem.

(Barefoot Computing, 2021)

"Computational Thinking can be defined as competence in problem solving & design to create useful solutions, informed by the possibilities that Computing offers"

(Millwood et al., 2018, p. 8)

Computational thinking and coding are a key element of all CARGO CONNECT℠ sessions. At the heart of these sessions is a process of testing and learning, whereby learners work logically by changing and testing one variable (eg building design or code block) at a time, and documenting this. In so doing, learners can reflect upon the process and debug (or fix) any part of their model build / programming 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 in thinking about the problem differently; *I wonder if..., how might you…, have you considered…* Examples of guiding questions are provided in each session.

While engaging in coding and computational thinking it is important to support learners in using the correct **terminology** to describe the concepts and approaches they are developing while engaged in learning activities. Table 5 below details five concepts and approaches of computational thinking and coding which are developed across the CARGO CONNECT℠ sessions.

Concept or approach	Explanation	Example of the concept or approach in use
Algorithms	Making steps, rules, and/or instructions	Creating the code or program within the WeDo 2.0 app. Creating algorithms. Writing instructions, eg recipes.
Debugging	Finding and fixing 'bugs' in a logical and methodical manner	Iteratively making small changes to the code or program and testing the outcome in order to overcome a problem. Creating tests, evaluating program outputs and statements
Decomposition	Breaking down into parts	Organising information, creating representations of relationships and systems in diagrams, eg 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 program.

Table 6. Five concepts and approaches of computational thinking developed across the CARGO CONNECT℠ sessions.

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**), see Figure 8, includes a useful graphic which summarises the key concepts and approaches of computational thinking and coding.

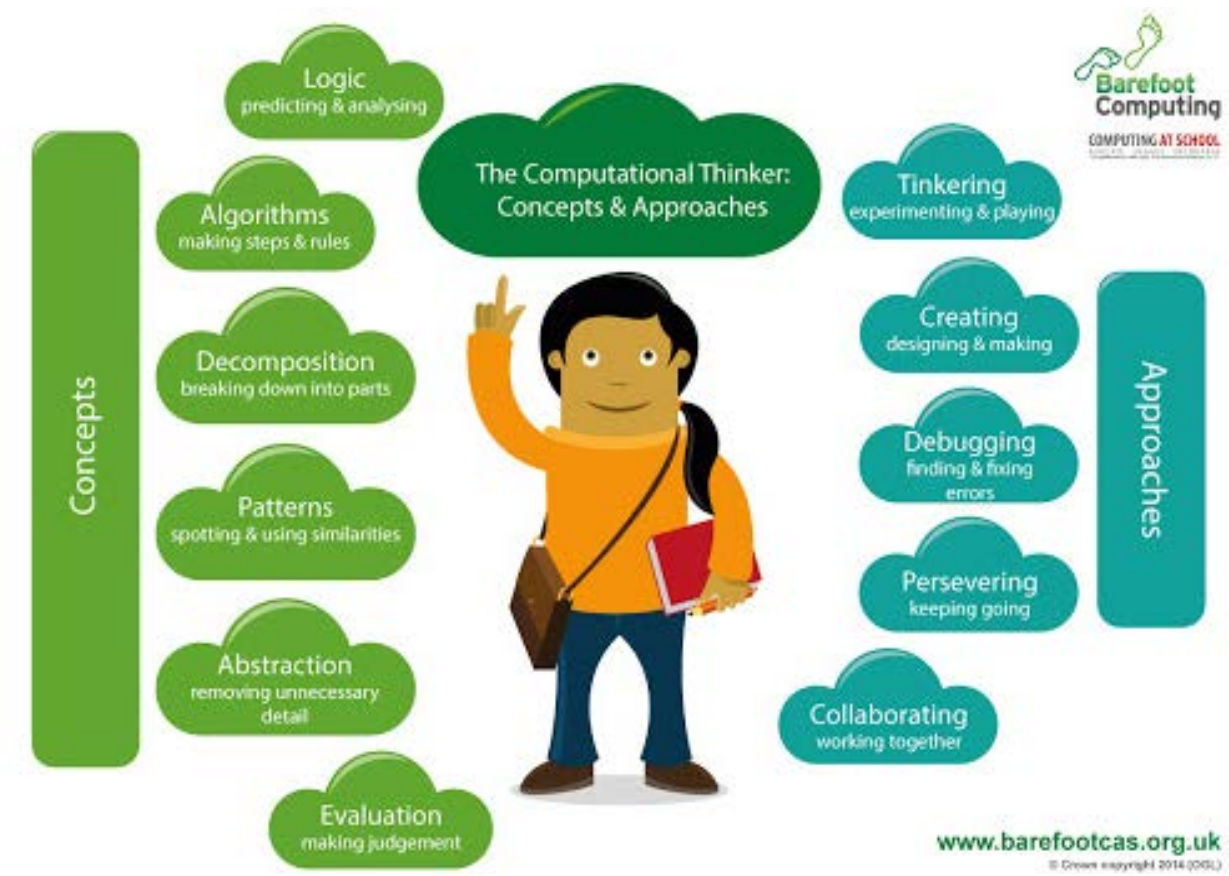


Figure 8. The Computational Thinker: Concepts and sroaches

Further help and support to schools

Help and support is available to teachers and schools. The PDST and PDST Technology in Education are available to provide a range of support 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 with CARGO CONNECT℠.

> PDST 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 **pdst.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**.

CARGO CONNECT℠ sessions

General information: using this Teaching Guide

Organisation of teams

Learners work together in teams of four to six using pieces from the LEGO® Education WeDo 2.0 and CARGO CONNECT℠ Explore sets. They will collaborate and communicate to build, learn, and play together. Please refer to the Team Meeting Guide (page 4) for details of team roles. Learners should remain in the same teams for all sessions.

Engaging with professionals

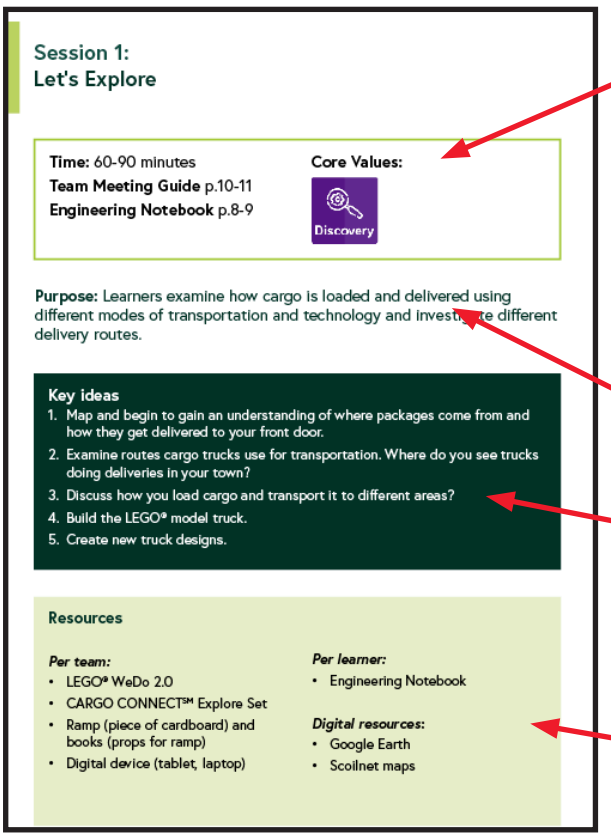
There are opportunities to engage with professionals over the course of the season through school visits, Zoom etc. Refer to the Career Connections pages in the back of the Engineering Notebook for some of the jobs that are linked to the CARGO CONNECT℠ season. *Insert list of contacts that may be useful to help with organising this talks. Engineers Ireland, logistics companies, Irish Haulage associations etc. Parents.

Managing equipment

The *FIRST*® LEGO® League Explore Team Meeting Guide provides useful advice on the management of materials (page 7). The following are further recommendations:

Before	Ongoing	After
If the sets have been previously used - each team checks that they are not missing any elements before completing their first session. This can be done by comparing the contents against the cover insert (pictured below). Designate one WeDo 2.0 set and CARGO CONNECT℠ 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 sessions. Any LEGO® elements found on the floor could be placed in a box on the teacher's desk. Teams missing elements can then check this box. Move all school bags and personal belongings of learners to the back of the room while completing sessions 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 showcase event: Each team checks that their WeDo 2.0 set is not missing any elements. Disassemble the CARGO CONNECT℠ models and place the pieces (and printed building instructions) into ziplock bags for future use. Prototyping pieces can be resealed into storage containers.

Session overview



Session 1:
Let's Explore

Time: 60-90 minutes
Team Meeting Guide p.10-11
Engineering Notebook p.8-9

Core Values:
Discovery

Purpose: Learners examine how cargo is loaded and delivered using different modes of transportation and technology and investigate different delivery routes.

Key ideas
1. Map and begin to gain an understanding of where packages come from and how they get delivered to your front door.
2. Examine routes cargo trucks use for transportation. Where do you see trucks doing deliveries in your town?
3. Discuss how you load cargo and transport it to different areas?
4. Build the LEGO® model truck.
5. Create new truck designs.

Resources

Per team:
- LEGO® WeDo 2.0
- CARGO CONNECT™ Explore Set
- Ramp (piece of cardboard) and books (props for ramp)
- Digital device (tablet, laptop)

Per learner:
- Engineering Notebook

Digital resources:
- Google Earth
- Scoilnet maps

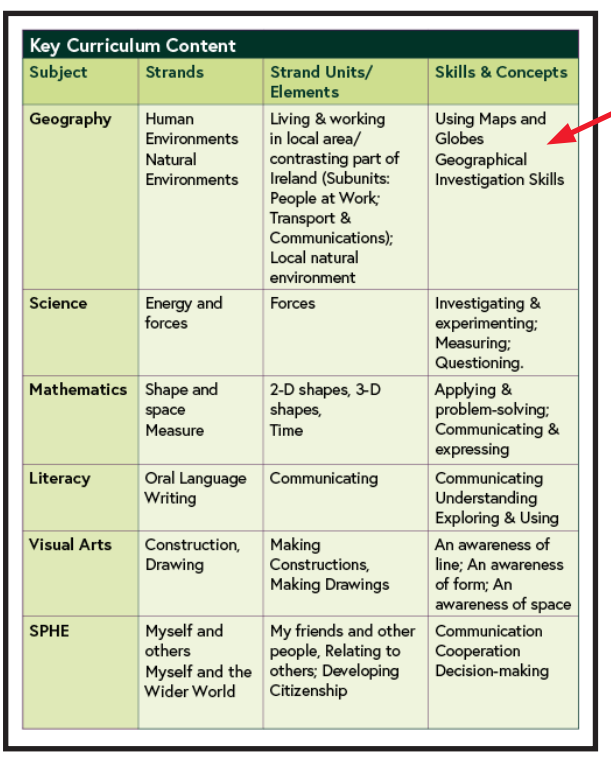
Each session contains an estimated time for the session, broken down into core learning activities and suggested learning activities.

The Teacher Guide should be read with reference to the *Team Meeting Guide* and learners' *Engineering Notebook*.

Purpose of each session is provided.

Key ideas: Provides an overview of the key ideas to be explored in the session.

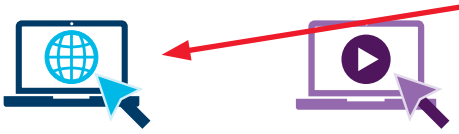
Resources: This includes team resources, digital resources and any printable resources. All digital resources can be accessed via the link provided in the online guide.



Key Curriculum Content

Subject	Strands	Strand Units/ Elements	Skills & Concepts
Geography	Human Environments Natural Environments	Living & working in local area/ contrasting part of Ireland (Subunits: People at Work; Transport & Communications); Local natural environment	Using Maps and Globes Geographical Investigation Skills
Science	Energy and forces	Forces	Investigating & experimenting; Measuring; Questioning.
Mathematics	Shape and space Measure	2-D shapes, 3-D shapes, Time	Applying & problem-solving; Communicating & expressing
Literacy	Oral Language Writing	Communicating	Communicating Understanding Exploring & 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 Cooperation Decision-making

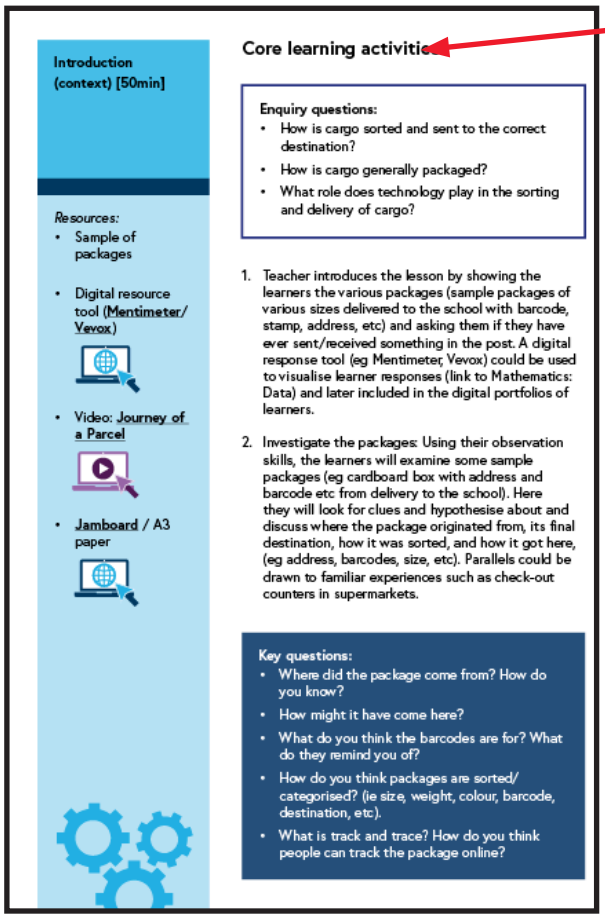
Curriculum connections: This includes reference to (i) strand, (ii) strand units/ elements and (iii) skills and concepts.



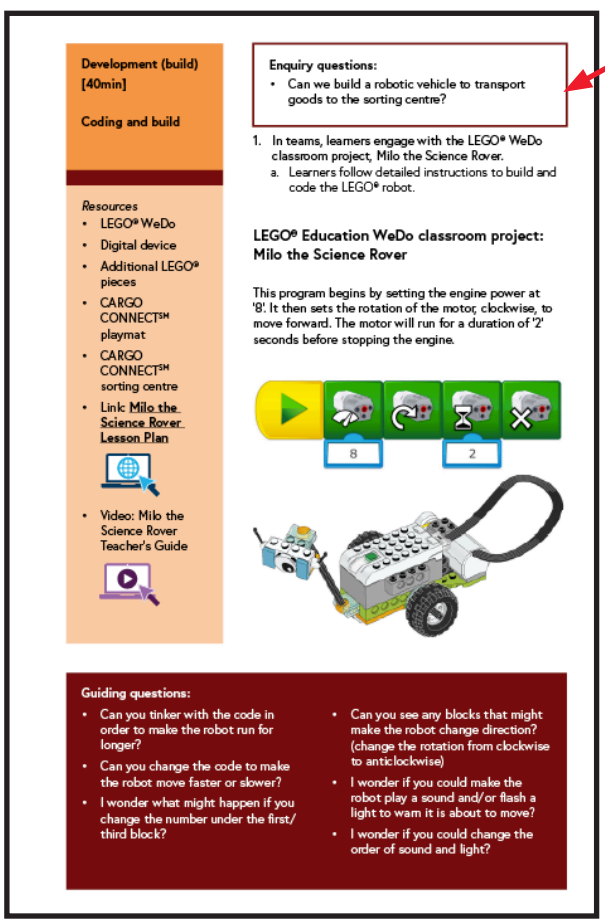
Icon to indicate visiting a website

Icon to indicate watching a video

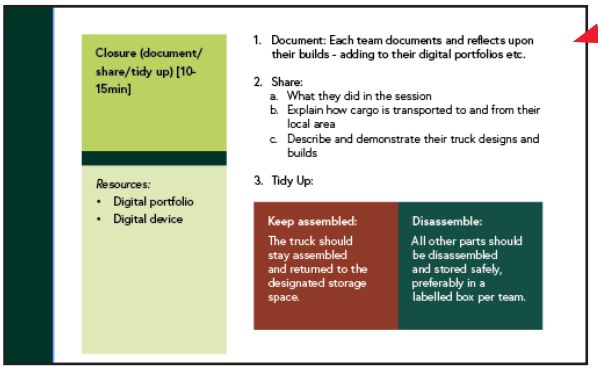
Resource icons: Resources that require visiting a website or watching a video will have icons under them in the resource section to indicate that a link must be clicked on to access the resource.



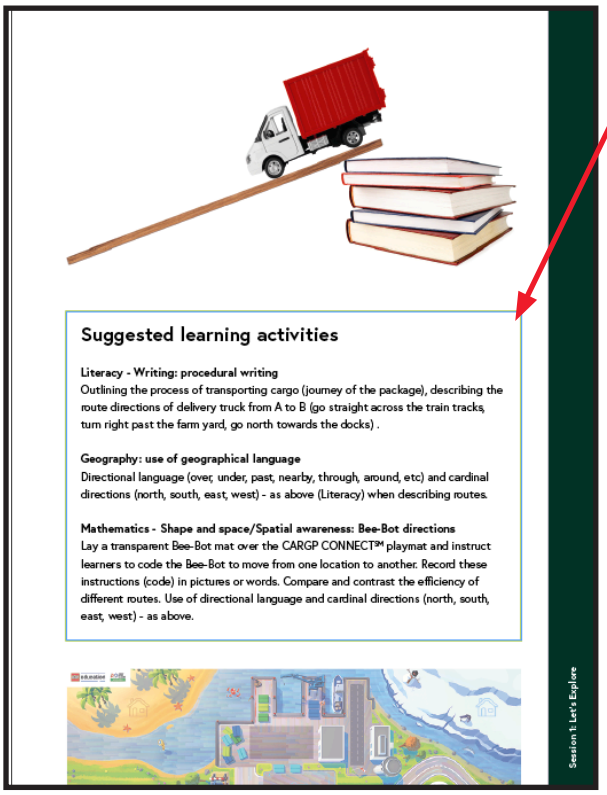
Core learning activities: Learning activities, resources, key discussion points and suggested time frame for each key activity provided.



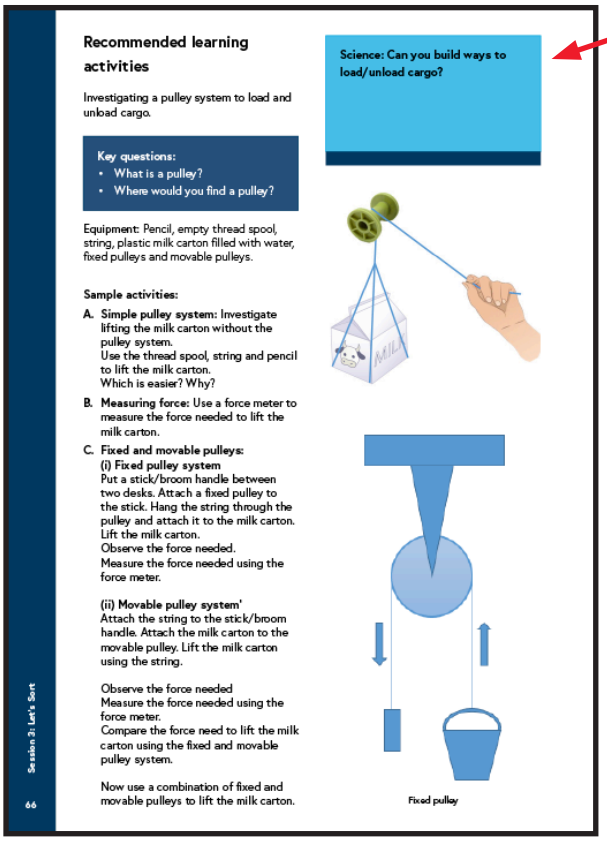
Coding and build: Details of the build and code are provided. *Teacher guiding questions* and *Important points to note* will support the learners' development of computational thinking and coding skills.



Closure: This is an important feature of every session. Further details and teacher guidance is provided in the next section.



Suggested learning activities: These highlight connections to the curriculum which develop the learners' skills and knowledge in a specific subject area within the context of the *FIRST*® LEGO® League Explore CARGO CONNECT℠ challenge. These are optional but recommended lesson ideas.



Recommended learning activities: Additional learning activities which explicitly link to the primary curriculum subject areas are provided in this section. These are optional but are embedded with the *FIRST*® LEGO® League Explore CARGO CONNECT℠ challenge and would serve to develop a more enhanced and holistic understanding of the CARGO CONNECT℠ theme.

Session closures

Every session 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 session, in order to build upon this in future sessions.

These session closures have been designed to build toward sessions 10 and 11. By engaging fully with the session closures learners will have completed a lot of reflection in advance of the final sessions, which will make these more effective.

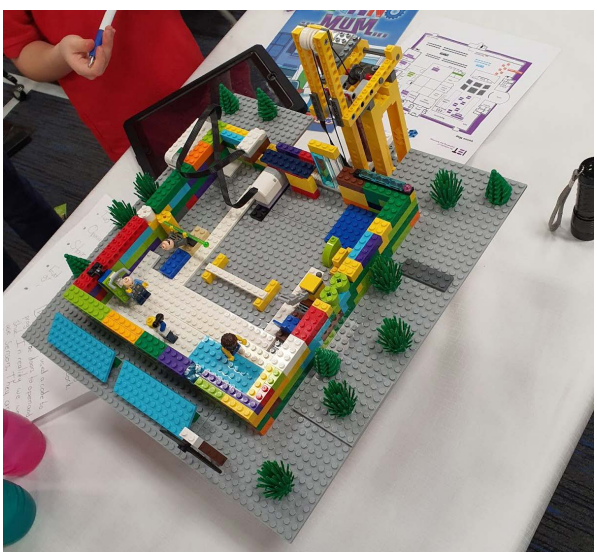
Below is a general overview of what is intended in these session closures. Session-specific details are provided in the session guides.

Document

It is recommended that learners use digital devices (eg tablet/camera) and/or portfolio tools (eg Google Sites/SeeSaw etc) to document the *engineering design process* while exploring the sessions in the *FIRST*® LEGO® League.

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 Draft Primary Curriculum Framework.



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

Twitter: *@TheIET, @Learnit_Ireland, @scienceirel, @DCU*

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

Share

Teams are invited to share what they did during the session, including demonstrating their model and explaining how their code works. The focus of these sharing sessions is to enable learners to explain their thinking and use the correct vocabulary in their explanations. In the initial sessions the teacher may need to model the types of questions that could be asked. As the class progresses through the sessions, 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 or interactive whiteboard.

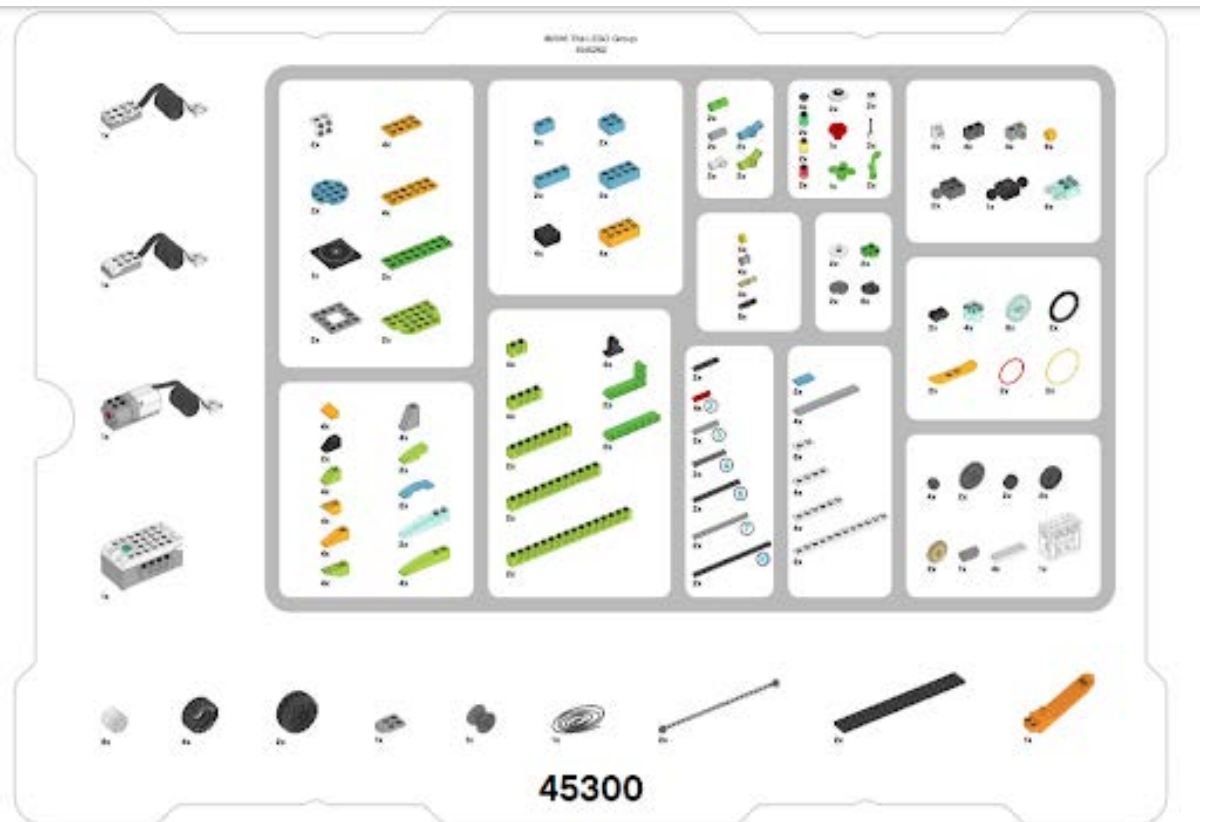
The presenting team stays at their work area and all other learners physically move to this work station for the duration of the sharing.

Tidy up

It is recommended that each team be assigned a specific Wedo 2.0 Set for the duration of the *FIRST*® LEGO® League.

It is important to build up an expectation of learners that each team deconstructs and replaces all parts into the correct section of their WeDo 2.0 Set at the end of each session. This will facilitate the following sessions to run smoothly, and avoid the loss of required pieces.

As illustrated here, the WeDo 2.0 set has specific sections for different categories of pieces, with these pictured on the stickers and on the cover insert.



Session overview

The sessions in this CARGO CONNECT℠ Teacher Guide are designed to be flexible in order to meet the needs of the class. It is recommended that the core content of each session be followed; there is flexibility to adapt the sessions as required. Figure 9 gives an overview of the development of all sessions.

Introduction to CARGO CONNECT℠: Geography context lesson

Time: 50 minutes

Team Meeting Guide N/A

Engineering Notebook N/A

Core Values:

Discovery

Purpose: Learners examine journeys of everyday products (ie food) from production through transportation to consumption. This sets the curricular context for the CARGO CONNECT℠ sessions.

Key ideas

1. Where do everyday items and products come from?
2. Interdependence of people and places around the world linked by trade and everyday products.
3. Focus on food - the story of the banana (from the land to my hand).

Key investigation questions

- Where does our food/everyday products come from?
- How does it get here?
- What jobs are involved in making and transporting the products from the land to my hand?

Key curriculum content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Geography	Human environments; Natural environments; Environmental awareness and care	Living & working in the local area/ contrasting area (Subunits: People at work; Transport and communication); People & places in other areas; Trade and development issues; Caring for the environment	Using maps and globes; Geographical investigation skills (questioning, observing, predicting, investigating, estimating and measuring, analysing, recording and communicating)

Resources

Per team:
Shopping bag for each group containing:

- Packaged and labelled bananas (eg from Costa Rica)
- grapes (eg from Argentina)
- oranges (eg from Spain)
- mushrooms (eg from Co. Monaghan) etc.
- Digital device (tablet, laptop)
- Food miles template sheets
- Class atlases
- Production process template sheets
- Printable PDF - **photos of the story of banana production** (for sequencing)

Digital resources:

- **Food miles calculator**
- **Video on the journey of bananas**
- **IWB interactive story of the banana photos**
- **Google Earth project**

Session introduction [10min]

Resources:

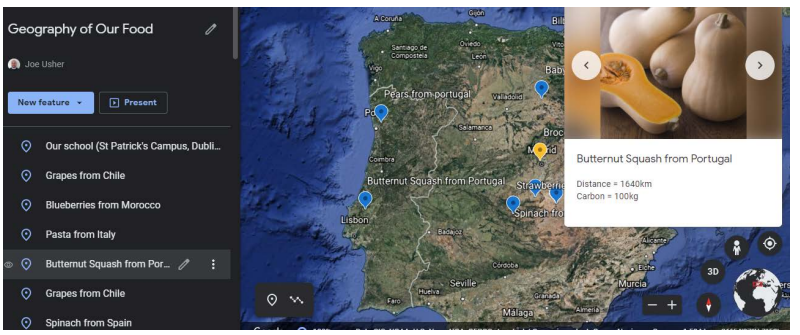
- Four simple food items
- **Google Earth project**
- Food miles grid distances and emissions template **www.foodmiles.com**

Core learning activities

The teacher brings bags of shopping containing four simple food items (stimulus) into class and distributes one bag to each group. In their groups, the learners will observe each food item, examining labels to determine country of origin (eg bananas from Costa Rica).

The learners will mark and label each of these countries of origin and the product on a Google Earth project by dropping pins for each product on the country of origin.

This **Google Earth project** can be added to and edited by anybody. This could also be done using blank world. maps.



Note: these resources could be substituted with learners' jumpers, runners, or items in the classroom which can be investigated for country of origin.

The class can then discuss the different locations of countries of origin and why for example bananas come from Costa Rica and not County Cork etc.

Key questions:

- Where does the food product come from?
- Why might it come from there?
- How do you think it gets here?
- What type of transport would be used?

The learners will then use the **www.foodmiles.com** calculator to calculate the km distance travelled by each food item. This information can be recorded on the *Food miles grid distances and emissions template* either on digital devices or on paper. Note and discuss the carbon emissions associated with each item in relation to the sustainability of our food consumption. S

Session development [25min]:

Focus on bananas

Resources:

- Jamboard/A3 sheets
- Production process template (digital/ photocopiable resource)
- **IWB interactive story of the banana** / printable **story of the banana**.
- Video: **Banana production and transportation**

The learners will hypothesise and speculate as to how bananas get from Costa Rica etc to Ireland and what jobs are involved in getting bananas 'from the land, to my hand'.

The learners should brainstorm the process of producing and transporting bananas. This could be done digitally on Jamboard or on A3 sheets.

This **video** could then be used as a means of demonstrating banana production and transportation.

Using either the **IWB interactive story of the banana**, or the printable **story of the banana**, learners should sequence the images and match captions for the journey of bananas 'from the land, to my hand'.

The teacher should clearly explain and define the terms **package** and **cargo** here. Package =1 product. Cargo = multiple packages. Each package of bananas is loaded onto the cargo ship and transported in bulk.

The learners should then work together to record the various jobs involved in getting the bananas from the land to my hand (eg banana farmers, banana washers, box makers, packaging, loading onto trucks, transporting/truck driving, shipping across the ocean, unloading onto trucks, transporting to shops, etc).

These could be categorised using the *Production process template* into primary, secondary and tertiary, on digital devices, on paper, or alternatively, just written out in sequential order in line with the journey of production.

Closure (document/ share/tidy up) [10min]

The class can discuss what they have learned about our connections to other people and places through the food we buy and eat and how goods are transported around the world.

Key questions:

- What did you learn about how food is transported around the world?
- What kinds of jobs are linked to food production?
- How were the bananas transported from the farm to the port? From Costa Rica to Ireland?
- What different modes of transport did you observe in the story of the banana from the land to my hand?

Suggested learning activities:

Geography: carbon footprint of the food we eat

Explore and record the carbon dioxide emissions for each food item (using the food miles calculator). The learners could examine the distance (km) and carbon footprint of each product and determine more sustainable alternatives (such as alternative places where the item could be produced closer to home/Ireland, alternative products instead of that product - such as locally produced strawberries rather than grapes from outside Ireland, etc). The class could also consider what food is produced locally by farmers and in local community allotments etc. They could then explore what could be grown in the school garden and engage in planting fruit and vegetables as a means of producing food more sustainably. S

Mathematics: food miles data

Create graphs to represent the food miles travelled by the items examined, or of items contained within lunchboxes.

Drama: learner/teacher in role

Teacher and/or learners in role exploring the story of the bananas from the land to my hand (eg banana farmers, banana washers, box makers, packaging, loading onto trucks, transporting/truck driving, shipping across the ocean, unloading onto trucks, transporting to shops, etc). In groups learners can be asked to complete three freeze frames to represent scenes from the story.

Literacy: diary entry

Learners write a diary entry from the perspective of one of the individuals pictured on the sequencing cards (banana farmer, banana washer, etc).

Resource 1: Food miles grid distance and emissions

Product	Place/country of origin (from label)	Distance travelled (km)	Estimated CO_2 emissions	Mode of transport:

Resource 2: Production process template

Map out the product from 'land to hand' including all materials in the product and the jobs involved in its production. See example as a guide:

Product	Primary	Secondary	Tertiary
Milk carton	Farmer (milk from cows) Forestry worker (cardboard cartons from trees) Oil rig worker (oil from underground for making the plastic lid)	Creamery worker (treating the milk) Factory worker (making the cartons from timber) Factory worker (making the plastic lids from oil)	Transporter (milk from farm to creamery) Transporter (milk from creamery to shops) Transporter (timber from forest to factory to make cartons) Designer (designs labels for cartons etc)

Session 1:
Let's Explore

Time: 60-90 minutes

Team Meeting Guide p.10-11

Engineering Notebook p.8-9

Core Values:

Purpose: Learners examine how cargo is loaded and delivered using different modes of transportation and technology and investigate different delivery routes.

Key ideas

1. Map and begin to gain an understanding of where packages come from and how they get delivered to your front door.
2. Examine routes cargo trucks use for transportation. Where do you see trucks doing deliveries in your town?
3. Discuss how you load cargo and transport it to different areas?
4. Build the LEGO® model truck.
5. Create new truck designs.

Resources

Per team:

- LEGO® WeDo 2.0
- CARGO CONNECT℠ Explore Set
- Ramp (piece of cardboard) and books (props for ramp)
- Digital device (tablet, laptop)

Per learner:

- Engineering Notebook

Digital resources:

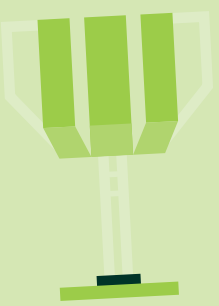
- Google Earth
- Scoilnet maps

Key curriculum content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Geography	Human environments; Natural environments	Living and working in local area/ contrasting part of Ireland (Subunits: People at work; Transport and communications); Local natural environment	Using maps and globes; Geographical investigation skills
Science	Energy and forces	Forces	Investigating and experimenting; Measuring; Questioning
Mathematics	Shape and space; Measure	2-D shapes; 3-D shapes; Time	Applying and problem-solving; Communicating and expressing
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 (curricular context setting) [20min]:
Trucks delivering in your town

Resources:

- **Google Earth**
- **Scoilnet Maps**



Core learning activities

Enquiry questions:

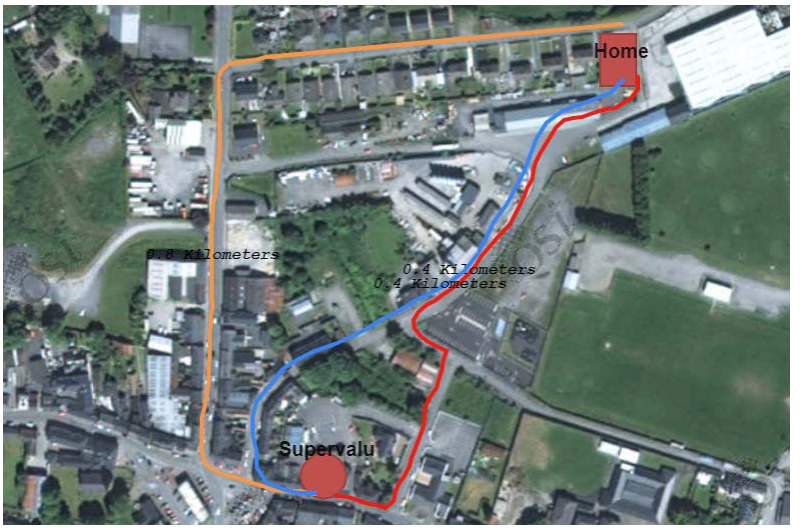
- How is cargo delivered using different modes of transportation?
- What delivery routes are used?
- Which route is best?

Using a Google Earth satellite function or the Scoilnet aerial photograph layer on the interactive whiteboard (Scoilnet Maps), zoom down to the local area/shops etc. Ensure the aerial layer is activated.

1. Learners should identify places on the map where they know that trucks make deliveries (eg local supermarkets, post office, factories).

2. Introduce the scenario of transporting goods from A to B (eg a home delivery from local supermarket to the school/designated home).

    - The learners could decide upon the fastest route for the cargo truck to go. They can determine the fastest routes by using the distance measurement tool on Scoilnet Maps or using string to measure distance on a printed map of the locality.



3. Introduce the learners to the LEGO® playmat. Identify and discuss different features represented on the playmat map such as hot and cold islands, seas, and various transport infrastructure (port, roads, rail, landing strip).

Development (build) [20min]

CARGO CONNECT℠ truck

In teams:

a. Learners talk about the guiding questions on p.8 of the Engineering Notebook, designing solutions in the provided spaces.
b. Learners follow detailed instructions to build the truck in the CARGO CONNECT℠ pack.

Individually or in small groups:

c. Learners design and draw a new truck that transports cargo.
d. Learners build trucks using the prototyping pieces (bag 4).

As a team:

e. Learners look at the map and circle routes that the truck can take - Engineering Notebook p. 9.

There is no coding required for this LEGO® model.

Closure (document/ share/tidy up) [10-15min]

Resources:

- Digital portfolio
- Digital device

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

2. Share:
   a. What they did in the session
   b. Explain how cargo is transported to and from their local area
   c. Describe and demonstrate their truck designs and builds

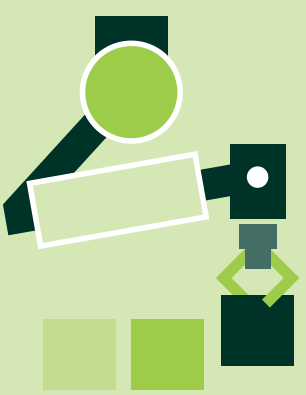
3. Tidy Up:

Keep assembled:	**Disassemble:**
The truck should stay assembled and returned to the designated storage space.	All other parts should be disassembled and stored safely, preferably in a labelled box per team.

Recommended curricular development [20min]

Resources:

- Cubes/books
- Ramp (cardboard)



1. In teams, learners modify their trucks.
   Here the learners could investigate changing different parts of the truck and investigate the impact of this 'change' on how the truck moves and transports cargo. For this the learners will need a ramp and some cubes/books to prop up the ramp.

2. Learners could investigate outcomes such as distance travelled and safety (eg whether or not the truck falls off the ramp). The following are samples of investigation questions that could be provided by the teacher. Learners should also be given the opportunity to come up with their own investigation questions.

   a. What impact adding additional wheels to the truck has on the distance the truck travels?
   b. What impact does adding additional cargo (weight) have on the distance the truck travels?
   c. Can I modify the design of the truck to carry more cargo?

It is important that the learners change only one design feature at a time and record the impact that change had on how the truck travels.

Suggested learning activities

Literacy - Writing: procedural writing
Outlining the process of transporting cargo (journey of the package), describing the route directions of delivery truck from A to B (go straight across the train tracks, turn right past the farm yard, go north towards the docks) .

Geography: use of geographical language
Directional language (over, under, past, nearby, through, around, etc) and cardinal directions (north, south, east, west) - as above (Literacy) when describing routes.

Mathematics - Shape and space/Spatial awareness: Bee-Bot directions
Lay a transparent Bee-Bot mat over the CARGP CONNECT^{SM} playmat and instruct learners to code the Bee-Bot to move from one location to another. Record these instructions (code) in pictures or words. Compare and contrast the efficiency of different routes. Use of directional language and cardinal directions (north, south, east, west) - as above.

Session 2:
Let's Transport

Time: 75 minutes (55 minutes core + 20 minutes suggested)
Team Meeting Guide p.10-11
Engineering Notebook p.8-9

Core Values:

Purpose: Learners examine how transport is changing, identifying various modes of transport used for different purposes in the transportation of cargo and the role of technology in these changes.

Key ideas

1. Build and code the LEGO® robot (Cooling Fan).
2. Design two forms of transportation that can transport cargo.
3. Explore where cargo fits on a vehicle. Build a vehicle that transports cargo.

Resources

Per team:

- LEGO® WeDo 2.0
- CARGO CONNECT℠ Explore Set (may need to break this down further)
- Digital device (tablet, laptop)

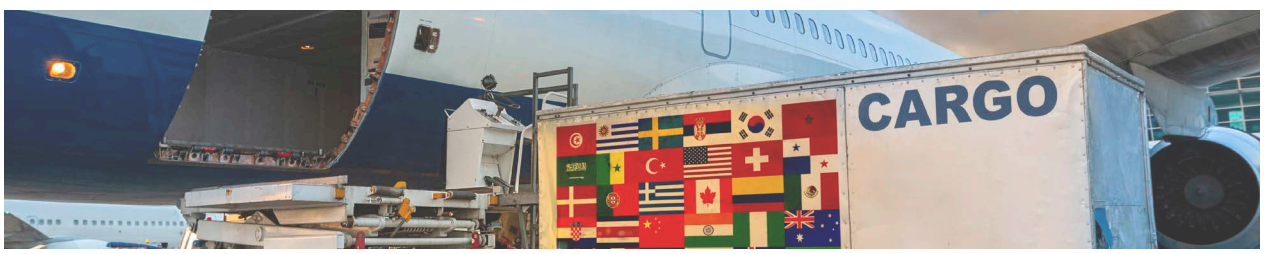
Per learner:

- A3 page for design and make activity
- Engineering Notebook

Digital resources:

- Video: **An Post Delivering the Future**
- Video: **Mushrooms from Farm to Fork**
- Link: **Cooling Fan Lesson Plan**

Key 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 line; An awareness of form; An awareness of space
Mathematics	Shape and space; Measure	2-D shapes; 3-D shapes; Time	Applying and problem-solving; Communicating and expressing
Science	Energy and forces; Materials	Forces; Properties and characteristics of materials	Designing and making
SPHE	Myself and others	My friends and other people; Relating to others; Designing and making	Communication; Co-operation; Decision-making
History	Continuity and change over time	Transport	Working as an historian (Time and chronology; Using evidence; Change and continuity, Cause and effect)
Geography	Human environments; Environmental awareness and care	Living and working in local area/ contrasting part of Ireland (Subunits: People at work; Transport and communications); Caring for the environment	Using maps and globes; Geographical investigation skills



Introduction (curricular context setting) [30min]

Resources:

- Video: An Post Delivering the Future

- Video: Journey of mushrooms from farm to fork.

Core learning activities

Enquiry questions:

- How is transport changing?
- What different modes of transport are needed in delivering a package?

Class discussion on transport in the past and how transport is changing into the future (eg horse-drawn carts, electric scooters, drones etc). **An Post Delivering the Future** is an excellent two minute video for stimulating thought and discussion.

Key questions:

- What different forms of transport did you see in the video?
- Why would An Post have cargo bikes, trucks, vans and drones? Why not just one mode of transporting cargo?
- What challenges would there be in transporting food or Covid19 vaccines etc? (linking to perishable cargo that need temperature control)

1. The learners should think about any packages they have had delivered to their own homes.

Key questions:

- How was the package delivered?
- What mode of transport was the postal worker/delivery person using? (not a truck, maybe a van, cargo bike, small van, etc?)
- Would it have come from the factory to your home on a bike?
- Why not?

2. Tracking the journey of a product that needs to be kept cool.

    a. The learners could use this **Video** to explore the journey of mushrooms 'from farm to fork'. Here they should observe the cooling fans in the 'fridge room' which helps to keep the mushrooms fresh.

Also note the cooling fans on the refrigerated lorries that are used to transport the mushroom cargo from the packhouse to the shops. "Learners should identify areas on the LEGO® playmat map that would require refrigerated transport.

b. Alternatively, the learners could pick a locally produced perishable product (eg milk/dairy) and identify the stages (in sequential order) of that product's journey from its origin to the shops, to homes. How is it transported? How is it kept fresh?

Development (build) [40min]

1. **In teams, learners engage with the LEGO® WeDo 2.0 classroom project Cooling Fan.**

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

   b. Learners are encouraged to complete challenge tasks: modify build and code so that a steering wheel / boat rudder / propeller is added to the robot.

Resources:

- LEGO® WeDo 2.0
- Engineering Notebook, p.10
- CARGO CONNECT℠
- Digital device

Coding and build

Resources:

- LEGO® WeDo 2.0
- Digital device
- Video: Cooling Fan Teacher Guide

- Link: **Cooling Fan Lesson Plan**

LEGO® Education WeDo classroom project: **Cooling Fan**

Purpose of the build:

- To introduce learners to the LEGO® Education WeDo software and block-based coding.
- To introduce the 'motor' block and explore what happens when the power of the motor is changed.

Enquiry questions:

- Could we build something that helps keep perishable goods cold?
- Could we change the power of our cooling fan to suit the different perishable goods that might be transported?

Once the code is executed (started), this robot will turn on the motor, which will cause the fan to begin moving.

This can be tinkered with in order to make the fan move more quickly/slowly, to change the direction of movement (clockwise/anticlockwise), and to change the duration the motor stays on for.

Guiding questions:

- Can you change the direction the fan 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 have the fan stay running for longer?
- What is the fastest and slowest speed you can set the fan to turn?

Development continued

2. In teams, learners build one other form of transportation following the design and make process, using the prototyping pieces.

Key questions:

- Can teams integrate the cooling fan into their prototype to keep their cargo cool?
- Or can teams use it as a method of propulsion for their vehicle?

3. Explore: Refer to the journey that a selected item takes to get to your home (eg banana, mushrooms, Amazon package etc) and the required conditions for some packages (chilled/refrigerated).

   a. Learners consider and list the different forms of transportation required to transport the product. Each group should choose one form of transport. Key enquiry question: How could you make the form of transport better? eg faster; more sustainable; more efficient. A key element of the design must be a place for the cargo to fit. S

   b. Plan: Each team must draw a detailed plan of their design (Engineering Notebook, p.11). Ask the learners to consider:
   What equipment do you need? Record the coding skills you will use. Use the coding skills you have developed through the Cooling Fan build.

   c. Make: Build the design using the prototyping pieces.

   d. Evaluate: Encourage the learners to reflect on their build with their team: How have you improved your form of transport? What other things would you like to add?

Closure (document/ share/tidy up) [10-15min]

Resources:

- Digital portfolio
- Digital device

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

2. Share:
   a. What they built.
   b. Show the coding skills they learned.
   c. Explain how they changed the program.
   d. Describe their transportation designs.
   e. Demonstrate their solutions.

3. Teams tidy up:

Keep assembled:	**Disassemble:**
The truck should stay assembled and returned to the designated storage space.	All other parts should be disassembled and stored safely in designated containers.

Important points to note

The transportation design task can be differentiated as required: teams can be asked to build an additional form of transportation.

The cooling fan mechanism could be integrated into a form of transportation in order to chill/refrigerate cargo.

Suggested learning activities

Mathematics - Data: traffic survey

- Undertaking a traffic survey from school gates or in different parts of the locality. Recording different modes of transport (tally) and presenting data in the form of graphs etc.

History: transport in the past

- Reviewing old maps of the locality through Scoilnet or Geohive and identifying evidence of different transport modes in the past (eg tramways, old rail lines, canals).
- Investigating an historical form of transport such as the canal and inland waterways system (barges used for transporting sugar beet, coal and turf). How these stopped when the railway system (which was faster and cheaper) was built.

Science; Geography: renewable and non-renewable energy transport S

- Exploring renewable and non-renewable energy transport modes - identifying various modes of transport used in the journey of cargo and categorising these into sustainable and unsustainable.
- Proposing alternative methods of transporting carbon in a more sustainable manner (less carbon food miles/carbon footprint).
- Case study of An Post's zero emissions postal delivery plan (Dublin, Cork, Galway, Limerick, Kilkenny, etc all zero emissions postal delivery). Investigating whether this could be done elsewhere and if it really is zero emissions throughout the entire journey.

Session 3:
Let's Sort

Time: 90 minutes

Team Meeting Guide p.14-15

Engineering Notebook p.12-13

Core Values:

Purpose: Learners develop an understanding of the stages of package/ cargo delivery and the role of sorting centres in this process.

Key ideas

1. Build and code the LEGO® project Spy Robot.
2. Can you build and code a robot that responds to motion?
3. Build the sorting centre Inspire model.
4. Can you build ways to load and unload cargo?
5. How is cargo sorted?

Resources

Per team:

- LEGO® WeDo 2.0
- Digital device (tablet, laptop)
- CARGO CONNECT℠ Explore Set
- A3 Paper

Per learner:

- Engineering Notebook

Digital resources:

- Video: **Journey of a Parcel**

Key curriculum content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Geography	Human environments	Living and working in the local area/ contrasting area (Subunits: People at work; Transport and communications); People and places in other areas; Trade and development issues	Using maps and globes; Geographical investigation skills (Investigating; Observing; Hypothesising; Communicating)
Science	Energy and forces; Materials	Forces; Properties and characteristics of materials	Questioning; Predicting; Investigating and experimenting
Mathematics	Shape and space; Measure	2-D shapes; 3-D shapes; Time	Applying and problem-solving; Communicating and expressing
Literacy	Oral language; Writing	Communicating	Communicating; Understanding; Exploring and using
Drama	Drama to explore feelings, knowledge and ideas	Cooperating and communicating in making drama; Exploring and making drama	Developing empathy
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

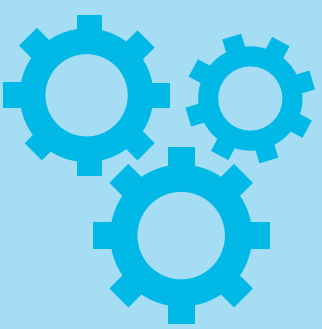
Introduction (context) [50min]

Resources:

- Sample of packages
- Digital resource tool (**Mentimeter**/ **Vevox**)

- Video: **Journey of a Parcel**

- **Jamboard** / A3 paper



Core learning activities

Enquiry questions:

- How is cargo sorted and sent to the correct destination?
- How is cargo generally packaged?
- What role does technology play in the sorting and delivery of cargo?

1. Teacher introduces the lesson by showing the learners the various packages (sample packages of various sizes delivered to the school with barcode, stamp, address, etc) and asking them if they have ever sent/received something in the post. A digital response tool (eg Mentimeter, Vevox) could be used to visualise learner responses (link to Mathematics: Data) and later included in the digital portfolios of learners.

2. Investigate the packages: Using their observation skills, the learners will examine some sample packages (eg cardboard box with address and barcode etc from delivery to the school). Here they will look for clues and hypothesise about and discuss where the package originated from, its final destination, how it was sorted, and how it got here, (eg address, barcodes, size, etc). Parallels could be drawn to familiar experiences such as check-out counters in supermarkets.

Key questions:

- Where did the package come from? How do you know?
- How might it have come here?
- What do you think the barcodes are for? What do they remind you of?
- How do you think packages are sorted/ categorised? (ie size, weight, colour, barcode, destination, etc).
- What is track and trace? How do you think people can track the package online?

3. Exploring the journey of a package: The learners should then observe the **video** of the 'Journey of a Parcel'.
   The learners can then discuss and record the sequence of steps entailed in Jack ordering and receiving his package (on **Jamboard** or using A3 paper). They should also identify the various jobs involved over the course of the package's journey. They should identify the importance of the sorting centre in the distribution and delivery of cargo.

The learners should observe the LEGO® playmat map and consider the best location for a sorting centre on this map and give reasons for their suggestions.

Key questions:

- Where did Jack's package come from?
- Where did it go before being sent to Jack's house?
- Why are packages screened at the sorting centre?
- Why do they scan the barcodes of the packages?
- What kinds of jobs did you see along the journey of the package/in the sorting centre?
- What kinds of technology are An Post using?

Development (build) [40min]

Coding and build

Resources:

- LEGO® WeDo
- Digital device
- Link: **Spy Robot Lesson Plan**

- Video: Spy Robot Teacher Guide

- Video: How a Distance Sensor Works

1. In teams, learners build the sorting centre
   a. Learners follow detailed instructions to build the sorting centre.
   b. Learners follow the specific task instructions in the Engineering Notebook (p.13).

2. In teams, learners engage with the LEGO® WeDo classroom project Spy Robot.
   a. Learners follow detailed instructions to build and code the Spy Robot.
   b. Learners encouraged to complete challenge tasks: modify their code in order to change the sound, or flash a light.

LEGO® Education WeDo classroom project: Spy Robot

This classroom project is called the 'Spy Robot', but within the context of CARGO CONNECT℠ it could be considered a 'Checker-bot' because it checks for movement.

Purpose of the build:

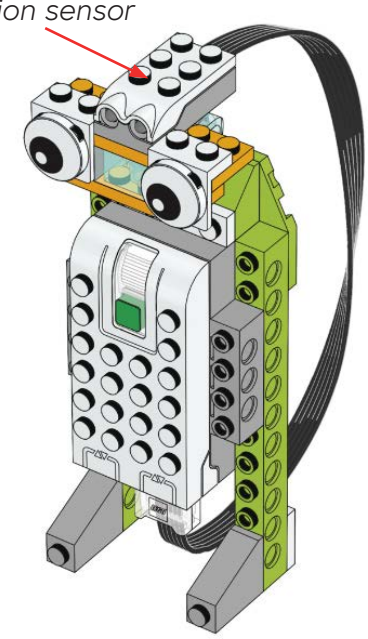
- To introduce learners to the motion sensor and explore how it can be used to play a sound when motion is detected.
- To introduce conditionals; a sound is played, if motion is detected.

This robot will respond to motion by playing a sound. This can be tinkered with in order to play different sounds, and/or turn on coloured lights on the Smart Hub.

Enquiry questions:

- Could we build something that would let An Post sorting centre workers know that a parcel was in their work area?
- What ways could the An Post worker be alerted? Could we cater for all abilities (sight/hearing difficulties)?

Motion sensor



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?

Important points to note

The Smart Hub does not have a speaker built in. Any sounds will play from the digital device being used, so ensure the sound is turned up.

The sorting centre is manual for now - learners must turn crank left to sort to blue bin, right for green bin.

[Potential difficulty for any learner suffering from colour blindness]

Connect to telling time by sharing that turning the crank right is clockwise and turning it left is counterclockwise.

Closure (document/ share/tidy up) [10-15min]

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

2. Share:
   a. Teams are encouraged to demonstrate their builds and coding in order to demonstrate what they did, and explain how they did it. Specific focus given to how teams modified their coding for the Spy Robot.
   b. Teams describe how cargo is loaded and unloaded.

3. Tidy up:

Keep assembled:	**Disassemble:**
The sorting centre and truck stay assembled and are returned to the designated storage space.	Spy Robot disassembled and WeDo kit sorted correctly.

Resources:

- Digital portfolio
- Digital device

Recommended learning activities

Investigating a pulley system to load and unload cargo.

Key questions:

- What is a pulley?
- Where would you find a pulley?

Equipment: Pencil, empty thread spool, string, plastic milk carton filled with water, fixed pulleys and movable pulleys.

Sample activities:

A. **Simple pulley system:** Investigate lifting the milk carton without the pulley system.
Use the thread spool, string and pencil to lift the milk carton.
Which is easier? Why?

B. **Measuring force:** Use a force meter to measure the force needed to lift the milk carton.

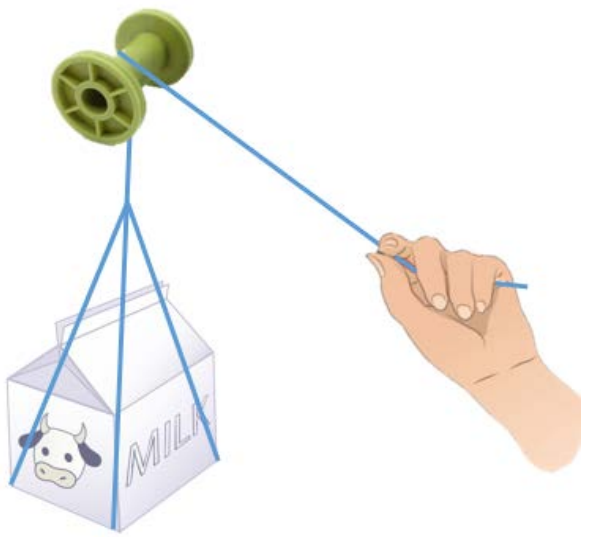
C. **Fixed and movable pulleys:**
(i) Fixed pulley system
Put a stick/broom handle between two desks. Attach a fixed pulley to the stick. Hang the string through the pulley and attach it to the milk carton.
Lift the milk carton.
Observe the force needed.
Measure the force needed using the force meter.

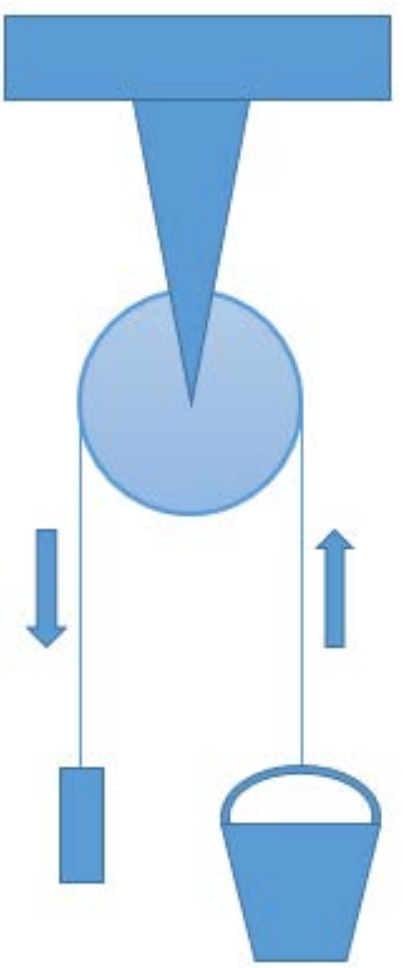
(ii) Movable pulley system'
Attach the string to the stick/broom handle. Attach the milk carton to the movable pulley. Lift the milk carton using the string.

Observe the force needed
Measure the force needed using the force meter.
Compare the force need to lift the milk carton using the fixed and movable pulley system.

Now use a combination of fixed and movable pulleys to lift the milk carton.

Science: Can you build ways to load/unload cargo?





Fixed pulley

Predict what force will be required to lift the milk carton.
Which combination works best? Why?

D. **Design and make:** A pulley system that will lift a load onto and off the LEGO® truck.

Explore: The children will explore different types of pulley systems through activities A to C above.

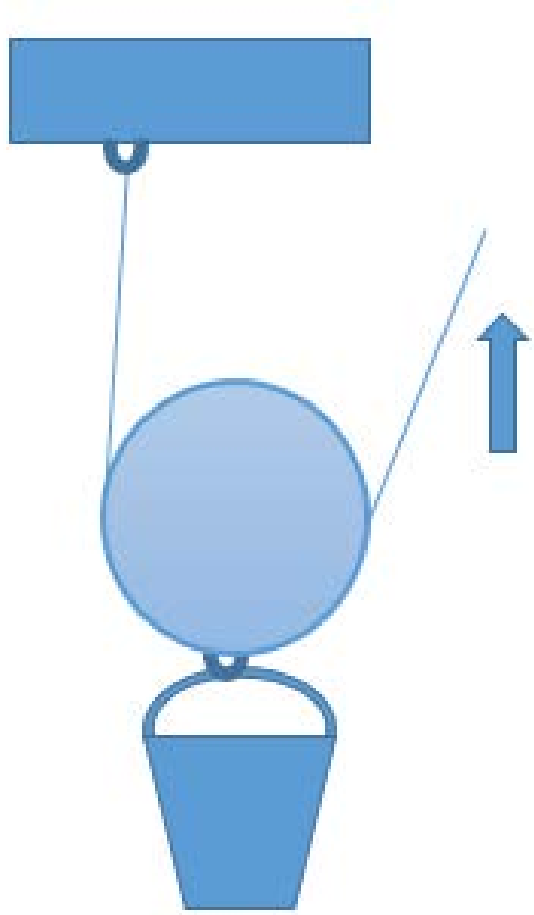
Plan: Plan your pulley system.

How many pulleys will be used? How will these be supported? Make a list of all the equipment you require. Remember the load should be lifted onto the truck and then lifted off the truck when it reaches the sorting centre. Consider the shape of the lifting device? Will it be able to lift a variety of packages of different shapes and sizes?

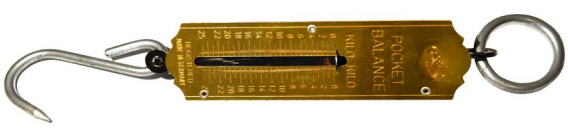
Make: Make your pulley system

Evaluate: Try your pulley system with a variety of items? Will the pulley system lift the load onto the truck and remove the load at the sorting centre? Do you need to make revisions to your design?

Please refer to Science Teacher Guidelines (DES, 1999), Exemplar 46, pp 138-139,for further details on a similar design and make activity using a pulley system.



Movable pulley



Force meter

Suggested learning activities

Drama: Role play

The class could organise the furniture and layout of the classroom to reflect the journey of a package. Here the learners can re-enact the journey of a package from original online order, packaging and sorting through to delivery (eg using tables as conveyor belt, role-playing various jobs, etc).

Mathematics: Time

Measures/Time: clockwise and anticlockwise

Related LEGO® WeDo 2.0 guided lesson:

Lessons - Science - Speed (PDF linked lesson)

Investigating what factors can make a car go faster to help predict future motion.

Session 4:
Let's Drive

Time: 60-90 minutes
Team Meeting Guide p.16-17
Engineering Notebook p.14-15

Core Values:

Purpose: Learners build and code a motorised LEGO® robot in order to deliver cargo to the sorting centre.

Key ideas

1. Build and code the LEGO® robot: Milo the Science Rover.
2. Add a cargo container to Milo the Science Rover.
3. Identify routes used for transportation.

Resources

Per team:

- *LEGO® WeDo 2.0*
- *Digital device (tablet, laptop)*
- *CARGO CONNECT™ Explore Set*

Per learner:

- *Engineering Notebook*

Digital resources:

- Google Earth

Key curriculum content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Geography	Human environments; Natural environments	Living and working in the local area/ contrasting area (Subunit: Transport and communications) Trade and development issue; Local natural environment	Using maps and globes; Geographical investigation skills (Observing; Recording; Communicating)
Mathematics	Shape and space; Measure	2-D shapes; 3-D shapes; Time	Applying and problem-solving; Communicating and expressing
Science	Energy and forces; Materials	Forces; Properties and characteristics of materials	Designing and making; Observation; Investigating and experimenting; Recording and communicating
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
Music	Performing; Composing	Playing instruments; Improvising and creating; Talking about and recording compositions	A sense of pulse/ tempo/duration/ dynamics/ structure/style

Introduction (context) [10min]

Resources

- **Google Earth**
- **Scoilnet Maps**

Core learning activities

Enquiry questions:

- How do delivery drivers know where to go?
- What directions should freight drivers follow in collecting and delivering cargo?

Using a Google Earth satellite function or the Scoilnet Maps aerial photograph layer on the interactive whiteboard, zoom down to the local area/shops etc. Ensure the aerial function is activated.

a. Learners should identify a local shop where they know that trucks make deliveries.
b. Ask learners to identify the routes that a freight driver could take in delivering cargo to the local shop. If a warehouse or factory exists in the local area, learners could be asked to identify the route from the warehouse/factory to the local shop, as in the example below.
c. Learners should observe the LEGO® playmat map and identify ways in which freight is transported to and from the sorting centre and port area (road, rail, sea, air).

Development (build) [40min]

Coding and build

Resources

- LEGO® WeDo
- Digital device
- Additional LEGO® pieces
- CARGO CONNECT℠ playmat
- CARGO CONNECT℠ sorting centre
- Link: **Milo the Science Rover Lesson Plan**

- Video: Milo the Science Rover Teacher's Guide

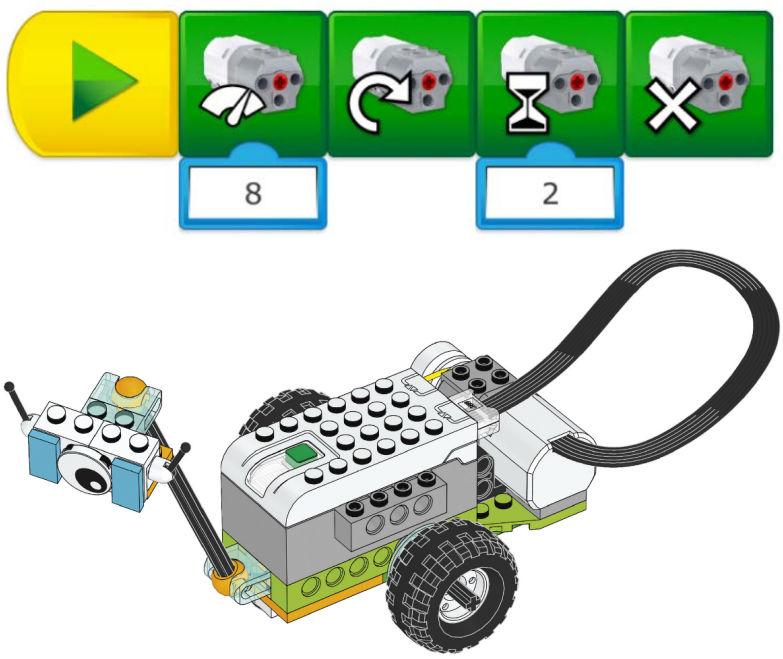
Enquiry questions:

- Can we build a robotic vehicle to transport goods to the sorting centre?

1. In teams, learners engage with the LEGO® WeDo classroom project, Milo the Science Rover.
   a. Learners follow detailed instructions to build and code the LEGO® robot.

LEGO® Education WeDo classroom project: Milo the Science Rover

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 the engine.



Guiding questions:

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

Development continued

b. Learners are encouraged to modify the program (code) in order to consider the challenge tasks; move backwards
   i. *Add sounds (what sounds do trucks make?)*
   ii. *Add a sensor to make Milo start and/or stop*
   iii. *do a turn (see Important points to note)*
   iv. *other adaptations of their choosing - Engineering Notebook. p.14 can be used for planning code changes)*

Important points to note:

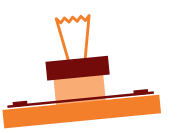
Milo the Science Rover is not mechanically capable of turning due to its design. The purpose of this challenge task is to encourage learners to consider the design of a robotic model and any limitations it may face.

Students could program Milo to travel set distances and place a pause (wait block) in the code to allow them to pick up and manually turn Milo.

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 when building the Spy Robot: The motion sensor could be used to start or stop Milo's movement.

Similarly a sound could be played or a light could flash when the code begins or ends. This idea could be used similarly to the reversing warning on trucks: Milo could warn learners that it is about to move by playing a noise or flashing a light.



Development continued

c. Learners design and build a cargo container which could be added to Milo. Investigate if they can code Milo to move with the cargo container attached.

2. Working in teams, learners set up the CARGO CONNECT℠ playmat, with the sorting centre positioned correctly. Learners then consider the enquiry questions relating to the CARGO CONNECT℠ playmat (Engineering Notebook. p.15):

   a. What routes are used to get cargo to the sorting centre?
   b. How does a freight driver (or our imaginary CARGO CONNECT℠ truck driver) know what routes to use when transporting cargo?

3. Teams choose a route that Milo can follow in order to transport cargo to the sorting centre. Teams create and test programs which will direct Milo to follow the chosen route.

   a. Teams create and test programs for alternative routes.
   b. Teams evaluate the routes followed - this could be based on time, distance travelled, simplicity of code, etc.

Closure (document/ share/tidy up) [10-15min]

1. Document: Each team documents and reflects upon their builds.
2. Share:
   a. What they did in the session
   b. The coding skills they learned
   c. Explain how they changed the program
   d. Demonstrate how their robot transports cargo on the mat
3. Teams tidy up:

Keep assembled:	**Disassemble:**
The sorting centre and truck should stay assembled and be returned to the designated storage space.	Milo disassembled and the WeDo kit sorted. All other parts should be disassembled and stored safely in designated containers.

Resources:

- Digital portfolio
- Digital device

Recommended learning activities

Science: Investigating with Milo

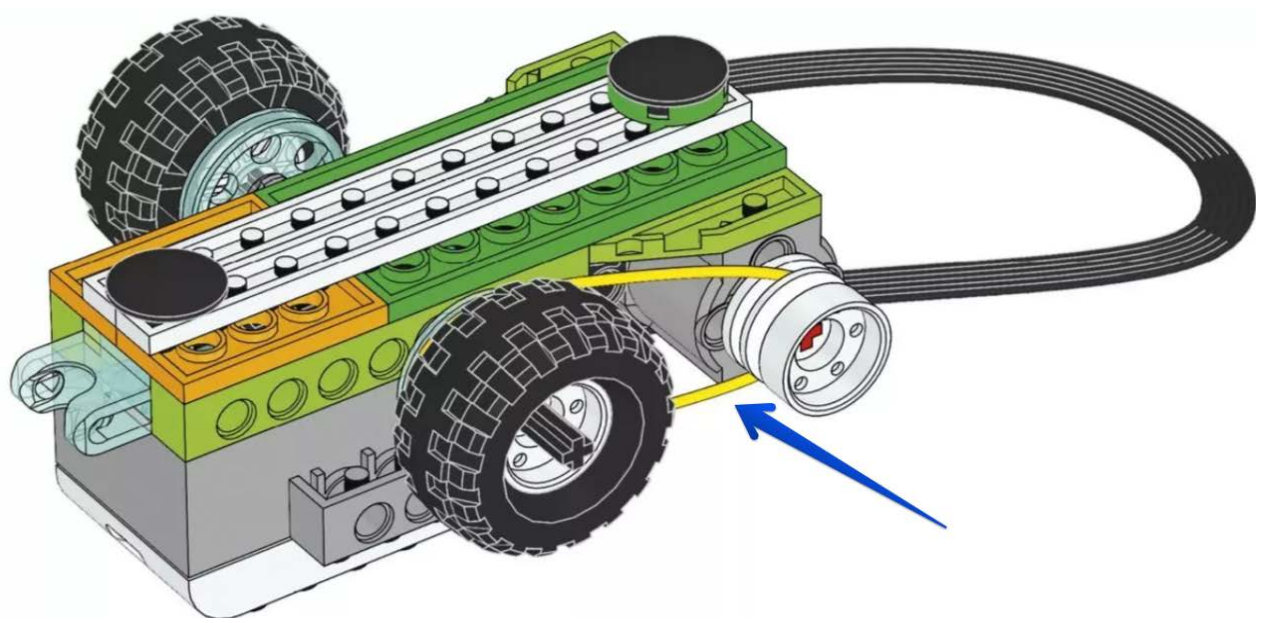
Learners work in groups to programme the 'fastest' Milo. Each group will be given an investigation question:

- What impact does adding additional wheels have on the time it takes Milo to travel 2 metres? Predict how long you think it will take? Record your findings.
- What impact does adding larger wheels have on the time it takes Milo to travel 2 metres? Predict how much faster/slower? Record your findings.
- If I change the pulley system on Milo's wheel, what impact will it have on the speed of Milo? (See images A and B of Milo's wheel and pulley system. These are examples of how the pulley system can be changed)

In groups, learners use the results from the above investigations to redesign a 'faster' Milo.

A

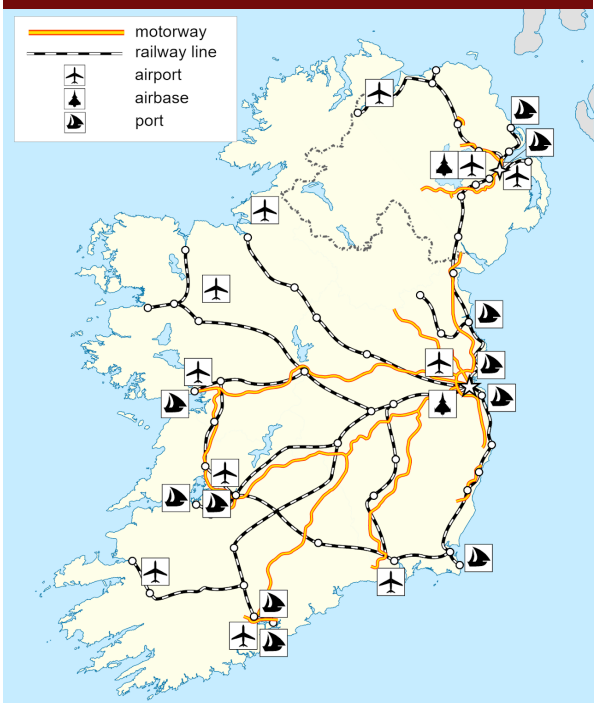
B



Further afield: using class atlases and/or roadmaps/Google Earth, the learners should plan the fastest route to export cargo from their local area to larger cities/ports such as Cork, Dublin or Galway. Learners should consider different road types (local, regional and motorway roads) and rail connections to and from their local area.

a. Learners could trace the routes on maps, and write out what roads to take (eg N55 onto M3, etc) using geographical directional language (linking to Procedural writing in Literacy).
b. Learners could record the distances with string (link to Measures in Mathematics) or on the digital maps on Scoilnet Maps or Google Maps and estimate journey time

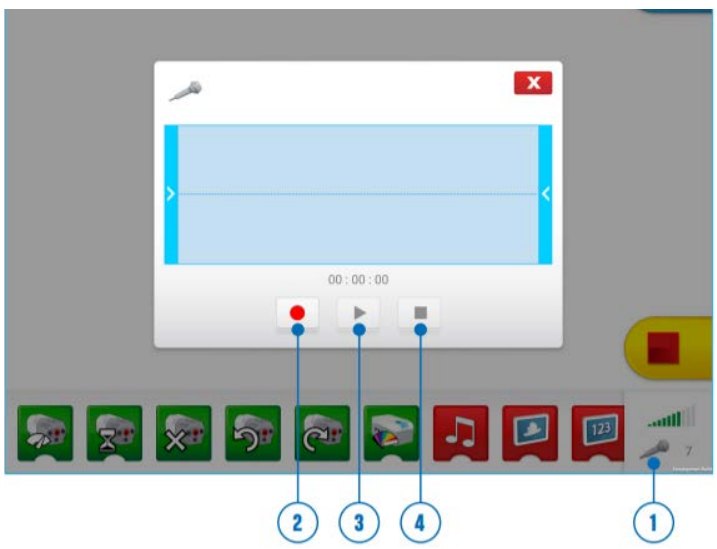
Geography: Mapping routes for transport



Suggested learning activities

Music: Composing; Performing

- Compose and perform a short melody which could be recorded and played by Milo the Science Rover as part of its program.
- Inspiration could be taken from the **musical recycling trucks in Taiwan**, or **ice cream trucks**



1. Press the Mic icon to access the window.
2. Press the Record icon to begin recording.
3. Press the Play icon to play back the recording.
4. Press the Stop icon to stop the recording.

Session 5:
Let's Motorise

Time: 60-90 minutes

Team Meeting Guide p.18-19

Engineering Notebook p.16-17

Core Values:

Purpose: Learners determine how products are packaged, what products are transported in the cargo containers and how packages get transported in and out of their community.

Key ideas

1. Determine what products are transported in the cargo containers.
2. Construct and code the motor and hub build and then modify the program to sort blue cargo.
3. Investigate what cargo is transported in and out of your community.
4. Talk as a team about how a warehouse worker ensures cargo is sorted correctly.

Resources

Per team:

- *LEGO® WeDo 2.0*
- *Digital device (tablet, laptop)*
- *CARGO CONNECT℠ Explore Set*

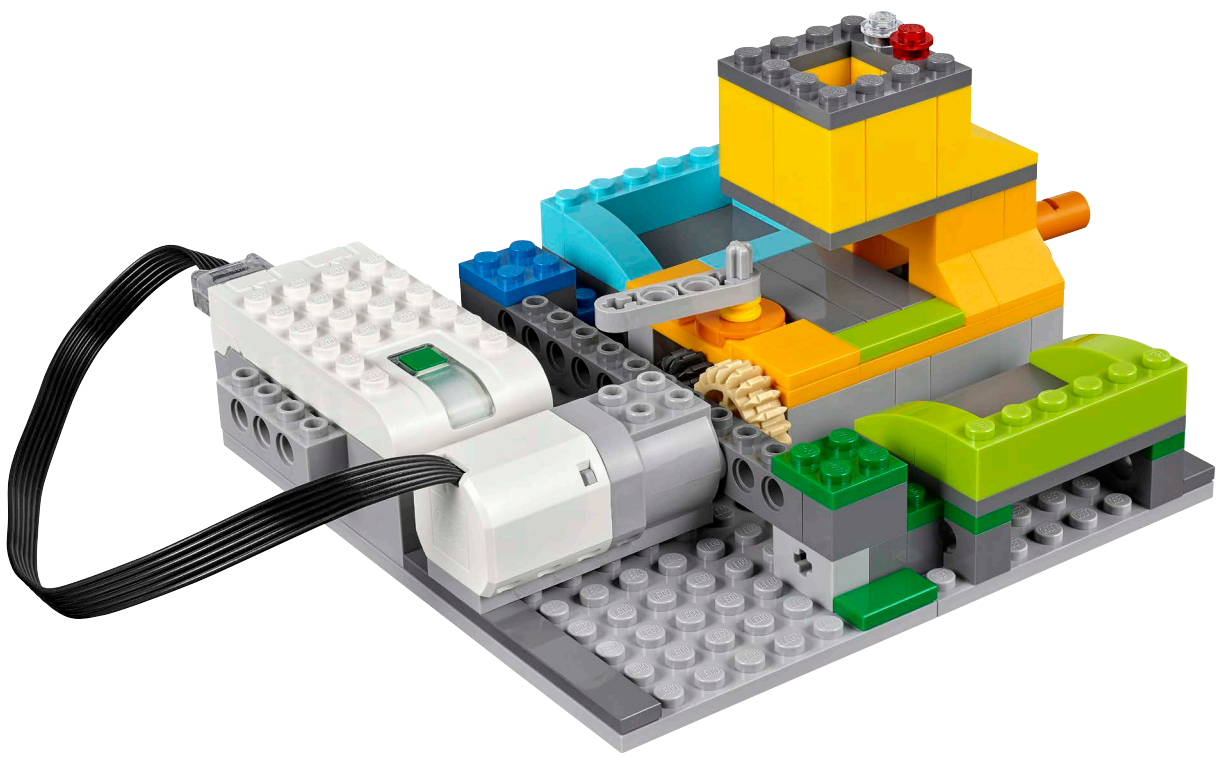
Per learner:

- *Engineering Notebook*

Digital resources:

- Images of LEGO® box packaging (to be printed or photocopied)

Key curriculum content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Literacy	Oral language; Writing	Communicating	Communicating; Understanding; Exploring and using
Geography	Human environments	Living and working in the local area/ contrasting area (Subunit: Transport and communications) People and places in other areas; Trade and development issues	Using maps and globes; Geographical investigation skills (Observing; Recording; Communicating)
Science	Materials	Properties and characteristics of materials	Designing and making: Explore, plan, make, evaluate
Drama	Drama to explore feelings, knowledge and ideas, leading to understanding	Exploring and making drama	Prerequisites for making drama; Elements of drama



Introduction:
(context) [20min]

Resources:

- Resource 3: The Journey of LEGO® from Factory to Store (Sequencing images)
- Video: **Amazon Sorting Centre**

Note:

Package = 1 product

Cargo = multiple packages

Core learning activities

Enquiry questions:

- What is the difference between a product, package and cargo?
- What could be inside each package?
- How are products generally packaged?
- What role does technology play in the sorting and delivery of cargo?

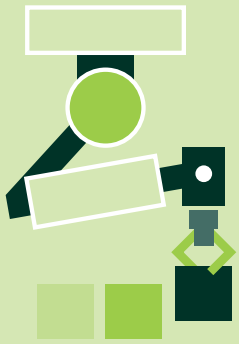
Thinking over previous lessons such as the transportation of bananas and other products, learners should consider how products are packaged and how these packages are transported as cargo.

a. Class discussion on the packaging of products and how products are safely and securely transported from origin to destination.

b. In groups, the learners should sequence the Images of a box of LEGO®: packaging, loading, unloading and delivery, and creating caption for each image using the correct terminology (product, package, cargo) to describe what is happening and how the box of LEGO® is packaged along with other boxes in larger cardboard boxes as cargo etc.

Key questions:

- What is the difference between a product, a package and cargo?
- What could be inside a package? How do you know?
- How are different products packaged and transported differently? (eg perishable products, fragile products such as glass)



Imports and exports to and from the local area: Here the learners should consider what products are produced in and exported from their local area (eg local factories/ quarries/farms/fisheries) and also what products are imported into their local areas (eg food stocks for supermarkets/restaurants, stock supply for newsagents, pharmacies, etc).

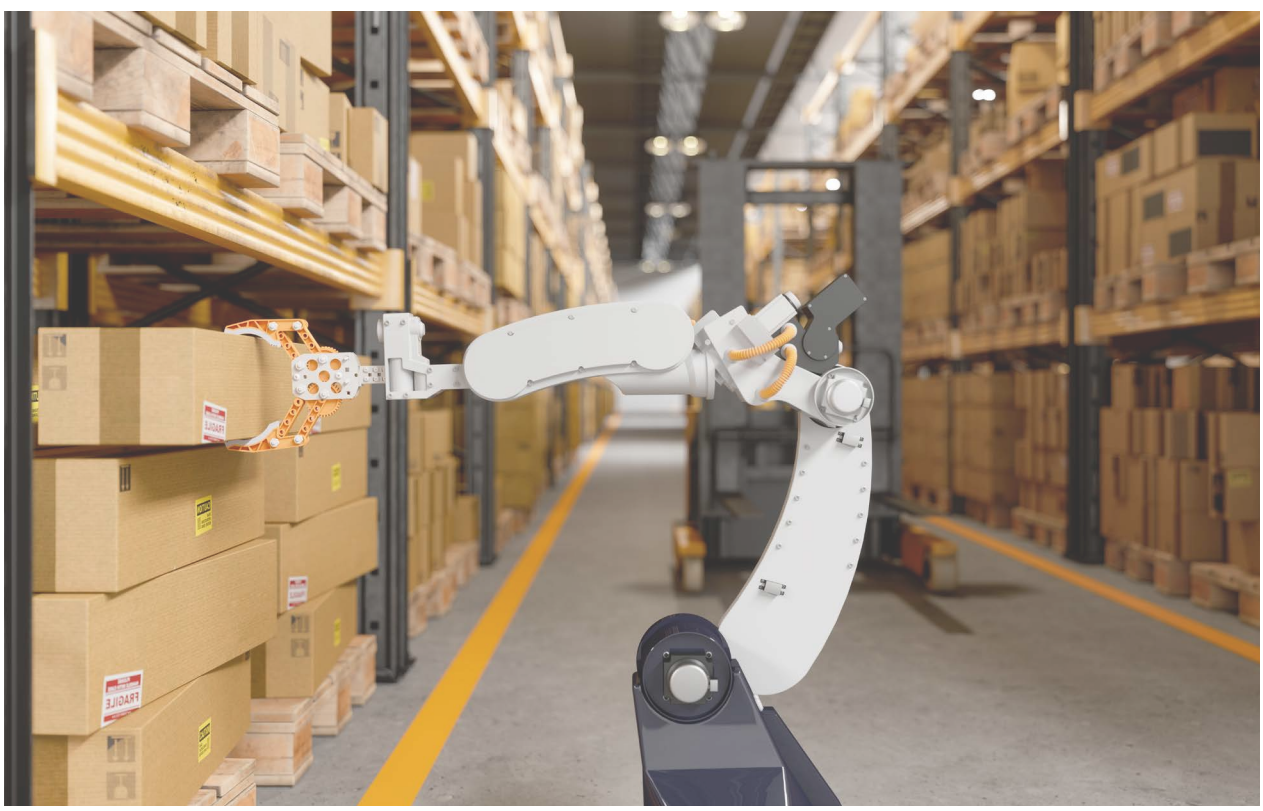
Key questions:

- What products do we produce in our locality?
- Where do we export these products to?
- What about products that come into our locality? What kinds of products do we not produce locally that we need to import? How do they get here?

Sorting centres: The learners should then observe the two-minute video of the Amazon sorting centre and discuss the role of technology in sorting and moving packages around the sorting centre.

Key questions:

- What kinds of robots/technology did you see in the Amazon sorting centre?
- How do the robots know where to go? (motion sensors/QR codes etc)



Development (build) [30min]

Coding and build

Resources:

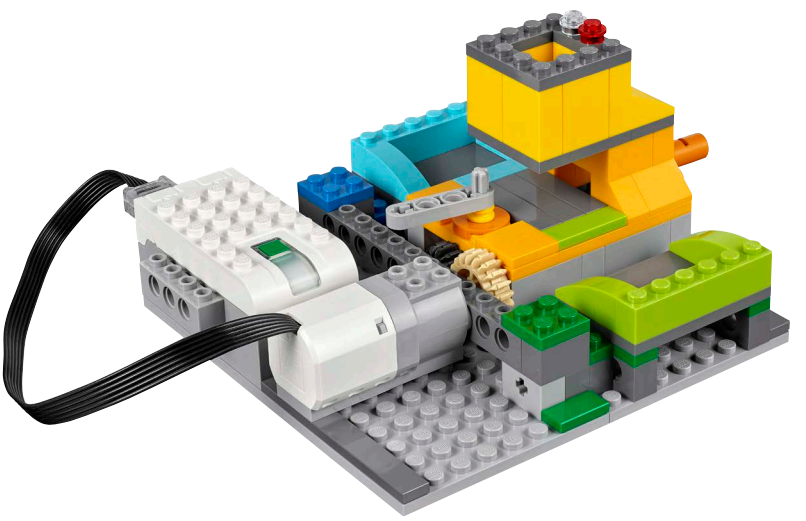
- Engineering Notebook
- CARGO CONNECT℠ sorting centre
- LEGO® WeDo
- Digital device
- Video: Motorising the Sorting Centre Teacher Guide

1. Using Ruby and Jacob's questions as a prompt (Engineering Notebook p.16), learners think about the types of cargo, packages and products that might be represented by the differently coloured blocks.

Important points to note

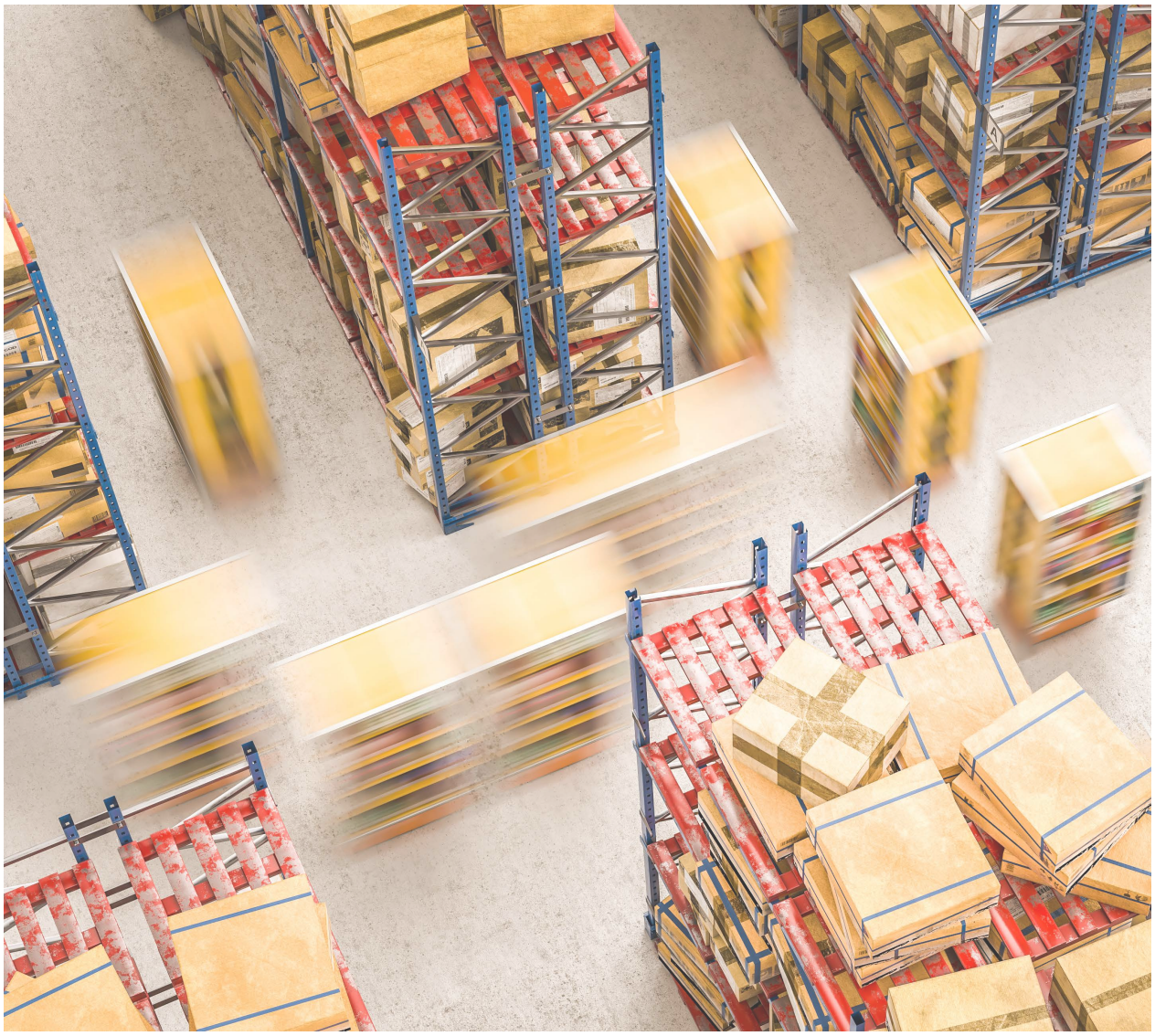
Learners should be encouraged to apply their knowledge and skills from previous coding activities when modifying the motorised sorting centre.

2. In teams, learners motorise the sorting centre
   a. Learners follow detailed instructions to build and code the motor and hub build.
   b. Learners connect the motor and hub build to the sorting centre (previously built)
   c. Learners work together to adapt the program provided in Book 2 so that blue cargo can be sorted.
   d. Learners collaboratively plan how they could change the program to add functionality (e.g. sound/lights/sensor/etc).
   e. Learners test their program and debug any unexpected difficulties.



Guiding questions:

- Can you modify the code so that the blue cargo is sorted?
- I wonder what would happen if you change the motor direction?



Closure (document/ share/tidy up) [10-15min]

Resources:

- Digital portfolio
- Digital device

1. Document: Each team documents and reflects upon their builds.

2. Share:
   a. What products are in the cargo containers
   b. Demonstrate how they motorised the sorting centre
   c. Explain how they changed the code to sort the blue cargo.

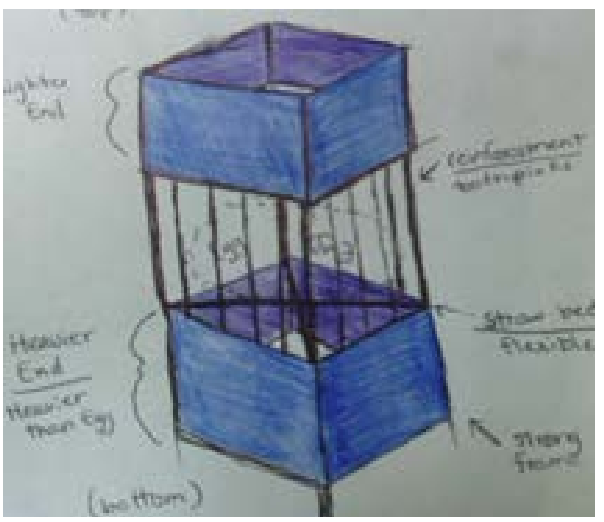
3. Teams tidy up:

Keep assembled:	**Disassemble:**
The motorised sorting centre and truck should stay assembled and be returned to the designated storage space.	All other parts should be disassembled and stored safely in designated containers.

Suggested learning activities

Science: egg drop

Learners work in groups to design and make 'packaging' that will allow an egg to be dropped safely to the ground (without breaking). Learners explore and observe different types of materials and their characteristics (for example bubble wrap, felt, newspaper, cotton wool). In groups learners plan and make their design. Learners then test their design and evaluate it in terms of whether or not the egg broke when it reached the ground.



Geography: People at work; Local produce

The class could focus on a product which is produced in the local area (such as agricultural product, factory product (furniture, pharmaceuticals, etc). They could invite a worker related to this product to come into class (physically or virtually) and interview them about their work, what they do, their product, etc.

Drama: Drama to explore feelings, knowledge and ideas, leading to understanding; Exploring and making drama

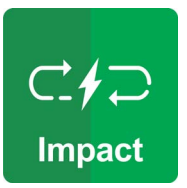
Learners open an imaginary package and convey its contents to their classmates using mime. learners can either choose their own contents, or the teacher can have options prepared in advance. Classmates take turns to guess the contents of the imaginary package. The learner with the correct guess takes the next turn at miming.

Resource 3: The journey of LEGO® from factory to store (sequencing images)

Session 6:
Let's Be Safe

Time: 75-100 minutes
Team Meeting Guide p.20-21
Engineering Notebook p.18-18

Core Values:



Purpose: Learners will consider and design ways to safely transport cargo across water.

Key ideas

1. Build a form of transport to transport cargo by air and water.
2. Can you build ways to safely transport cargo from the sorting centre to the island and icy area (playmat).
3. Code the sorting centre to respond to a sensor and have safety flashing lights when sorting.
4. Explore the work of a safety specialist. How would a safety specialist do a safety check in a sorting center.

Resources

Per team:

- *LEGO® WeDo 2.0*
- *Digital device (tablet, laptop)*
- *CARGO CONNECT℠ Explore Set*

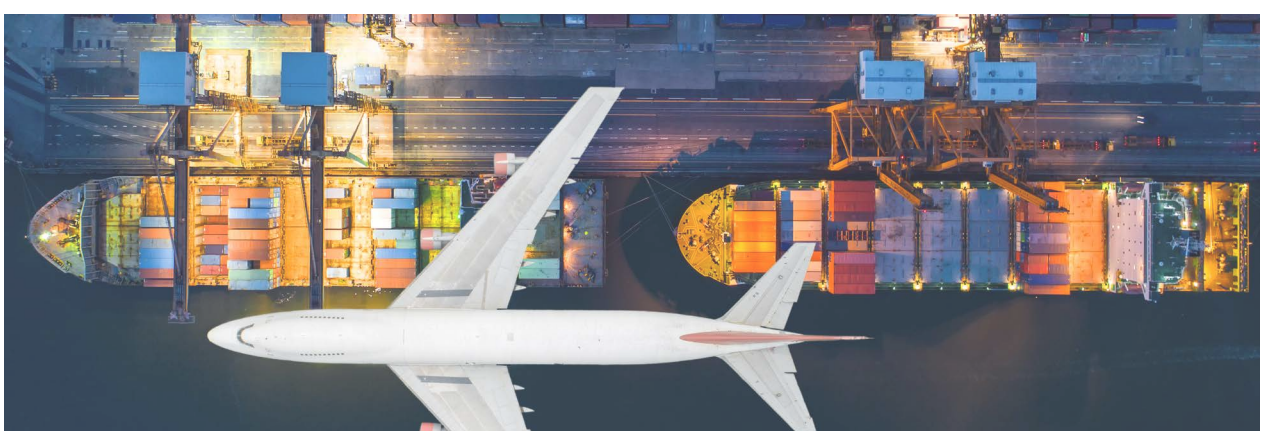
Per learner:

- Engineering Notebook

Digital resources:

- Pictures of various forms of transport
- Diamond 9 ranking template
- Video: **Safety operation in Amazon warehouse**
- Website: **Vessel tracker website**

Key curriculum content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Geography	Human environments; Natural environments	Living and working in the local area/ contrasting area (Subunit: Transport and communications) People and places in other areas; Trade and development issues; Lands, rivers and seas	Using maps and globes Geographical investigation skills (Investigating; Hypothesising; Recording and communicating)
Science	Energy and forces; Materials	Forces; Properties and characteristics of materials	Designing and making: Explore, plan, make, evaluate. Working scientifically (Questioning; Investigating and experimenting)
History	Eras of change and conflict	Traders, explorers and colonisers from Europe	Working as an historian (Time & chronology; Change and continuity; Cause and effect)
SPHE	Myself; Myself and others; Myself and the wider world	Safety and protection; My friends and other people; Relating to others; Developing citizenship	Personal and self-management skills



Introduction (context) [20min]

Resources:

- **Vessel tracker website**

- Resource 4: Different modes of transport across water
- Resource 5: Diamond ranking template

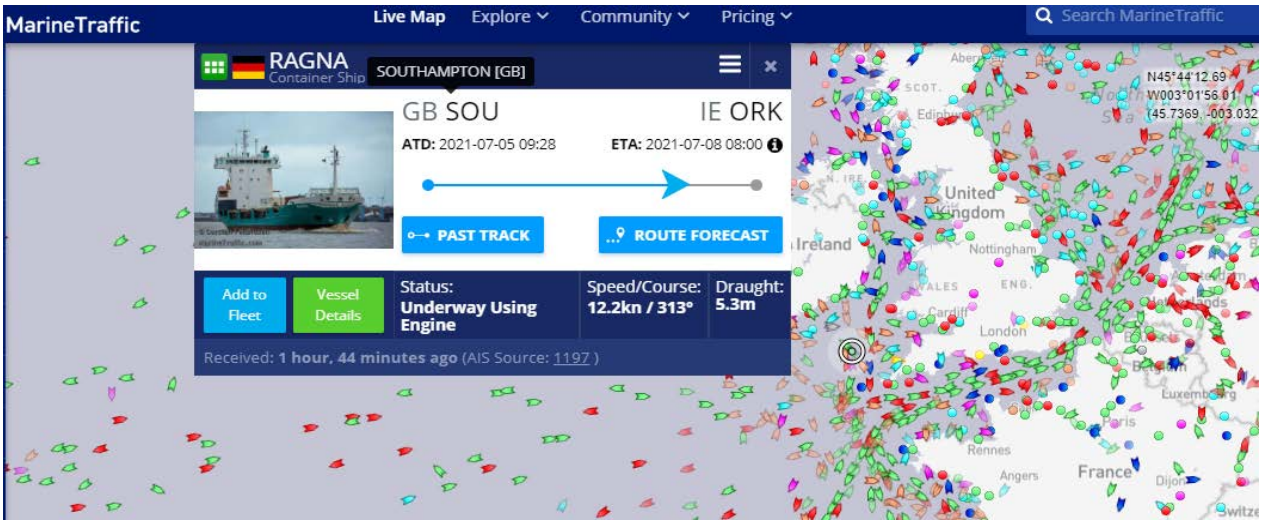
Core learning activities

Enquiry questions:

- How is cargo transported across water?
- What different modes of transport could be used to move cargo under, across or over water?
- Which transport modes are best for this purpose?

1. Learners observe the LEGO® playmat map and consider the fact that cargo will need to be transported across water to get to the hot and cool islands. In pairs, learners discuss the idea of transport across water (seas and oceans), listing different modes of transport for crossing a body of water.

2. Learners could investigate live shipping routes using the **vessel tracker website** whereby they can click on a vessel around Ireland/anywhere in the world and will obtain live information on the origin, destination and purpose of each vessel.



3. Investigating transport over water:
   a. Each group of learners could be given pictures of various forms of transport across, over or under water. They should identify each mode and hypothesise as to the usefulness of each mode.
   b. The class can decide upon a criteria for evaluating the effectiveness of each transport mode (eg speed, safety, capacity for carrying large amounts of cargo, cost of building, environmental impacts, etc). They could write the criteria on a diamond 9 ranking template and rank each factor in accordance to its importance. S
   c. Groups should compile a list of advantages/disadvantages for each transport mode.

Development (Build) [40min]

Coding and build

Resources:

- CARGO CONNECT℠ playmat
- CARGO CONNECT℠ prototyping pieces
- CARGO CONNECT℠ sorting centre
- LEGO® WeDo
- Digital device
- Additional LEGO® pieces
  Video: **Safety operation in Amazon warehouse**

- Video: Coding a flashing light

1. Design how you would transport cargo by air and water
   a. In teams, learners use the CARGO CONNECT℠ playmat to map the journey of a product. Learners consider different ways they could transport the cargo from land to the island.
   b. Learners design how they would transport the product over the water (this could be by air or water). In teams learners build their design using the prototyping pieces.
   c. In teams learners re-examine the journey from a safety perspective. learners assess and identify potential safety hazards along the journey. learners then consider how they could make the journey safer.
   d. Learners use their LEGO® pieces to add features to enhance the safety of the journey (eg How could you ensure that the cargo does not fall off the ship? Determine how much cargo (weight) that the mode of transport can carry? Add ramps when loading and unloading cargo).

2. Innovate upon the sorting centre coding in order to add a safety light
   a. Watch the video: **Safety operation in Amazon warehouse**. Learners consider the safety issues raised in the video and discuss the role of sensors to enhance the safety of the Amazon sorting centre.
   b. In teams, learners code the sorting centre to have a safety flashing light when sorting.
   c. Learners add a sensor to the sorting centre and code it. Discuss how this makes the sorting centre safer?

Coding and build

Resources:

- CARGO CONNECT℠
- LEGO® WeDo
- Digital device

This activity involves learners building upon what they have learnt in previous lessons. The following images are not the solution, rather, they are to aid in reaching a working solution.

This algorithm will set the motor power to 8, the direction of movement to clockwise, the duration to 2 seconds, and then stop the motor.

This block will direct the Smart Hub to turn on light colour 1.

The program below will make the light blink.

Guiding questions:

- Can you tinker with the code in order to make the process safer?
- Could a sound be played while sorting is in progress? Linked to what they saw on the Amazon sorting centre video.
- Could you make the centre flash a light to warn that it is active?
- How can we innovate upon what we have previously learnt?
- Can we make the light blink on/off?
- Could we have two lines of code in our program? One for movement and one for the light?

Important points to note

The LEGO® WeDo 2.0 app includes a program library which details ways in which learners could 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.

Closure (document/ share/tidy up) [10-15min]

1. Each team documents and reflects upon their builds.

2. Share:
   a. How they safely transported cargo across the water
   b. Point out the safety features present on their build
   c. Explain how they coded a safety light

3. Teams tidy up:

Keep assembled:	**Disassemble:**
The motorised sorting centre and truck should stay assembled and returned to the designated storage space.	All other parts should be disassembled and stored safely in designated containers.

Resources:

- Digital portfolio
- Digital device

Recommended learning activities

Science: Investigating different ways to transport cargo over water

A hovercraft can travel over water and land because they move across a layer of air. Make your hovercraft using the following equipment: old CD, balloon, pop-up top from drinks bottle, glue or packaging tape.

1. Take the pop-up lid and carefully glue it to the centre of the CD.
2. Leave to dry and ensure that it is secure. Place the balloon over the top of the popup lid.
3. Inflate the balloon through the centre of the CD.
4. Pinch the neck of the balloon to stop the air coming out.
5. Remove your hand from the balloon when you are ready to test your hovercraft.

Design and make a hovercraft [60 min]

Investigate, measure and communicate: How far your balloon will travel if you inflate your balloon by different amounts.

How far does your balloon travel over different surfaces?

Groups of learners work together to design a way of getting cargo to and from a lighthouse based on a small island 200 metres from the nearest land. The design will need to use a zipline to carry the cargo safely across the waves which can be high during storms.

Provide the learners with a range of materials for this activity: different types of material for zipline (wool, twine, string), plastic spindle, Blu Tack, elastic bands, straws, sticky tape, coloured card, weights (for testing).

Explore: Learners should investigate different variables that affect their zipline. For example, how does the incline of the zipline affect how fast something is delivered?

Does the weight of the cargo affect the way it travels down the zipline?

How does the material the zipline is made from affect the speed the cargo travels down the wire?

Plan: Using the results from their investigation each team should plan their zipline design. Each zipline must travel 200 cm and carry a load of 100 grams safely across the 'water' in the fastest times.

[Or] Lighthouse keeper challenge: Can you transport cargo to an island using a zipline [60 min]

Make: Learners make their zipline using a range of materials.

Evaluate: How long does it take the cargo to travel across the zipline?

What is the maximum weight the zipline can carry?

Which zipline carried the cargo safely across the water?

What changes could you make to your zipline design?

Suggested learning activities

Geography: Trade and development; People at work; Transport and communications

The class could examine case studies of transport over water and great distances. They could examine the following innovations and how they have improved transport and logistics for people and products.

Suez Canal (linking Mediterranean Sea with Red Sea)

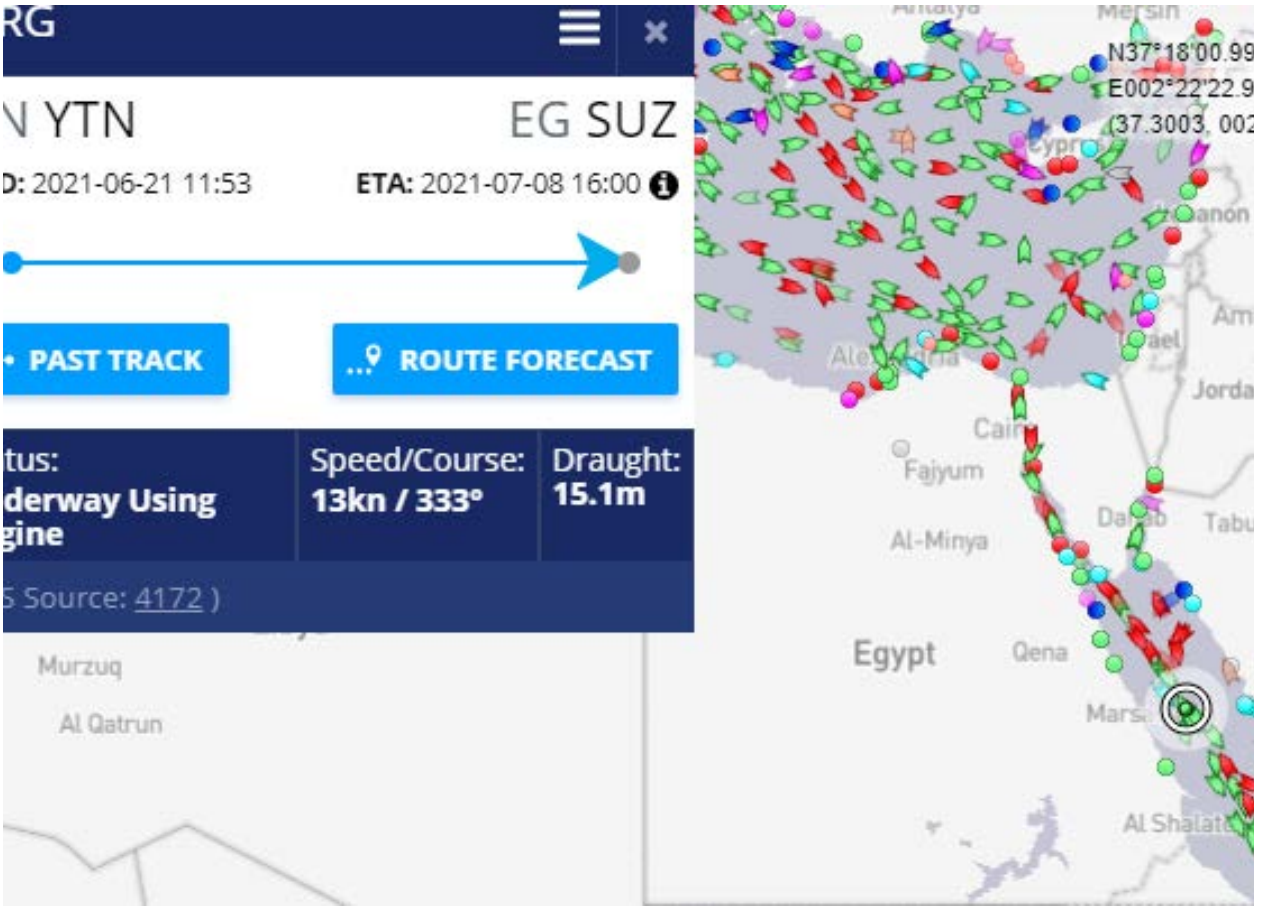
Panama Canal (linking Pacific Ocean with Atlantic Ocean)

Channel Tunnel (UK-France) underwater tunnel for cars and trains

Dursey Island cable car (Ballaghboy-Dursey Island, Cork)

Sea Bridge in China (Hong Kong–Zhuhai–Macau)

Suez Canal Study: Using their class atlases, the learners could be tasked with getting goods from Italy to Oman in the fastest way possible by boat. They could map the possible routes (eg around Africa) before being introduced to the Suez Canal. The learners could explore the international shipping transport crisis which unfolded when the Evergreen cargo ship blocked the Suez Canal, causing major delays in the transportation and delivery of goods between Europe and Asia. The learners could investigate shipping information in the Suez Canal using the **vessel tracker website**



Suggested learning activities

History: Eras of change and conflict; Traders, explorers and colonisers from Europe

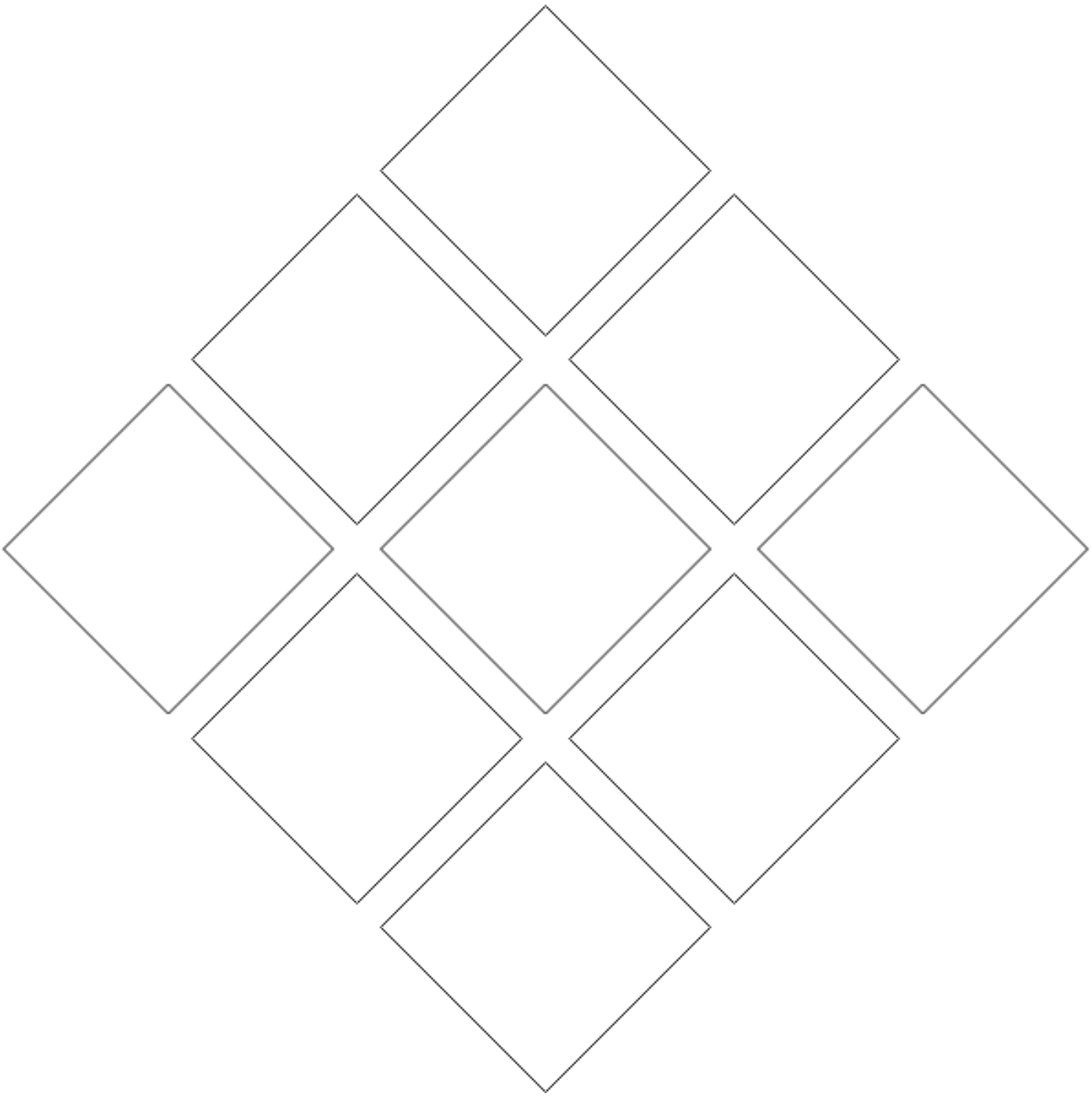
Learners could learn about trade routes during the Age of Discovery and how innovative tools such as compasses, mapping and shipbuilding led to Europeans colonising many parts of the world and establishing trade links in Asia and the Americas.

Science: Design and make a boat

In groups, learners explore different materials that could be used to build their boat. Plan their designs. Each boat should be able to transport 'cargo' across a set distance. Learners should consider the capacity of their boat and the use of a sail. Learners make their boats in their groups. Evaluate which boat can travel a set distance with the cargo on board.

Resource 4: Different modes of transport across water

Resource 5: Diamond 9 ranking template



Session 7:
Let's Improve

Time: 90 minutes
Team Meeting Guide p.22-23
Engineering Notebook p.20-21

Core Values:

Purpose: Learners consider and design ways to improve access and efficiency of the cargo journey and sorting process, and develop in-depth understanding of the importance of ports.

Key ideas

1. The team design ways to improve transportation access and efficiency.
2. The team will improve the efficiency of the sorting centre.

Additional

- Build destinations where cargo is being delivered.
- How would a machine operator make adjustments to the sorting centre?
- Create a new form of transportation that can access many different areas.

Resources

Per team:

- *LEGO® WeDo 2.0*
- *Digital device (tablet, laptop)*
- *CARGO CONNECT℠ Explore Set*
- *Atlas/class map*

Per learner:

- Engineering Notebook

Digital resources:

- Google Earth
- Video: How a port operates
- Video: How ports and container ships operate
- Video: Amazon sorting centre

Key curriculum content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Geography	Human environments; Natural environments	Living and working in the local area/ contrasting area (Subunit: Transport and communications) People and places in other areas; Trade and development issues; Local natural environment; Lands, rivers and seas	Using maps and globes; Geographical investigation skills (Investigating; Observing; Recording; Hypothesising; Communicating)
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
Mathematics	Shape and space; Measure	2-D shapes; 3-D shapes; Time	Applying and problem-solving; Communicating and expressing
Science	Energy and forces; Materials	Forces; Properties and characteristics of materials	Working scientifically

Introduction (Context) [30min]

Resources:

- CARGO CONNECT℠ playmat
- Atlases/class maps
- **Google Earth**

- **Scoilnet Maps**

- Video: **How ports operate?**

- Video: **How ports and container ships work**

Core learning activities

Enquiry questions:

- How do ports work?
- Why are ports important?
- How do ports ensure efficient transportation of cargo?
- What technology and jobs are involved in the operation of ports?
- How do these machines/technologies improve accessibility between transport modes?

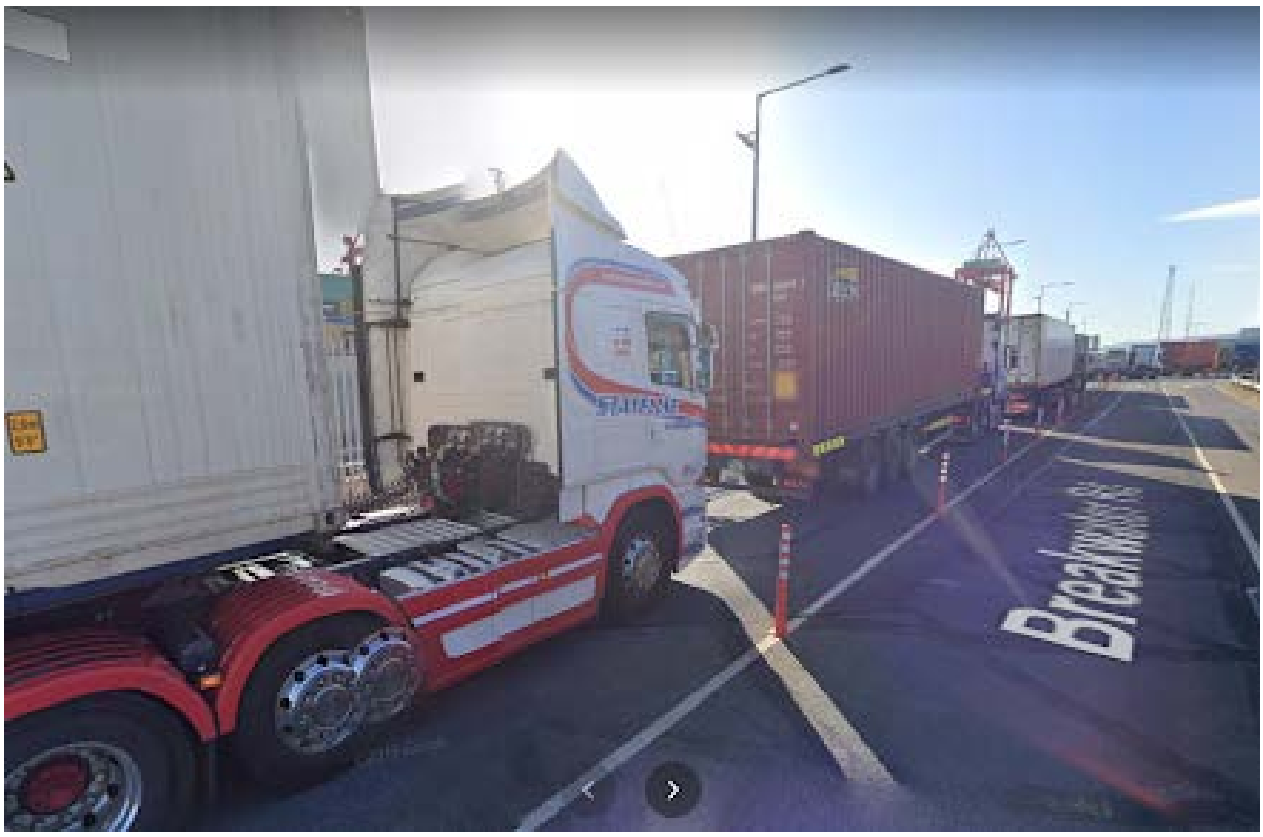
Learners consider the nearest port/transport hub to their local area (eg Port of Cork). They could identify these on their atlases/class maps.

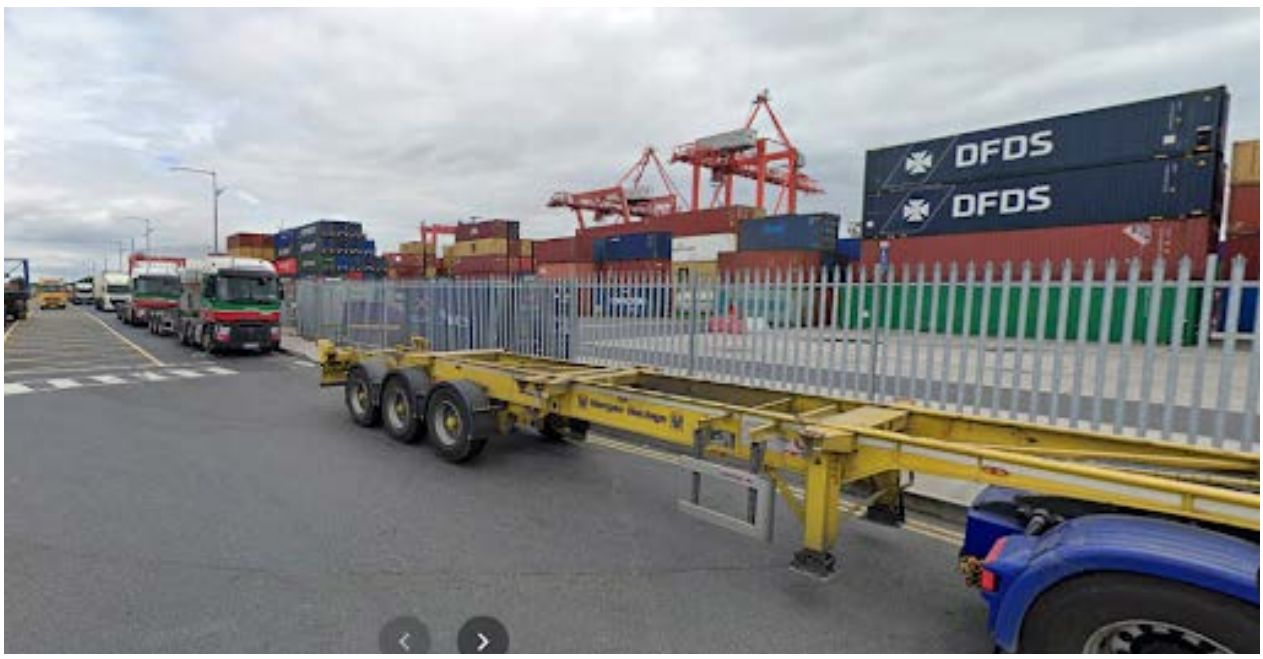
1. The learners should use Google Earth to investigate various features of the port such as the container terminal, lines of trade connections (to France/UK, etc), warehousing, and most importantly access to other transport modes such as road and rail links to and from the port and hypothesise as to how it works. See example below.

2. The teacher could then show the learners a short video **How ports operate** (2.30 min video) or **How ports and container ships work** (3.30 min video) and get the learners to discuss.

3. The learners could annotate the aerial imagery on Scoilnet Maps or Google Earth or alternatively on a printed version provided by the teachers identifying each of the major features of the port (container terminal, warehousing, access to other transport modes such as road and rail links to and from the port).

4. The learners should also use the yellow explorer on Google Earth Street View to explore the roads around the port, observing warehouses, container ports, queues of cargo trucks, cranes, etc (see below for examples).





Key activites continued

5. The learners should observe the *FIRST*® LEGO® League playmat and identify features of the port on the mainland, which aid accessibility and efficiency of transportation of cargo (eg the crane for loading/unloading ships, the rail and road links, the container depot, proximity of sorting centre etc).

6. The class should focus on the hot and cold destinations and discuss any potential accessibility issues to these destinations from their own community/mainland (eg lack of port/landing strip for plane/landing pad for helicopter, etc. In their groups they should build appropriate destinations on the 'home icon' on each island which would facilitate efficient and smooth access (using what they have learned from their investigations into ports).

Development (build) [20 min]

Resources:

- CARGO CONNECT℠ sorting centre
- Digital device
- Video: **Amazon sorting cntre**

Focus on the sorting centre

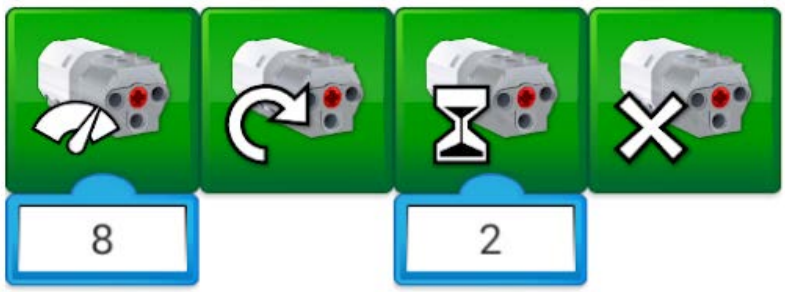
1. Watch the video of the **Amazon sorting centre**. Consider how Amazon have improved the efficiency of the sorting process.
2. In teams, learners consider how they can improve the efficiency of the LEGO® sorting centre. Efficiency is the ability to avoid wasting materials, energy, efforts, money, and time in doing something. Examples of efficiency include sorting cargo faster, sorting cargo by colour, or stopping the cargo process when there is no cargo loaded.
3. Learners alter the sorting center to include a sensor that will enhance the efficiency of the sorting process.
4. Learners create a new programme and try it out on the sorting centre. How has it enhanced the efficiency of the sorting centre?

Coding and build

Resources:

- LEGO® WeDo
- CARGO CONNECT℠ sorting centre
- Digital device

This activity involves learners building upon what they have learnt in previous lessons. The following images are not the solution, rather, they are to aid in reaching a working solution.



This algorithm will set the motor power to 8, the direction of movement to clockwise, the duration to 2 seconds, and then stop the motor.

The first block means the WeDo Smart Hub will wait until the motion sensor is triggered.

Then it will play music 1 and turn on light colour 1.

Guiding questions:

- Can you tinker with the code in order to make the process safer?
- Could a sound be played while sorting is in progress? Linked to what they saw on the Amazon sorting centre video.
- I wonder if you could make the centre flash a light to warn that it is active?
- Is there any way that your build could 'sense' that something is moving? (sensor)

Important points to note

The LEGO® WeDo 2.0 app includes a **program library** which details ways in which learners could 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.

Closure (document/ share/tidy up) [10-15min]

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

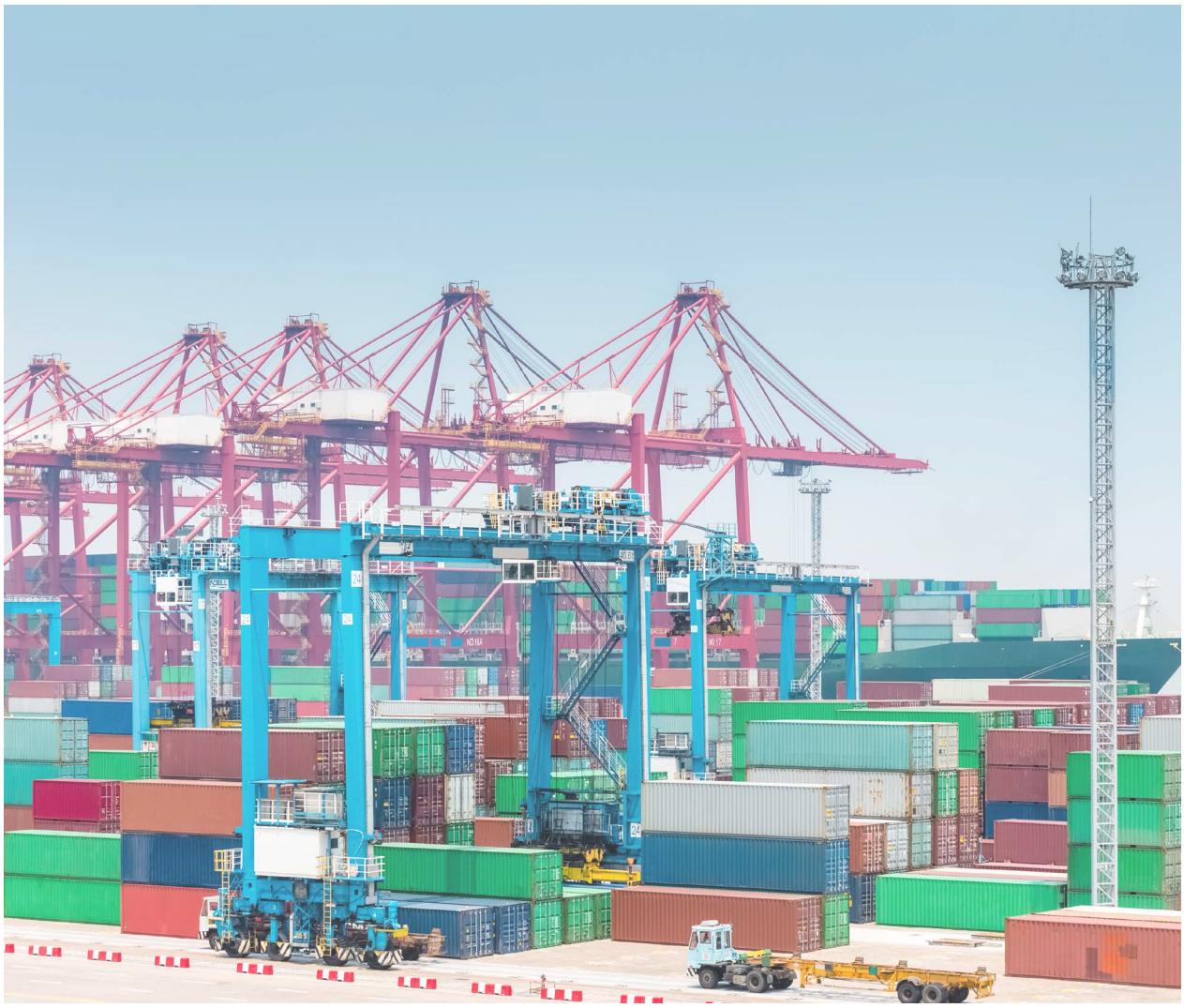
2. Share:
   a. The destinations created for cargo deliveries
   b. Demonstrate how they improved access to destinations
   c. Explain how they improved sorting efficiency (including safety)

3. Teams tidy up:

Keep assembled:	**Disassemble:**
The motorised sorting centre and truck should stay assembled and returned to the designated storage space.	All other parts should be disassembled and stored safely in designated containers.

Resources:

- Digital portfolio
- Digital device



Suggested learning activities

Drama: learner/teacher in role

Teacher and/or learners in role exploring the work that goes on at a port and the journey of cargo from the sorting centre through the port and to the hot/cold destination, taking inspiration from the CARGO CONNECT℠ playmat (eg sorting centre conveyor workers, forklift drivers, truck drivers, crane operators, shippers, etc). In group learners can be asked to complete three freeze frames to represent scenes from the story.

Literacy: diary entry

Learners could write a diary entry describing their day's work from the perspective of someone who works on the port or in the sorting centre.

Geography; Science S

Learners could examine the different types of energy used to transport cargo at every stage of the transportation process. Learners should determine how sustainable this energy use is and suggest alternative and more sustainable sources of energy. Learners could also suggest improvements for more sustainable production and transportation processes and behaviours.

Session 8-9:
Building The Team Model

Time: Two 90 min sessions recommended
Team Meeting Guide p.24-25
Engineering Notebook p.22-23

Core Values:

Purpose: In teams, learners create a team model that shows 'The journey of cargo to their destinations'.

Key ideas

1. Discuss knowledge and understanding of the CARGO CONNECT℠ theme.
2. Collaboratively design and label a team model.
3. Collaboratively build and code a team model that shows the transportation journey of cargo.

Resources

Per team:

- LEGO® WeDo 2.0
- Digital device (tablet, laptop)
- CARGO CONNECT℠ Explore Set
- CARGO CONNECT℠ playmat
- Materials for planning design (paper/digital tool eg Jamboard)

Per learner:

- *Engineering Notebook*

Optional:

- The team model can use extra LEGO® bricks, minifigures, baseplates and other LEGO® elements.
- Art supplies may not be used.

Key curriculum content			
Subject	**Strands**	**Strand units/ elements**	**Skills and concepts**
Mathematics	Shape and space; Measure	2-D shapes; 3-D shape; Time	Applying and problem-solving; Communicating and expressing
Science	Energy and forces; Materials	Forces; Properties and characteristics of materials	Designing and making; Observation; Investigating and experimenting; Recording and communicating
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 Cooperation Decision-making

Team model requirements

- Include the assembled Explore models and mat
- Include motorised parts (at least one)
- Use LEGO® coding (WeDo 2.0 app)
- Be made of only LEGO® elements (no art supplies)
- Should fit on a table and be easily transportable (for future showcase)

Core Learning Activities

Introduction [15min]

Resources:

- Images of journey of LEGO® (digital/ printable)
- Digital device (**Mentimeter**/ Vevox)

1. Teacher introduces the session by showing the learners the images of the journey of LEGO® from factory to shop (printable version). The teacher asks the learners to think about what they now know about the journey of cargo.

2. Invite learners to think about their new knowledge and understanding by working with a partner using a think-pair-share approach, or with their team in a snowballing approach. learners can be asked to refer to their Engineering Notebooks and digital portfolios for further information.

3. Using an appropriate digital response gathering tool (eg Mentimeter) invite learners to record what they know about the journey of cargo to their destinations.

Development (build) [80min]

1. Teacher explains to learners that they are now going to use all that they have learnt through the CARGO CONNECT℠ sessions in order to create a team model which shows 'The journey of cargo to their destinations'.

2. Explore: In teams, learners discuss solutions to the questions posed in the Engineering Notebook (p.22)
   a. Learners brainstorm ideas on how to show the journey of products from their community getting to their destinations using a LEGO® model. 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).
   b. Once learners have discussed and decided upon a journey of cargo, they consider how they could improve the efficiency of the journey.

The following are additional examples of scenarios which could demonstrate 'The journey of cargo to their destinations':

- A package being sent from a post office, to the sorting centre, and then onward to the school
- A courier delivering packages within the local community
- Consider major issues associated with transporting cargo (cost, environmental impact, time) S
- A local factory sending products to a sorting centre and then onward to shops

Resources:

- Engineering Notebook
- CARGO CONNECT℠ playmat
- CARGO CONNECT℠ truck
- CARGO CONNECT℠ sorting centre
- Additional LEGO® pieces
- LEGO® WeDo
- DIgital Device

3. Key enquiry question: How could you improve the transportation of products? eg faster; more sustainable; more efficient S

4. Plan: Each team must draw a detailed plan of their design (Engineering Notebook, p.22). Ask the learners to consider:
   - What parts do you need?
   - Has the Explore model been included?
   - Record the coding skills you will use.
   - Use the coding skills you have developed through previous builds.

Coding and build

Resources:

- CARGO CONNECT℠
- LEGO® WeDo
- Digital Device

For further detail, please see the flow chart of builds and code.

There is no specific code or build in this session.

The following are examples of programs encountered to date which could be adapted and innovated upon.

Cooling Fan, turns on the motor.

Spy Robot: when motion is detected, a sound is played.

Milo the Science Rover: the motor power is set to 8, the direction of motor movement is clockwise, motor is turned on for a duration of two seconds, motor stops.

The LEGO® WeDo 2.0 app includes a program library which details ways in which learners could 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.

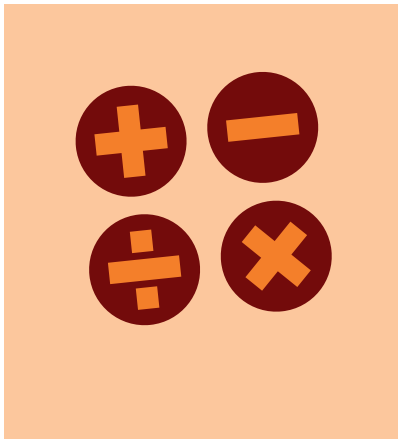
Guiding questions:

- What part of your model could you motorise?
- What would you like it to do? How can you motorise it to do this?
- How might you use the sensors?
- How does your model improve the transportation journey?
- Could you add any safety features to your model?
- I wonder if you could make use of skills you've encountered in other builds?
- 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?
- I wonder if you could change the order of sound and light?

Development continued

5. Make: In teams, learners build the design using the prototyping pieces and any other LEGO® elements available. Learners ensure that their team model meets the requirements on p.23 of the Engineering Notebook.

    a. Teams motorise at least one part of their model. Teams are encouraged to motorise and code a brand new part in their model. Inspiration could be taken from the builds completed so far. Any part of their model can be motorised, it does not have to be the sorting centre (but it can be if they choose to do so). Teams could also reuse the code from Session 5 for motorising the sorting centre.



6. Evaluate: Encourage the learners to reflect on their build with their team:
   - How does their team model show 'The journey of cargo to their destinations'?
   - Have you improved the transportation of products?
   - What part of your model is motorised, and how have you coded this?
   - What other things would you like to add?
   - What are the strengths and the weaknesses of your design?

Important points to note

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.

These sessions should be differentiated as required.

Teacher questioning and scaffolding will assist teams in creating innovative models.

Closure (document/ share/tidy up) [20min]

Resources:

- Digital device
- Digital portfolio

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

2. Share:
   a. Teams share their completed team models with the class
   b. Teams demonstrate what journey of cargo their build shows
   c. Teams explain the program and how it motorises a part of their build.

3. Teams tidy up:

Keep assembled:

The team model will remain assembled from this point forward until the event and should be placed in the designated storage space.

Disassemble:

Any unused pieces should be returned to the correct box and stored - this includes LEGO® WeDo 2.0 kit, prototyping pieces, and any LEGO® elements supplied by learners.

Suggested learning activities

Literacy - Writing/Exploring and using: procedural writing

Aided by media captured during these sessions (images, video, etc), learners write instructions on how to build their team model.

Literacy - Oral Language/Exploring and using: podcasting

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 journey of transportation was chosen, how their model innovates on the journey of products, what part was motorised, how this was coded, how they used the *FIRST*® Core Values in their build, the individual input of each team member, etc.

Drama - Drama to explore feelings, knowledge and ideas, leading to understanding/Exploring and making drama: 'The journey of cargo to their destinations'

In teams, learners create three scenes/tableaus which represent three 'stops' along the journey of cargo within their team model.

Visual Arts - Drawing/Making drawings; Paint and colour/Painting: Design a logo

Learners design a logo for the transportation company in their team model. Learners can first explore logos for transportation companies in order to seek inspiration. The logos could be completed independently, or in teams.

Session 10-11:
Team Poster

Time: Two 60-minute sessions recommended
Team Meeting Guide p.26-27
Engineering Notebook p.24-25

Core Values:

Purpose: In teams, learners create a team poster to explain their team journey and illustrate the design process.

Key ideas

1. Discuss knowledge and understanding of the CARGO CONNECT℠ theme.
2. Collaboratively plan and design a team poster.

Resources

Per team:

- *Poster paper/digital poster software (eg Canva, Slides, **piktochart**)*
- *Photos of team journey/team model/coding*
- *Diagram of team model*
- *Poster board to present poster*
- *Markers/crayons/colouring pencils*
- *Engineering Notebook*
- *Reflections from each session*

Key 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 [10min]

Resources:

- Digital device
- Poster paper/ digital poster software
- Digital portfolio

Core learning activities

In teams, learners brainstorm what to include in their team poster. The purpose of the team poster is to demonstrate the journey the team have taken and the design process they followed. Learners should be encouraged to use the reflections/journal entries and photos that they gathered throughout sessions 1-9.

Development (build) [80min]

Resources:

- Digital device
- Poster paper/ digital poster software
- Digital portfolio
- Diagram of team model
- Poster board
- Engineering Notebook
- Markers/crayons/ colours

In teams, learners draft their ideas for their team poster. These can be added to the Engineering Notebook, p.25.

Learners should consider using the following headings:

Team name: Each poster should have the team name.
Core Values: Provide examples of how your team has used the Core Values throughout the sessions.

Explore: It could tell the story of the team's reflection of what they have discovered about the journey of a product over the previous nine sessions.

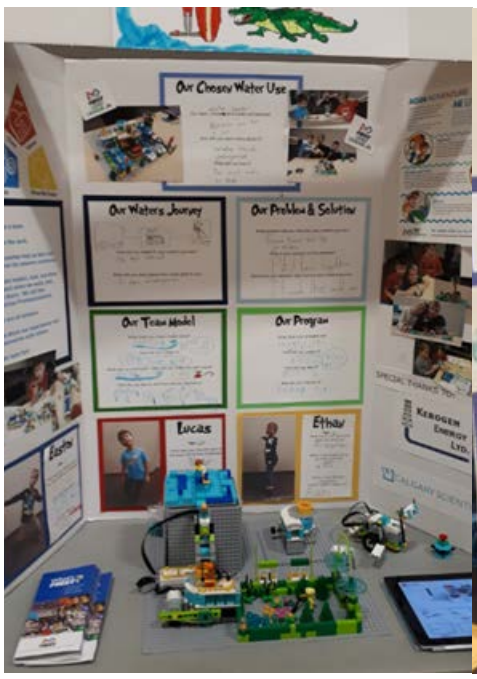
Our problem and solution: Learners explain how they improved the transportation of products. Did they do any research to help them find a solution, eg look up the internet, talk to an engineer, talk to a parent/guardian? They could include these findings.

Our model: Include a detailed drawing of the model explaining all of its features. If the team had a number of designs these can all be included here.

Our code: How does the code for the model work? What features does it have? What iterations did it go through? Does it use loops, sensors, multiple code etc? Can you add this here? (pictures of screenshots of the code are useful).

Provide learners with sample topics for the poster. Encourage the use of keywords, photos, diagrams.

Sample poster from previous *FIRST*® LEGO® League Explore events.



Closure (document/ share/tidy up) [10-15min]

1. Share:
   a. What they did
   b. Demonstrate their poster design
   c. Explain their team journey

2. Teams tidy up:
   a. Learners store their poster in a safe place.
   b. Tidy away all art supplies

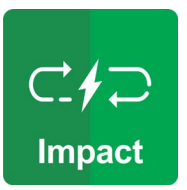
Resources:

- Digital poster/ poster

Session 12:
Let's Share

Time: 60 minutes
Team Meeting Guide p.28-29
Engineering Notebook p.26-27

Core Values:



Purpose: In teams, learners plan for how they will share their team model and team poster at the final event.

Resources

Per team:

- *LEGO® Build*
- *Digital device (tablet, laptop)*
- *Show me poster*

Digital Resources:

- *Reviewing questions*
- *Reviewing sheet for FIRST® LEGO® League Explore*

Key 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 [10min]

Core learning activities

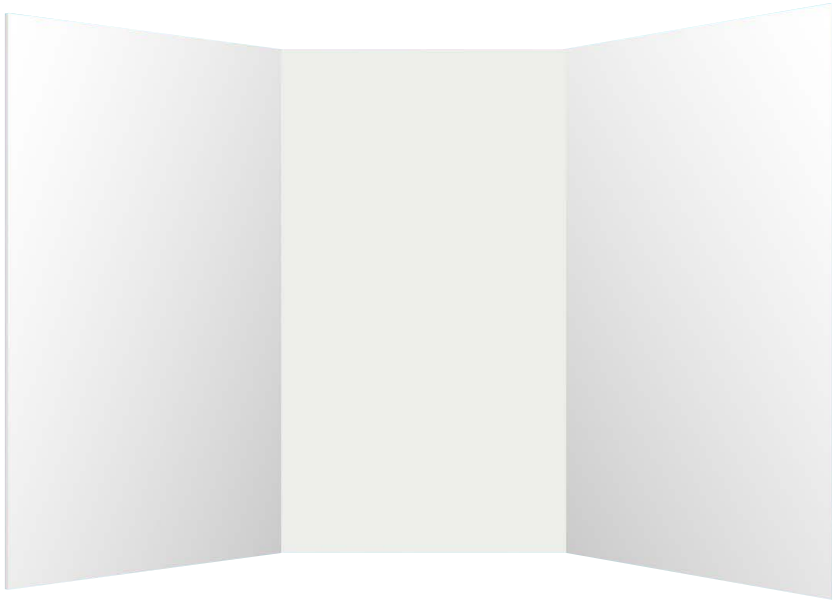
Explain the *FIRST*® LEGO® League Explore Festival event where the learners will showcase their LEGO® builds and posters.

Development [40min]

1. In teams, learners decide who will present each section of the poster.
2. Learners review their LEGO® build and ensure that their code works. learners decide who will present the LEGO® build.
3. In teams learners discuss what they have learned throughout the season. Learners should be prepared to share what they have learned at the LEGO® Festival.
4. Each team should practice their presentations.
5. Sample reviewing sheet and reviewing questions can be used to support the learners during this session:

Reviewing questions: **https://firstinspiresst01.blob.core.windows.net/first-game-changers/fll-explore/explore-reviewing-questions.pdf**

Reviewing sheet: **https://firstinspiresst01.blob.core.windows.net/first-game-changers/fll-explore/explore-reviewing-sheet.pdf**



Closure (document/ share/tidy up) [10-15min]

1. Share:
   a. Reflection and assessment (self and peer) of presentations.

2. Teams tidy up:
   a. Ensure team model and team poster are stored and ready to be transported to the event.
   b. Ensure all devices are fully charged.

3. Meta reflection - prompt questions to be considered by learners following engagement with CARGO CONNECT℠:
   a. What are three things you learnt?
   b. What is one thing that you learnt about yourself through completing CARGO CONNECT℠?
   c. What part of CARGO CONNECT℠ stands out for you? (Your favourite session, build, code?)
   d. What will you do differently now as a result of CARGO CONNECT℠?
   e. What changes could you or your family make to live more sustainably?
   f. Can you think of an example of when you demonstrated the *FIRST*® Core Value of: Teamwork, Inclusion, Innovation, Fun, Discovery, Impact?
   g. What would you like to do with LEGO® WeDo next?
   h. What other problems could we explore through the engineering design process?

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Appendix

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 and Learning dimension, and **one standard** from the Leadership and Management dimension. For each standard there are a number of statements of effective practice and highly effective practice. This resource 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.

Appendix - Digital Resources

Session	Detail and full URL
Pre1	• Interdependency of jobs grid template - **https://docs.google.com/document/d/1WCe3pD6U0A8VnsPUt3EFg6BtqONulFc5zU5qBeAYP9E/copy** • Photos of the story of the banana production (for sequencing) - **https://oxfamilibrary.openrepository.com/bitstream/handle/10546/620732/edu-go-bananas-slideshow-060217-en.pdf?sequence=10&isAllowed=y** • Food miles template - **https://docs.google.com/document/d/12PWPlQ7vclPndrNOfyBaD4cLB3IP4LldGQmS44vXKvA/copy** • Food miles calculator - **http://www.foodmiles.com/** • Video on the journey of bananas - **https://www.youtube.com/watch?v=TV7tsXyq7ow** • IWB interactive story of the banana photos for sequencing- **https://ca-fod.org.uk/Education/Kidz-Zone/Banana-Fairtrade-game** • Google Earth project - **https://earth.google.com/web/@32.86363086,-6.95154817,-2210.54672276a,13057312.0116663d,30.00000235y,0h,0t,0r/data=MicKJQojCiExVjBHVUstbXFad0FCZUphWVZQYUtIemxDeXFrcFgyLTY**
1	• Google Maps / Google Earth • Scoilnet Maps - **https://maps.scoilnet.ie/OSiMaps/EsriVer17/index.html**
2	• Video: An Post Delivering the Future - **https://www.youtube.com/watch?v=UkXwj_ZIW24** • Video: Mushrooms from Farm to Fork - **https://www.youtube.com/watch?v=TlKkHHAu-5w**

3	• Video: of the 'Journey of a Parcel' - **https://www.youtube.com/watch?v=W6fJK5fOhf0&t=1s** • Mentimeter - **https://www.mentimeter.com/** • Vevox - **https://www.vevox.com/** • Jamboard -**https://jamboard.google.com/** • Guided Projects - Science - 2. Speed - **https://education.lego.com/en-us/lessons/wedo-2-science/speed#2-explore-phase**
4	• Video: musical recycling trucks in Taiwan - **https://www.buzzworthy.com/taiwan-garbage-disposal/** • Video: ice cream trucks - **https://www.youtube.com/watch?v=htAMXx3upow**
5	• Images of LEGO box packaging - **https://docs.google.com/document/d/1vLkAZGaCoVj_cQQkPikvIFB348mtBqxtTAE4EwdQvuE/copy** • Video: of the Amazon sorting centre - **https://www.youtube.com/watch?v=wC4vITSVXoA**
6	• Pictures of various forms of transport - **https://docs.google.com/document/d/1bR2INXRG7PvcADGj7OUSnbk6sXxT0VZQ1AWY11i-3r4/copy** • Diamond 9 Ranking Template - **https://docs.google.com/document/d/1aOGUIxcWxiViF266lGCVnrM4L7W_S253xLgZ6ApljQQ/copy** • Video: Safety Operation in Amazon Warehouse - **https://www.aboutamazon.com/news/operations/5-things-you-dont-know-about-safety-in-amazon-warehouses** • Website Vessel Tracker Website - **https://www.marinetraffic.com/en/ais/home/centerx:-8.3/centery:49.9/zoom:4**
7	• Google Maps/Google Earth • Video: How a port operates- **https://www.youtube.com/watch?v=l8gZN_titMo** • Video: How ports and container ships operate - **https://www.youtube.com/watch?v=Kd_P_EB_kBE** • Video: Amazon Sorting Centre - **https://www.youtube.com/watch?v=4MH7LSLK8Dk**
8-9	• Images of the journey of LEGO from factory to shop - **https://docs.google.com/document/d/1vLkAZGaCoVj_cQQkPikvIFB348mtBqxt-TAE4EwdQvuE/edit** • Mentimeter - digital response gathering tool - **https://www.mentimeter.com/** • Anchor.fm - podcasting tool, straightforward app with easy editing tools - **https://anchor.fm/** • Vocaroo - simple online sound recorder- **https://vocaroo.com/** • Logos of Transportation Companies - **https://docs.google.com/document/d/1gbR0paJH7Hsjx-Rr58CPOTfUzw17dHcSGorBUTUWmho/copy**
10-11	• Canva - **https://www.canva.com/** • Google Slides - **https://slides.google.com** • Microsoft Powerpoint - **https://office.live.com/start/powerpoint.aspx** • Piktochart - **https://piktochart.com/**
12	• Reviewing Questions • Reviewing Sheet for FIRST LEGO League Explore Festival • **https://firstinspiresst01.blob.core.windows.net/first-game-changers/fll-explore/explore-reviewing-questions.pdf** • **https://firstinspiresst01.blob.core.windows.net/first-game-changers/fll-explore/explore-reviewing-sheet.pdf**

The Institution of Engineering and Technology

Contact

IET (UK)
T +44 1438 313 311
E postmaster@theiet.org
W www.theiet.org

Learnit
T 01 524 0004
E fll@learnit.ie
W www.learnit.ie

DCU
T 01 700 9161
E ioe@dcu.ie
W www.dcu.ie/instituteofeducation

Science Foundation Ireland
T 01 607 3200
E info@sfi.ie
W www.sfi.ie/

@TheIET

theiet.org