FIRST® LEGO® League Challenge – Primary National Curriculum links

Upper Key Stage 2 (Year 5 and Year 6)

Subject/Subject strand	Key Stage 2 NC objectives	Example application in FIRST® LEGO® League Challenge
English In years 5 and 6, pupils' confidence, enjoyment and mastery of language should be extended through public speaking, performance and debate.		
Spoken language Ensure the continual development of pupils' confidence and competence in spoken language and listening skills. Spoken language is important for pupils' development across the whole curriculum – cognitively, socially and linguistically. Spoken language underpins the development of reading and writing.	– listen and respond appropriately to adults and their peers – ask relevant questions to extend their understanding and knowledge – articulate and justify answers, arguments and opinions – give well-structured descriptions, explanations and narratives for different purposes, including for expressing feelings – maintain attention and participate actively in collaborative conversations, staying on topic and initiating and responding to comments – use spoken language to develop understanding through speculating, hypothesising, imagining and exploring ideas – speak audibly and fluently with an increasing command of Standard English – participate in discussions, presentations, performances, role play, improvisations and debates – gain, maintain and monitor the interest of the listener(s) – consider and evaluate different viewpoints, attending to and building on the contributions of others – select and use appropriate registers for effective communication.	– Taking part in team discussions throughout the season – Conducting interviews, gathering information from experts, peers and the wider public as part of the Innovation Project process – Presenting their research findings and Innovation Project solution to different groups, including judges at a tournament.
Reading (word reading)	– apply their growing knowledge of root words, prefixes and suffixes (morphology and etymology), as listed in English Appendix 1, both to read aloud and to understand the meaning of new words that they meet.	– Reading aloud as part of team practise sessions - rules, research, presentations. – Reading and understanding technical vocabulary as part of their Innovation Project research.
Reading (comprehension)	– continuing to read and discuss an increasingly wide range of fiction, poetry, plays, non-fiction and reference books or textbooks – reading books that are structured in different ways and reading for a range of purposes – understand what they read by: – checking that the book makes sense to them, discussing their understanding and exploring the meaning of words in context – asking questions to improve their understanding – summarising the main ideas drawn from more than one paragraph, identifying key details that support the main ideas – distinguish between statements of fact and opinion – retrieve, record and present information from non-fiction – explain and discuss their understanding of what they have read, including through formal presentations and debates, maintaining a focus on the topic and using notes where necessary – provide reasoned justifications for their views.	– Reading, discussing, debating, summarizing and understanding non-fiction content as part of their Innovation Project research. – Reading from different sources such as books, websites, newspapers, magazines as part of their Innovation Project research.

Subject/Subject strand	Key Stage 2 NC objectives	Example application in *FIRST*® LEGO® League Challenge
English In years 5 and 6, pupils' confidence, enjoyment and mastery of language should be extended through public speaking, performance and debate.		
Writing (transcriptional)	**Spelling** – use dictionaries to check the spelling and meaning of words – use a thesaurus.	– When planning and writing materials as part of their Innovation Project
Writing (compositional)	**Plan their writing by:** – identifying the audience for and purpose of the writing, selecting the appropriate form and using other similar writing as models for their own – noting and developing initial ideas, drawing on reading and research where necessary **draft and write by:** – selecting appropriate grammar and vocabulary, understanding how such choices can change and enhance meaning. – using a wide range of devices to build cohesion within and across paragraphs – using further organisational and presentational devices to structure text and to guide the reader [for example, headings, bullet points, underlining] **evaluate and edit by:** – assessing the effectiveness of their own and others' writing – proposing changes to vocabulary, grammar and punctuation to enhance effects and clarify meaning – ensuring the consistent and correct use of tense throughout a piece of writing – ensuring correct subject and verb agreement when using singular and plural, distinguishing between the language of speech and writing and choosing the appropriate register – proof-read for spelling and punctuation errors – perform their own compositions, using appropriate intonation, volume, and movement so that meaning is clear.	– When planning and writing materials for their Innovation Project to ensure it is a clear and well structured presentation of their ideas.

Subject/Subject strand	Key Stage 2 NC objectives	Example application in *FIRST*® LEGO® League Challenge
Mathematics At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems.		
Number (number and place value)	**Year 5** – interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero – solve number problems and practical problems **Year 6** – use negative numbers in context, and calculate intervals across zero – solve number and practical problems	– Calculating and adjusting values for variables in code (e.g. motor rotations or sensor readings) while programming a robot.
Number (addition, subtraction)	**Year 5 and 6** – solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.	– Handling and interpreting data as part of research in the Innovation Project
Number (multiplication and division)	**Year 5** – solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign **Year 6** – use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.	– Handling and interpreting data as part of research in the Innovation Project
Number (fractions)	**Year 5** – round decimals with two decimal places to the nearest whole number and to one decimal place – solve problems involving number up to three decimal places – solve problems which require knowing percentages and decimals	– Calculating and adjusting values for variables in code (e.g. motor rotations or sensor readings) while programming a robot.
Number (algebra)	**Year 6** – use simple formulae – enumerate possibilities of combinations of two variables.	– Calculating and adjusting values for variables in code (e.g. motor rotations or sensor readings) while programming a robot.
Measurement	**Year 5** – convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre) – use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling. **Year 6** – solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate	– Measuring and calculating distances required to achieve specific robot movements.

Geometry (properties of shape)	**Year 5**
	– know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
	– draw given angles, and measure them in degrees (°)
	– Identify:
	  • angles at a point and one whole turn (total 360°)
	  • angles at a point on a straight line and a turn (total 180°)
	  • other multiples of 90°
		– Measuring and calculating the angle of turn required to achieve specific robot movements.

Statistics	**Year 5** – complete, read and interpret information in tables, including timetables.	– Handling and interpreting data as part of research in the Innovation Project

Subject/Subject strand	Key Stage 2 NC objectives	Example application in *FIRST*® LEGO® League Challenge
Science They (pupils) should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.		
Working scientifically	– taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate – reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations – identifying scientific evidence that has been used to support or refute ideas or arguments.	– Using sensors on a robot. – Presenting their research findings and Innovation Project solution to different groups, including judges at a tournament.
Forces	**Year 5** – identify the effects of air resistance, water resistance and friction, that act between moving surfaces – recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	– Designing, building and testing a robot and its attachments to achieve specific goals.
Computing Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through	– design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts – use sequence, selection, and repetition in programs; work with variables and various forms of input and output – use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs – select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information	– Writing programs for a robot to accomplish the Robot Game missions. – Testing, correcting and improving programs for a robot to accomplish the Robot Game missions. – Working with input and output devices on a robot (e.g. sensors and motors) – Using IT to collect, analyse, evaluate and present data and information in the Innovation Project and Robot Design process
Design and Technology Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts [for example, the home, school, leisure, culture, enterprise, industry and the wider environment.		
Design	– use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups – generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design	– When developing an innovative solution to a problem that the team has identified in the Innovation Project
Make	– select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately – select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities	– When developing an innovative solution to a problem that the team has identified in the Innovation Project

Subject/Subject strand	Key Stage 2 NC objectives	Example application in *FIRST®* LEGO® League Challenge
Design and Technology Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts [for example, the home, school, leisure, culture, enterprise, industry and the wider environment.		
Evaluate	– investigate and analyse a range of existing products – evaluate their ideas and products against their own design criteria and consider the views of others to improve their work	– When developing an innovative solution to a problem that the team has identified in the Innovation Project
Technical knowledge	– apply their understanding of how to strengthen, stiffen and reinforce more complex structures – understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages] – understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors] – apply their understanding of computing to program, monitor and control their products.	– Designing, building and testing a reliable robot and its attachments to achieve specific goals. – Presenting and explaining their design choices for a robot and its attachments in the Robot Design judging.