# STEM IN SCHOOLS PRIMARY SCHOOL BROCHURE

Does your Year 6 build shelters large enough to get into?

Does your Year 4 build chairs they can sit on? See inside…

**STEM being Science, Technology, Engineering and Maths, Engineering being the application of STM to the solution of a practical problem.**

| Activity | Year group | Approx. Timing hr | Max numbers | Material Cost per Pupil, £ |
|---|---|---|---|---|
| Anglo Saxon Artefacts + | 4-6 | 2½ | 30 | 1.00 |
| Balloon Buggies | 5&6 | 1½/2¼ | 30/60 | 1.00 |
| Bridges with Maths | 5&6 | 1 ¾ | 30 | 0.50 |
| Bridges of London/The World + | 5&6 | 2½ | 60 | 1.00 |
| Bridges, Card/Spaghetti/STIXX + | 5&6 | 2½ | 30 | 1.00 |
| Bridges / Towers, K'NEX | 5&6 | 2½ | 60 | Nil '' |
| Building Game, The | 6 | 1½ | 60 | Nil |
| Burglar Alarms | 4&5 | 1 | 30 | Nil  |
| Cams | 4-6 | 2½ | 30 | 2.00 cardboard, nil K'nex'' |
| Chairs, STIXX + | 4-6 | 3 | 45 | £1.25* |
| Communication Towers, STIXX + | 4-6 | 2½ | 60 | £1.50 |
| Community Activities | | | | |
| Cross Curricular | | | | |
| Crowns/Hats + | 4-6 | 2 | 60 | 1.00 |
| Egyptians, Ancient, STIXX + | 2-6 | 2½ | 45 | 1.00 |
| Electric Buggies, Making | 5&6 | 2 | 60 | 2.00 |
| Electric Buggies, Pulleys | 5&6 | 1½ | 30 | Nil  |
| Electric Buzzers, Steady Hands | 4-6 | 2½ | 30 | 3.00 |
| Electrical Circuit Quiz Board | 4-6 | 2 | 30 | 1.00 |
| Electrical Control / Controlling Vehicles | 4-6 | 2 | 30 | 0.75 |
| Electronic Control / Controlling Vehicles | 6 | 2½ | 30 | 1.00 |
| Enterprise | 6 | 5 | 60 | 2.50^ |
| Fairground Carousel Motor | 6 | 3 | 30 | Motor 2.50*; String 1.00 |
| Fairground K'NEX | 6 | 2½ | 60 | Nil '' |
| Fairground K'NEX Motor | 6 | 3 | 30 | 0.50 |
| Famous Structures + | 5&6 | 2½ | 60 | 0.75 |
| Frictionless CDs | 4-6 | ¾ | 60 | 0.50 |
| Garden Tripods+ | 5&6 | 5 | 60 | 1.50 |
| Greek Artefacts + | 4-6 | 2½ | 45 | 1.00 |
| Greek Temples +, *See Roman Temples* | 2-6 | | | |
| Harry Potter Artefacts + | 4-5 | 1½ | 30 | 1.00 |
| Homes + | 1&2 | 3 | 45 | 0.50# |
| INSETS | | | | |
| Invertebrates/Mini Beasts+ | 2-6 | 3 | 30 | 1.00 |
| K'nex Creative, Challenges | 2-6 | 2 | 60 | Nil '' |
| Manneguins / School Play Props+ | 4-6 | 2½ | 45 | 1.00 |
| Mayan Structures + | 4-6 | 2½ | 45 | 1.00 |
| Money Containers, Recycled | 3-6 | 1 | 60 | 0.50 |
| Moving Persons | 1&2 | 2 | 30 | 0.75 |
| Moving Pictures, Double Levers | 1&2 | 2 | 30 | 0.50 |
| Musical Instruments, Recycled + | 4-6 | 3 | 60 | 1.00# |
| Parthenons & Shelters + | 5&6 | 3 | 60 | 1.00# |
| Photo Frames, Recycled + | 3-6 | 2 | 60 | 0.50 |
| Playground Forces & Equipment + | 1&2 | 3 | 45 | 0.50# |
| Pneumatic Moving Monsters | 3-5 | 2 | 45 | 1.00 |
| Pneumatic Romans / Greeks | 3-6 | 2½ | 30 | 2.00 |
| Rockets, Alka Seltzer | N-3 | 1¼ | 60 | 0.50  |
| Rocket Cars, STOMP | 1-6 | 1 | 30 | 1.00 |
| Rockets, STIXX + | 1-3 | 3 | 60 | 0.50# |

| | | | | |
|---|---|---|---|---|
| Rockets, STOMP | R-6 | 1 | 60 | Nil ◆ |
| Rockets, STOMP a Science Investigation | 4-6 | 2½ | 60 | 0.50 |
| Roman / Greek Temples + | 2-6 | 2½ | 45 | 1.00 |
| Rubber Band Buggy/Scientific Investigation | 3-6 | 1/1½ | 30 | Nil ◆ |
| Seats with Reading Lights | 4-6 | 3 | 30 | 1.50 |
| Shelters / Tall Towers + | 5&6 | 2½ | 90 | 0.75 |
| Shelters Lite | 3&4 | 2½ | 60 | 1.00 |
| Summer Fetes/Christmas Fair | | | | |
| Tall Towers, Sweetest | 4-6 | ½ | 60 | Nil |
| Tetra STIXX + | 4-6 | ½ | 60 | Nil |
| Torches | 4&5 | 2 | 30 | 1.50 |
| Torches, Dynamo | 6 | 2½ | 30 | 2.00 |
| Vehicle & Winding Mechanisms, K'nex | 2&3 | 2 | 60 | Nil '' |
| Victorian Toys, for CAMs see above | 4-6 | 1½ | 60 | 1.00 woodpeckers |
| Viking Artefacts + | 4-6 | 2½ | 45 | 1.00 |
| Wastepaper Bins / Containers, Recycled + | 5&6 | 2 | 45 | 1.00 |
| Winding Mechanisms, Cotton Reels | 2&3 | 1¼ | 60 | 1.00 |
| Winding Mechanisms, Cotton Reel Tanks | 1-3 | ¾ | 60 | 0.50 |
| Winding Mechanisms, Plaster of Paris | 2&3 | 3 | 30 | 2.00 |
| Work related Learning | | 6 | | |

+ Using a STIXX machine

* I can fit two classes of 30 into a day by some prefabricating. There would be additional material cost of £0.50 per pupil for this.

# To fit in over 35 students at a time, I need to do some prefabrication. There would be an additional material cost of £0.50 per pupil for this.

'' If you want to keep a K'NEX model as an example/for display this would be £12.50 per model

◆ If you want to keep a Stomp Rocket Launcher the cost will be £12.50 each, Rubber Band Buggy £12.50 each, Electric Burglar Alarm Kit £2.00 per student, Motorised K'NEX Fairground £25.00, Electric Buggy £20.00 each, Rockets £1.00.

^ Enterprise if over 45 pupils, a supplement of £200.00 as I bring an extra facilitator with me

S = Science Ma= Mathematics D&T=Design&Technology A&D=Art&Design

## PRIMARY SCHOOLS – DESCRIPTION OF ACTIVITIES

Activities are split into an introduction/theory, use of equipment with H&S, a practical session then a brief plenary.
As I use the STIXX machine for a number of activities I describe it separately below. After that the activities are described in alphabetical order.
At the end two tables one of them in alphabetical order and one of the same activities, but by the age I think they are most appropriate for.

## STIXX MACHINE

Despite my Engineering background I still think these machines are the nearest thing to magic. The students roll up sheets of newspaper and coat the seam with cellulose paste. They place the roll in the machine (this looks like a mangle which you used to find on top of old washing machines.) The handle is turned and the top roller is lowered on to the newspaper which tightens the roll. This produces a solid rod of newspaper 60 cm long and 2cm in diameter, which is dry enough to use immediately to build large structures. Cable ties are used to bind them together. When I say large, I mean life size; a team of six students can build a shelter large enough for all the team to get into within 90 minutes!

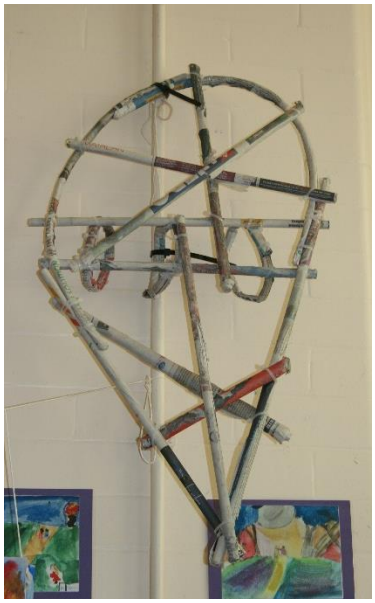
The variations are endless and I design new activities all the time; A4 scrap paper can be used instead of newspaper to make shorter rods for other activities. If you do not press the top roller down fully the rods can be bent into curves and spirals, when they become completely dry they are solid in their bent formed shape. If the students are making temporary structures like Shelters they use reusable cable ties, at the end of the activity these can be undone by the students. If they are making load bearing or permanent structures like Chairs, Bridges or Waste Paper Baskets they use normal permanent one use cable ties. The STIXX structures are large so storage space needs to be thought about in the choice of cable tie.

## ACTIVITY EQUIPMENT, MATERIALS & INSTRUCTIONS

If you have booked me to come in and run activities I can bring in the equipment, materials and go through the instructions for you yourselves to run other activities at the same time, this works particularly well for the younger year groups as to be age appropriate they are, generally speaking, easier to run. Having said that STIXX Shelters and Electronic Control have been run by schools successfully themselves with their year 6s. There are so many variations on this that I would need to quote against specific requirements.
A variation on this is hiring the kit even if I'm not coming into your school, you can either pay me to courier to and from or you can do that yourselves to keep the costs down.

## ANGLO SAXON ARTEFACTS, STIXX. Years 4, 5 & 6

Depending on age, size of the whole group and how long we have, using a STIXX machine the students work individually or in teams of up to 6 to make an artefact associated with the topic. For Anglo Saxons: - Shield, Axe, Helmet, Sword, Spear, Bow & Arrow, Plate, Coin etc.

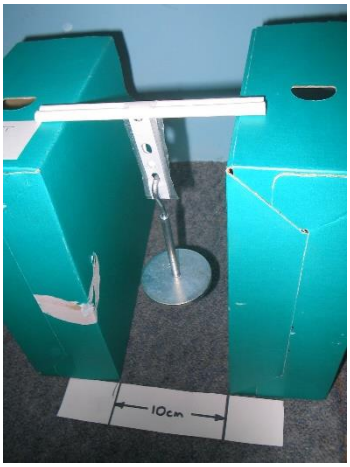


## BALLOON BUGGIES. Years 5 & 6

This activity starts with a discussion on different forms of power that can be used for cars once oil has run out and go on to discuss their advantages and disadvantages. The group discuss the possible 2D shapes for the buggy and then each student designs their own buggy, which harnesses its energy from an inflated balloon. Using just the materials they have been given, they individually use their measuring and making skills to construct a buggy. They use low temperature glue guns, junior hacksaws etc. The students keep the buggy made. If time we have a race to find the buggy that travels the furthest in a straight line. Shell developed the basic activity; my variation is that each student uses their full design and creativity skills for the chassis, so you get all sorts of different shaped buggies.

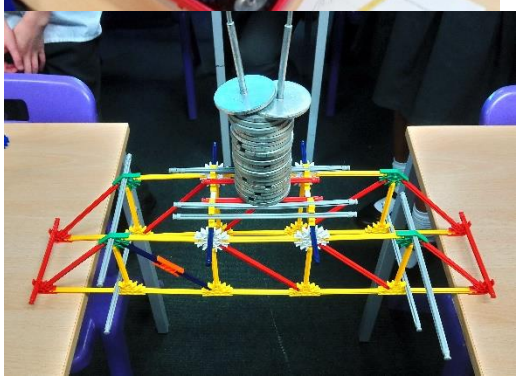
## BRIDGES WITH MATHS. Years 5 & 6

This is run as a scientific investigation after discussion about types of bridges and the Civil Engineers who are involved in designing and constructing them, students are set the task of testing the materials to be used for making their bridge, in this case paper art straws. The students work in teams of four or five and record their results on a bar chart. The bar chart is used to predict how many straws will be needed to build a bridge with a greater span which can support a given weight. Their prediction is built and tested.



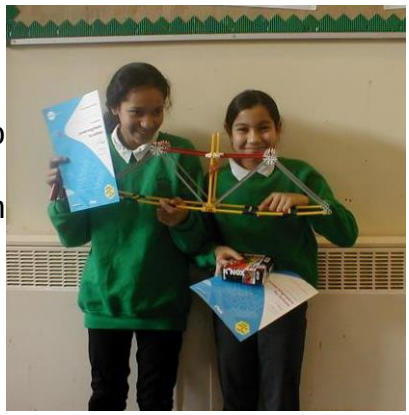

## BRIDGES WITH CARD / SPAGHETTI / STIXX AND BRIDGES OF LONDON OR THE WORLD WITH STIXX. Years 5 & 6

As a Civil Engineer I have a number of these activities!!! You choose before the day which building material the students will use e.g. STIXX newspaper rods or K'nex or spaghetti or thin card. Working in teams they build a bridge to span a given gap and carry a given weight in the middle. At the end they are tested to destruction to see which is strongest.



Using the STIXX machine you can theme the activity to be the Bridges of London or Bridges of the World. With more time and bigger teams they can build a bridge to walk over.

**BRIDGES / TOWERS, K'NEX**



In the introduction I talk about strong, stable shapes and structures. The students work in pairs to design and sketch out their ideas using their creativity. They then build their structure. By limiting the material available problem solving is emphasized. Teamwork is also encouraged by limiting the time available to complete the task. At the conclusion of the activity, each team makes a short presentation to the rest of the class about their model and any special features. For K'nex Bridges I test them to destruction! For K'nex Towers the tallest free standing Tower which successfully carries a weight at the top, is the winner.

**BUILDING GAME, THE. Year 6**

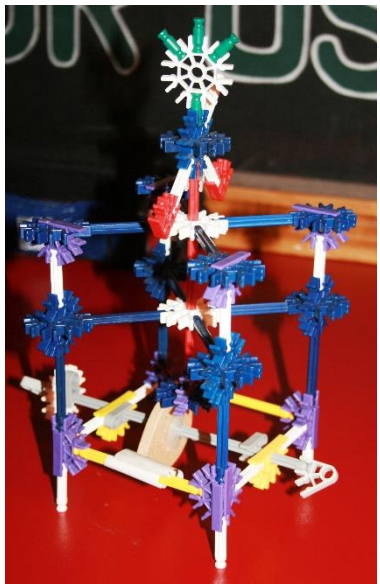
Students work in teams of five or six, within each team each assumes a role as found in the construction industry. Each team have to replicate a model made of different shaped and coloured blocks which is hidden away, within a limited time. Only certain members of the team can see the model for limited times. The only person allowed to touch the blocks to build the replica does not see the model. The activity is about communication, teamwork, decision making and time management. It is more fun than this description makes it sound!

**BURGLAR ALARMS & ELECTRICAL CIRCUITS. Years 4 & 5**

This activity is about simple working electrical circuits, different switches and where they are used in everyday life. The students working in pairs, make a pressure switch and wire it in to a circuit containing a pre-made motorized buggy and a battery. Once the switch is activated the buggy moves. The students work with kits which contain instructions and different switches, i.e. reed, vibration, tilt etc. in them and make up different Burglar Alarms. They then complete a sheet on how they think the switch works, a situation where it could be used etc.
A variation on this activity is that they make their own Burglar Alarm to keep.
This activity is very noisy!

**CAMS. Years 4, 5 & 6**

We look at cams and levers and how different movements can be achieved with their use. For K'nex Cams students work in pairs to make a moving model using a cam. At the conclusion of the activity, each team makes a short presentation to the rest of the class about their model and any special features, and then the models are taken apart. With Cardboard Cams they individually make a Cam toy using a pre made cardboard framework box, which can be kept.

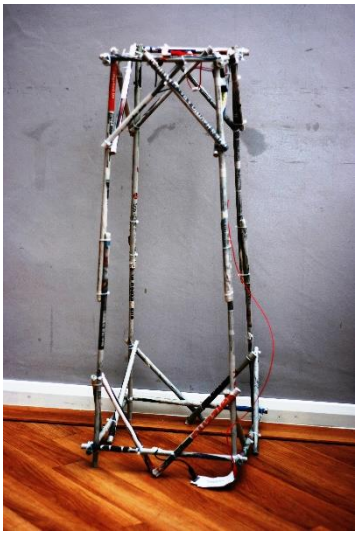


**CHAIRS, STIXX. Years 4, 5 & 6**

Working in teams of five the students design and sketch out their ideas for the back of the chair or the Mannequin. A theme can be set for their Chair back design e.g. it could for a book character, a famous person or more general like the West Indies, mathematical symbols or a throne. All the chairs have the same design of base so they should be strong enough to sit on and the mannequins should be able to have clothes displayed on them.

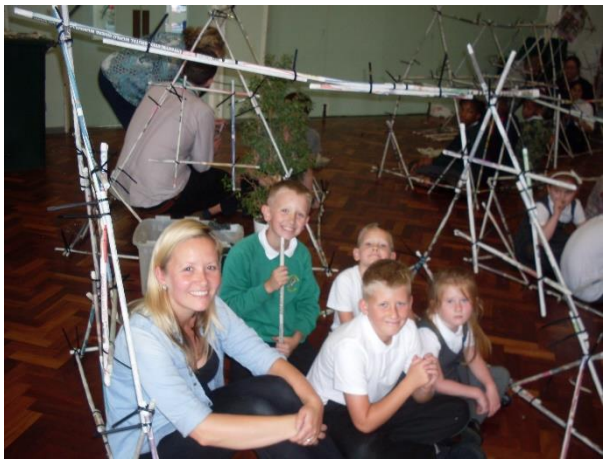
**COMMUNICATION TOWERS, STIXX. Years 4, 5 & 6**

The students in teams of six design and construct a communication tower to a given specification. They make an electrical circuit including a pressure switch and a light bulb, the pressure switch being on the floor and the light at the top of the tower. If time they then investigate how to send messages using the circuit, we look at Morse code and how it was used for communication.

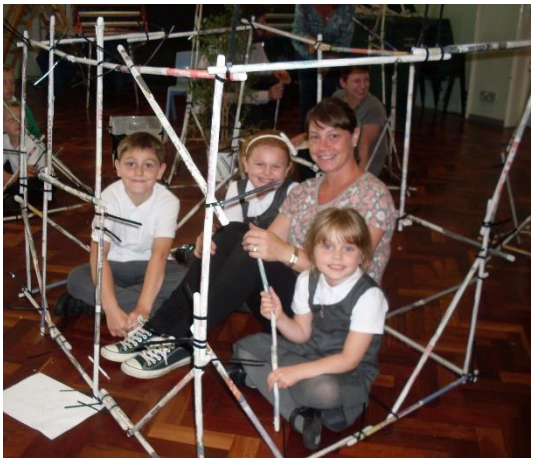


## COMMUNITY ACTIVITIES

If you wish to involve the local community in the activities taking place the easiest way is to ask for volunteers to help out, this is helpful with the younger groups. If there are quite a few and the activity is something like Shelters once they have helped the students to master the STIXX machine and get started, the volunteers can then be grouped into a team of their own and they undertake the same challenge.



If you wish it to be after school and the afternoon activity has been say year 6 and Shelters, there are two main options. In the shorter option the afternoon's Shelters are left up the parents come into review the Shelters and converse with their children about them, then the family groups undertake the Tetrahedron challenge. In the longer option year 6 families come in and undertake the Shelters challenge, the twist is that the families are only given the H&S message and they have to depend on their year 6 child telling them what to do with regard to using the STIXX machine, designing and constructing the Shelter. It is very interesting to see how some parents react!



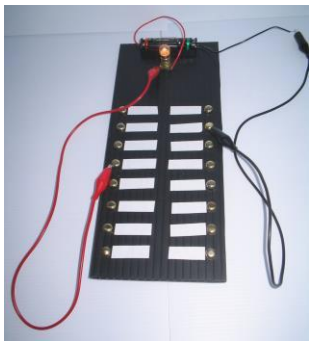
## CROSS CURRICULAR

STEM, Science and DT weeks I regularly feature in, but I can do Art, Maths and even Geography weeks. STEAM weeks are now creeping in where the A is Art, good engineering tends to look good artistically.

**Greek Cam Chariot**

**Pneumatic Roman**

**Victorian Cam Toys**



**Geographical Electrical Quiz**

**WWII Controllable Vehicles**

## CROWNS / HATS, STIXX. Years 4, 5 & 6

Whether the students work individually or in small teams depends on the year group and time available. The challenge is to design and make head gear using STIXX. A theme can be set e.g. a crown, Mexican, Clown etc. Being made of newspaper following the session they can be painted and decorated.

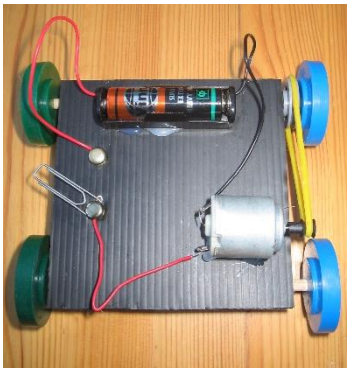
## EGYPTIANS, ANCIENT STIXX STRUCTURES. Years 2, 3, 4, 5 & 6

The students build a model representing the necropolis at Giza. Depending on the numbers of adults who help the students, teams are made up of 6 and each team is assigned a Giza structure to build e.g. one of the three main pyramids, one team the three smaller queen´s pyramids, one team the Sphinx, one team a Sarcophagus (large enough for a student to get into) one team a Mummy that can fit inside the Sarcophagus. Each team is given a sketch of how large I think their structure needs to be. Once the team has made the basic structure they then add special features i.e. for the pyramids they can make and fit passageways, chambers etc., on the Sarcophagus figures and decoration. The big problem is the storage afterwards as

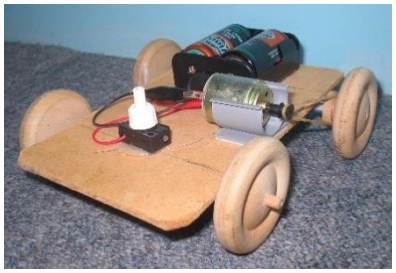
the pyramids are 1.1 x 1.1m by 0.9 tall. They can be made with reusable ties then a decision can be made at the end of the session on which structures to keep and which will be dismantled.
Obviously the structures can be varied to suit the topic i.e. Greek, Roman, Mayan etc. (see details elsewhere in the brochure).

## ELECTRIC BUGGY, MAKING. Years 5 & 6

As the title suggests each student uses various tools e.g. low temp glue gun, saw, wire strippers, craft knife etc. to build a four wheeled buggy. This is controlled with a handmade switch and powered by an electric motor using pulleys. The students keep their buggy.

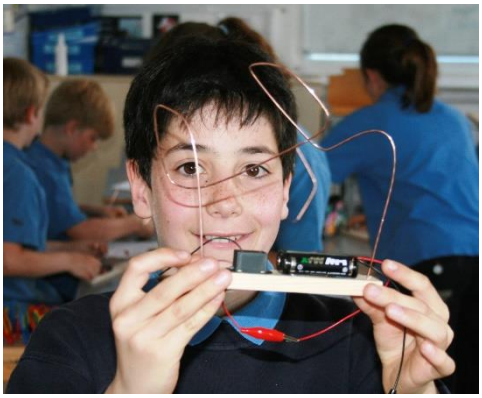


## ELECTRIC BUGGY, PULLEYS. Years 5 & 6

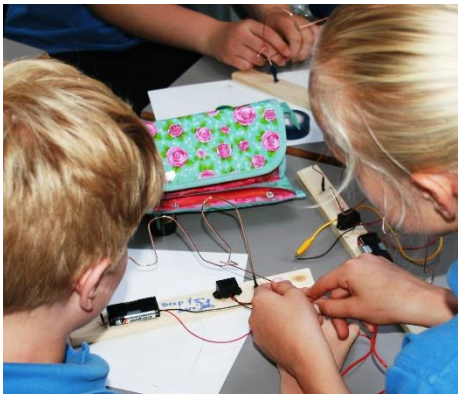


The students work in teams of four or five. Each team uses a pre-made buggy on which they experiment to find the most suitable gearing to achieve the fastest time over two metres. There are three variables: the size of the motor or axle pulley or the size of the wheels. The information is recorded on two tables, which are then used to interpolate what the time would be for different sized pulleys. These predictions are then tested. We end up with a knock out race with each team's best pulley combination. The students do not keep these buggies.

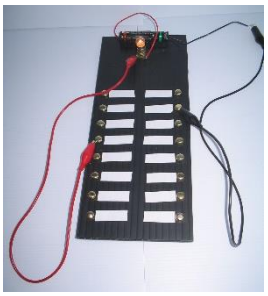
## ELECTRIC BUZZERS, STEADY HANDS. Years 4, 5 & 6



Working individually the students bend up a copper covered steel rod into a shape of their choice then make and attach a buzzer circuit to it. They then make a metal hoop on the end of a handle, the challenge, with a steady hand, is to pass the hoop all the way round their shape without it touching otherwise the buzzer goes off. They keep what they make.

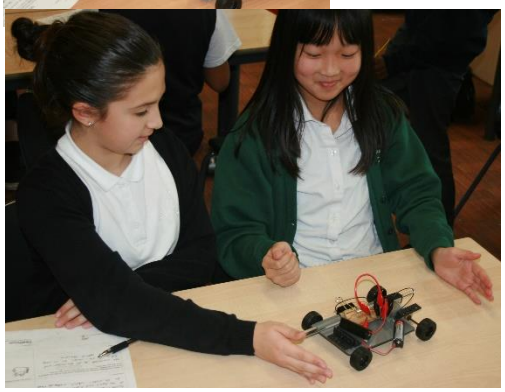


## ELECTRIC CIRCUIT QUIZ BOARD. Years 4, 5 & 6



The introduction is about simple electrical circuits. Working in pairs the students make a quiz board where a light comes on when the leads are put on the matching question and correct answer.

## ELECTRICAL CONTROL/CONTROLLING VEHICLES. Years 4, 5 & 6



This workshop gives students a basic understanding of electrical circuits. The introduction is about circuits, electrical symbols, circuit diagrams and how and why we use them. The students work in pairs and make a pressure switch. They use this to control a pre-made electric buggy and complete three more tasks of increasing difficulty, then another three tasks using a slide switch. (The last one is to control the buggy so that it moves backwards and forwards between two fixed objects automatically). The students do not keep these buggies.

## ELECTRONIC CONTROL/CONTROLLING VEHICLES. Year 6

The activity is based on controlling a model of a driverless automatic train. The students work in pairs, they are given a wheeled buggy with an electric motor. There are a series of tasks that they have to control the buggy to perform. The tasks are split into three sections. In section 1 they use a pressure switch and electrical circuits, section 2 uses a slide switch, section 3 uses the outputs of a programmable electronic controller (IQ2 chip). Sections 1 & 2 form the activity Electrical Control.

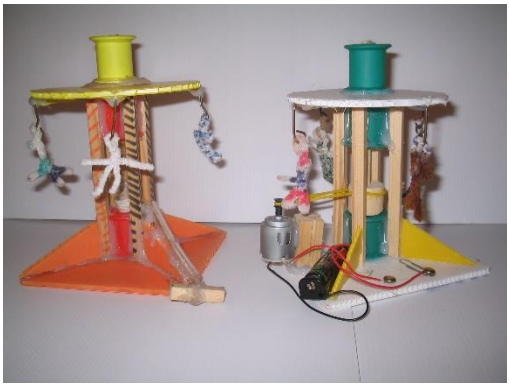
At the end of the second section the buggy should be going backwards and forwards between two fixed objects. In section 3 the buggy should be starting from station A, going to B, stopping then going on to C, then reversing and stopping at B & A on the return journey.

## ENTERPRISE. Year 6

In teams of six the challenge is to 'Design, manufacture and market something that could be sold through the Ikea catalogue, using only recycled paper.' STIXX machines are used to roll the paper into solid rods. These rods are then combined together to make almost anything of the pupil's creativity and imagination. Objects that have been made include: - stool, table, lampshade, lamp, hanging storage, coat hanger rail etc. Each member of the team takes on a specific role i.e. Chief Production Engineer, Marketing Manager Etc. There are a series of deadlines throughout that have to be adhered to and we end with a three minute presentation from each team on why IKEA should stock their company's product that they have made and priced. A separate mini brochure is available on request.

**FAIRGROUND CAROUSEL STRING/MOTOR OPERATED. Year 6**

In my introduction I cover the keywords and explain how to build the carousel. The students then each build their own carousel, from a set of instructions, which is about 17cm tall and they keep.



For the string operated option, the ride turns as you pull a string out. The motor operated is designed to meet the curriculum on pulleys, drive belts etc. and further work can be carried out using different sized pulleys.

**FAIRGROUND, K'NEX and FAIRGROUND K'NEX MOTOR. Year 6**

In the introduction I talk about strong, stable shapes and structures. With a year 6 group making fairgrounds I emphasize the keywords. The students work in pairs to design and sketch out their ideas using their creativity. They then build their structure. By limiting the material available problem solving is emphasized. Teamwork is also encouraged by limiting the time available to complete the task. At the conclusion of the activity, each team makes a short presentation to the rest of the class about their model and any special features. For Fairgrounds there is an option for the students to motorize their rides. This will take longer, but uses driving and driven pulleys, drive belt etc.

## FAMOUS STRUCTURES/LONDON LANDMARKS/WEMBLEY STADIUM/FAMOUS BRIDGES, STIXX. Years 5 & 6

In teams of six the students decide on a Famous Structure, this may be narrowed down by restricting the choice to say just London Bridges or with younger students just one specific famous structure such as Wembley Stadium. The students then sketch and design their model then construct it. At the end they then make a presentation/show & tell on their model and its special features.


## FRICTIONLESS/FLOATING CDs. Years 3 & 4

Each student makes a toy using a CD and water bottle top that floats on a bed of air when a valve releases the air from a balloon, this greatly reduces the friction to the floor or table top.

## GARDEN TRIPODS / JARDINERE / PLANT POT HOLDER. Years 5 & 6

The students are split into teams of four or five, they design their tripod within a given set of design criteria from which they draw up a parts list of the STIXX they will need. Before my visit the students should have researched Garden Tripod designs. The STIXX are made, waterproofed and the tripods fabricated using cable ties. They can be put outside and will last a plant growing season, depending on the quality of the waterproofing!

## GREEK ARTEFACTS, STIXX. Years 4, 5 & 6

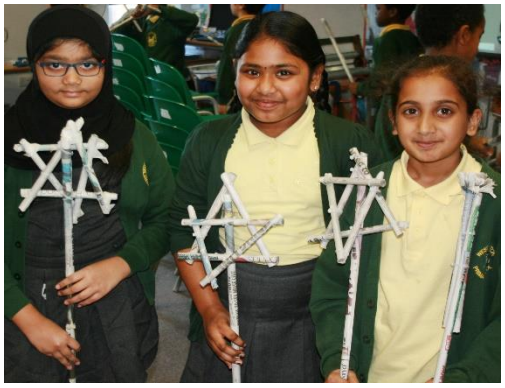
Depending on age, size of the whole group and time, using a STIXX machine the students work individually or in teams of up to 6 to make an artefact associated with the topic. As an example the equipment for a Greek Hoplite Infantryman: - Shield, Helmet, Sword, Body Armour, Spear/Javelin etc.

## GREEK TEMPLES. Years 2, 3, 4, 5 & 6

See Roman Temples

## HARRY POTTER ARTEFACTS, STIXX. Years 4 & 5

Depending on age, size of the whole group and time, using a STIXX machine the students work individually or in teams of up to 6 to make an artefact associated with the topic. For Harry Potter:- this could be the sign of the deathly hallows, a broom stick, a Quiditch goal, a pointy magic wand, a star magic wand, a giant key, a large pair of spectacles, sword of Azkaban etc. it just depends on the student's imagination and creativity.



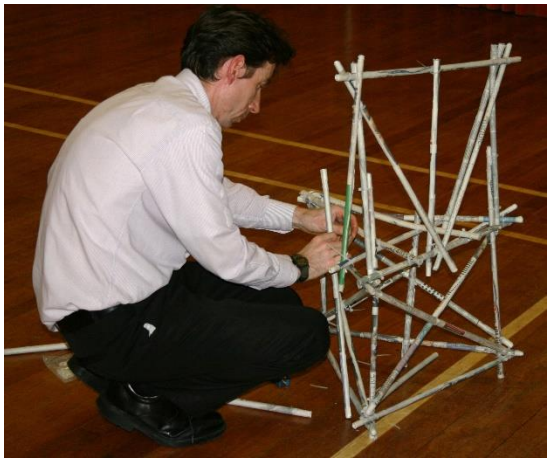
**HOMES, STIXX. Years 1 & 2**

The students are split up into teams of six, an adult with each team. Using the STIXX machine to make the newspaper rods and using masking tape, each team follows full written instructions to make one of six different homes; a Traditional House, a Wigwam, a Tent, a Tower Block, a Round House and an Igloo. The homes are big enough for one student at a time to get into. The structures can be left up at the end of the activity, but they do fill up a lot of space! An option is for one or more groups in to make a STIXX Rocket instead of a home.

**INSETS**

These can be split into staff team-building CPD and activity/practical sessions. They can be run individually as twilights or can be run in combination i.e. one team building followed by a practical session, to make a half or full day INSET.

For the **Team Building CPD** sessions you choose the activity, STIXX Shelters is the most popular, but it could be The Building Game, Enterprise or STIXX Tall Towers. Some like Enterprise need longer than others. Each of them run with teams of five or six competing against each other. Staff develop skills in teamwork, communication, cooperation, organization, problem solving, resilience and time management; some require enterprise and creativity carrying out a fun practical competitive task. They can be themed on Mindset Growth and the 4Rs, CREATE etc.



The **Activity/Practical** sessions are loosely split between the equipment used, being: - DT skills, STIXX Machine, glue gun and K'nex. The sessions are a hands-on practical experience for the staff. The introduction is on use and H&S of the equipment, the staff then have their choice of a number of activities that use that equipment, that cover the range of year groups represented. The staff keep the models they make (except K'nex). The INSETs develop the staff's confidence and competency in using DT equipment and give them ideas for practical DT and Science activities they can run with their students, whilst expert and specific individual advice is available. For example within the DT skills session glue guns, craft knives, junior hacksaws, drills and wire strippers are used and there are six activities available. If there are any specific activities from this brochure you want I should be able to include them. With full INSET days I add more activities and have time to run through them in greater detail.

The STIXX machine session is particularly useful if you have bought a STIXX machine. Twilight sessions are better value if booked in addition to a day of activities in the school.

**<u>INVERTEBRATES / MINI BEASTS, STIXX. Years 2, 3, 4, 5 & 6</u>**

Depending on the time available the students make or I prefabricate a frame that will sit on the student's shoulders when they are on all fours. Onto this frame, the students in teams of six, design and then build a given invertebrate staring with the body/thorax/shell, this could be a dragonfly, a crab, a bee, a spider etc. The frame is such that the students can then scuttle around the floor on all fours with their invertebrate on their shoulders. After the session the invertebrate can be painted, have paper mache added, junk modelling etc.

## K'NEX CREATIVE. Years 2, 3, 4, 5 & 6

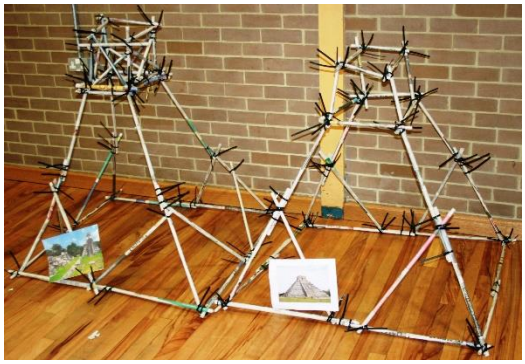
The theme could be 'Build something that could fly.' We discuss possible subjects e.g. plane, bird, ladybird, fly etc. The students work in pairs and start by sketching their subject and then building it using K'nex. The students are encouraged to be creative, imaginative and use their problem solving abilities to create a three dimensional model with special features. At the end each pair make a presentation to their class describing their model and its features. Then, unfortunately, the models are broken up after you have taken photos of them.

## MANNEQUINS/SCHOOL PLAY PROPS. Years 4, 5 & 6

The students are split into teams of four or five, they design their product within a given set of design criteria. The products are fabricated using cable ties.

## MAYAN, STIXX STRUCTURES. Years 4, 5 & 6

Similar to Egyptian Structures (see details under that heading) but each team is given a different Mayan structure to build. Within reason which structures are built is up to the teacher. For example you could choose The Pyramid of the Sun or Moon or Calakmul, a Stelae, a Ball Court, Funerary Mask etc.



## MONEY CONTAINERS, RECYCLED. Years 3, 4, 5 & 6

Working individually students use their making skills turn a recycled juice carton into a useful purse. They will be using scissors, staplers and adding Velcro for the catch.

## MOVING PERSONS/PIRATES/ALL ABOUT ME/SUPERHEROES. Years 1 & 2

I demonstrate the movement one can get from levers, fixed and loose pivots. Each pupil then builds a figure of a person where the head and the arms move as a button is slid up and down, using levers, sliders and a loose pivot. The legs are added using fixed pivots. This can be themed on Pirates so a Moving Pirate is made complete with wooden legs, parrots on shoulders, a hook for a hand or they can make a moving image of themselves 'all about me' or moving superhero etc.


## MOVING PICTURES, DOUBLE LEVERS. Years 1 & 2

The introduction is on toys before the invention of small motors and computers, in particular those using levers. The students working individually make a Moving Picture that works by using levers and sliders. If time the students using their creativity can then design and make a scene using their Moving Picture for example a baleen whale scooping up plankton, pods of dolphin leaping out of the waves, killer sharks chasing leopard seals etc.

## MUSICAL INSTRUMENTS, RECYCLED STIXX. Years 4, 5 & 6

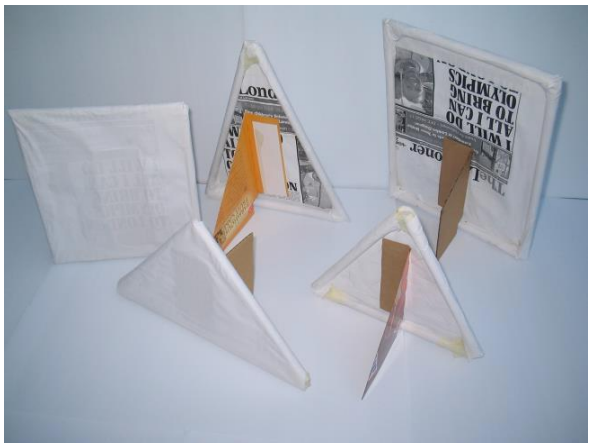
Using recycled junk and STIXX musical instruments are designed and made. They tend to look more authentic than they sound although the percussion instruments are better.

## PARTHENON & SHELTERS, STIXX. Years 5 & 6

It starts with the standard STIXX Shelters i.e. teams of six have to design and construct a Shelter large enough for all six students to get into, made out of newspaper (More details under STIXX Shelters.) After completion and reflection on skills used one Shelter (normally a cuboid) is left up and the rest taken apart. Each team is then assigned a different task to turn the cuboid into the Parthenon. One team each on the roof, the columns, the column capitals & bases, figures\scenes for the pediment, frieze etc.

## PHOTO FRAMES using RECYCLED PAPER. Years 3, 4, 5 & 6

Rolling A4 paper in the STIXX machine towards the long or short side gives rods of different lengths. Using these in combination with three or four sides creates over ten different possible 2D designs for the photo frames. The students, working on their own, choose the 2D shape they like and then make the components required. These are assembled using masking tape. An A3 sheet is stuck over the frame to give the frames a front to stick the photo on. The students cut out a stand from a cardboard cereal packet and this is stuck onto the frame. The following day (if the teacher wishes) these can be decorated with papier maché and/or poster paint.



## PLAYGROUND FORCES & EQUIPMENT. Years 1 & 2

The introduction is about forces and where and how we use them in Playground Equipment. The students are then split into groups of five, with an adult in each group. Using the STIXX machine to make the newspaper rods and masking tape, each group makes a different piece of playground equipment, a Swing, a Climbing Frame, a See-Saw, a Rocking Horse, a Table and a Stool. The Stool should be strong enough for the students to use at the Table and the Swing stands 1.2m high. The structures can be left up, but will fill quite a space. An option is for one or more groups to make a STIXX Rocket instead of a playground structure.

## PNEUMATIC MOVING MONSTERS. Years 3, 4 & 5

The introduction is about simple pneumatic systems. The students individually make a pneumatically operated monster with a pop bottle and burger box, with the addition of a valve the balloon can be left inflated.

## PNEUMATICS, ROMAN/GREEK/ETC. Years 3, 4, 5 & 6

The introduction is about simple pneumatic systems. The students individually make a pneumatically operated model. The choice of models that are made depends on you. In Romans when you push the master cylinder in the two slave cylinders go forward with the shield or sword or javelin or trident or whatever is attached. Tower bridge with lifting decks could be made etc.

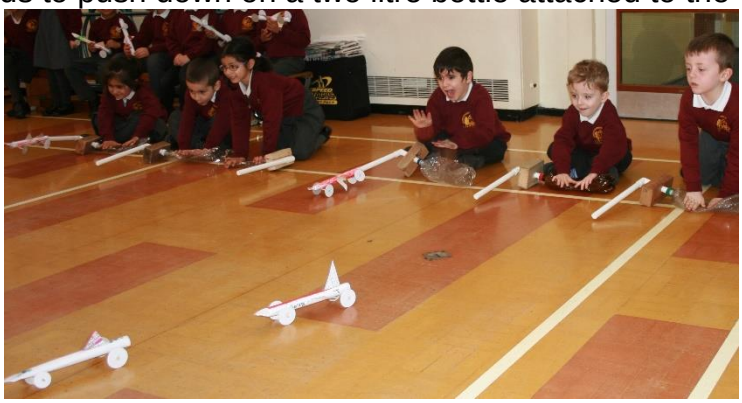
## ROCKETS, ALKA SELTZER. Years Nursery, 1, 2 and 3

This activity starts with a discussion about chemical reactions. Observation is made of what happens when an Alka Seltzer tablet is placed in water. Each student makes and decorates their own Rocket from a film canister (unfortunately I cannot get more film canisters these days so the students do not keep them.) I launch all of their Alka Seltzer powered Rockets which should reach a height of three metres.

## ROCKET CARS, STOMP. Years 1, 2, 3, 4, 5 & 6

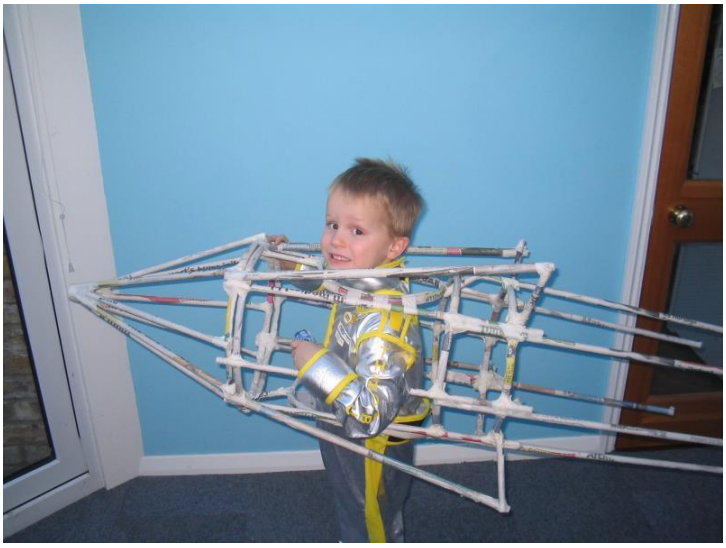
This is based round the same system of launching as the STOMP Rockets, but horizontally on a flat smooth surface. A chassis is made out of an A4 sheet of paper wrapped round a plastic tube. Axles and wheels are fixed to the chassis along with fins and air spoilers. The cars are launched by the students using their hands to push down on a two litre bottle attached to the plastic tube. If time the cars can be decorated and a knockout race organised.

Depending on the topic this has in the past been run as London Black Cabs, London Red Double Decker Busses, Rocket Horses etc.



**ROCKETS, STIXX. Years 1, 2 & 3**

Similar to Playing with Forces or Homes except they make Rockets. With the Rocket in the launch position a student can stand up in it in, when in the horizontal flight mode the portholes are sized so that the rocket will sit on their shoulders. An option is for one or more groups in Playing with Forces or Homes to make a Rocket instead.



**ROCKETS, STOMP. Years Reception, 1, 2, 3, 4, 5 & 6**

Rockets are made by rolling paper round a tube and stapling the end. They can either be launched by blowing down the tube or connecting the tube to a plastic bottle and stomping/jumping on the bottle. The activity can be extended by adding fins at a slight angle and investigating how the launch angle affects the distance travelled.

**ROCKETS STOMP, A SCIENTIFIC INVESTIGATION. Years, 4, 5 & 6**

As with STOMP Rockets the students each make two rockets one with and one without fins, then launch them by STOMPING on a 2l plastic bottle. The one without fins will go three or so metres, the one with fins, if attached the correct way will go 40 plus metres. This then leads on to looking at it as a science investigation i.e. what can we measure, what can we vary. There are in fact over 25 variables. If time or this can be completed afterwards, the students choose what to vary and what to keep constant then carry out their own fair test, from this they can then go onto graphs of results, predictions, conclusions etc. The slight drawback for a true fair test is the variation in the force of the STOMP and how measure or keep it constant!

## ROMAN TEMPLES AND AQUEDUCTS OR GREEK TEMPLES, STIXX STRUCTURES. Years 2, 3, 4, 5 & 6

Similar to Egyptian Structures (see details under that heading) but they are given a basic 3D shape to build as their Roman Temple cuboid on its side, cuboid on its end or a cylinder, the size is dependent on their age group the temple should be big enough for one student to get into it. On completion of the basic shape the ´Roman Temple Features´ are added i.e. roof, columns, column capitals and bases, pediment figures/scenes etc. The team/s on aqueducts are given a sketch to follow for a basic aqueduct they then use their creativity & imagination to add to it.

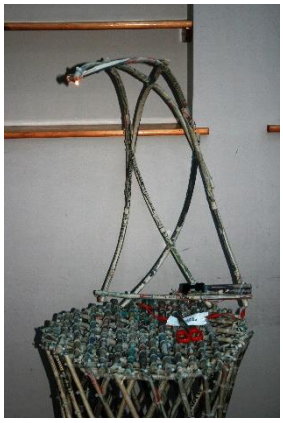
With Greek Temple the same, but they add 'Greek Temple Features.'

## RUBBER BAND BUGGY. Years 3, 4, 5 & 6

This is carried out as a scientific investigation, with the older groups this is discussed in greater depth. The various forces in action and other variables are discussed. The teams work in threes or fours, each team has a pre-made rubber band powered buggy and they investigate the distance travelled in relation to the number of twists of the rubber band. Each team collects their own set of results which they display on a large communal graph using their unique colour coded stickers. This graph and its variations are used as a focus of discussion. The graph is used to predict the number of twists required to travel a given distance. The students test their interpolations.

## SEATS WITH READING LIGHTS, STIXX. Years 4, 5 & 6

The students in teams of six design and construct a chair with a back strong enough for them to sit on. They then make an electrical circuit including a pressure switch and a light bulb with the switch on the seat of the chair such that when they sit on the seat the light comes on over their shoulder so that they can read.



**SHELTERS OR TALL TOWERS. Years 5 & 6**

The introduction is about strong two and three dimensional shapes and how to build a stable, strong structure. The students are split into teams of five or six. The challenge for each team is to use the STIXX machine to make newspaper rods and then connect them with re-useable cable ties to build a shelter big enough for the whole team to get into within the time. The activity is about creativity, teamwork, enterprise, communication, cooperation and working to a deadline. If you follow the Mindset and the four Rs, I can structure the introduction on that. The vast majority of the teams are successful, even if the roof is dished and the odd one needs a helping hand to remain upright!

Instead of Shelters the teams could make Famous Structures of their choice i.e. Eiffel Tower, Big Ben, Canary Wharf, a working model of the London Eye etc.
Or they could make models of the Olympic Stadia.
Or they could make models of equipment you could find at the Olympics. I.e. basketball hoop and stand, table tennis table, hurdle, archery target etc.
Depending on their topic the theme can be altered from Shelters:-
If Crime and Punishment, Jails.
If Extreme Earth, Shelters after a natural disaster.
If Greeks or Romans, Greek or Roman Temples.
If Victorians, Workhouses.
If WWII, Bomb Shelters.
Etc. etc.

STIXX Tall Towers is very similar, but each team tries to build the tallest free standing tower. Please be aware this ends up being very competitive, not always attractive!!

## SHELTERS LITE, STIXX. Years 3 & 4

It is the standard STIXX Shelters (more details under Shelters) but without choosing a 3D shape for their design. This makes it suitable for younger students. You can choose the 3D shapes from cuboid to octagonally based prism, the students stand, sit or lie in the shape and work out how big it needs to be to fit them all in. Then after that is checked they continue with making the STIXX rods and constructing their Shelter. Younger students do need support for this task, parents are great, preferably at least one adult per team of six students.

## SUMMER FETES / CHRISTMAS FAIRS

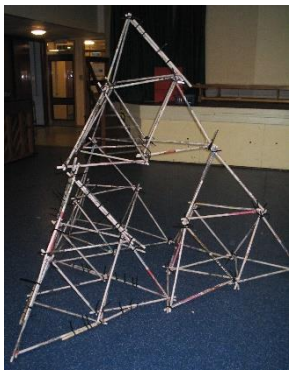
This can be completed in school time and the students make something with the STIXX machine that could be sold at the fete/fair such as wastepaper baskets from recycled paper. Or I bring along some STIXX machines to the fete/fair and visitors can either make a small object to keep such as a Harry Potter Artefact (see under separate heading) or can build onto a temporary structure that gets larger and larger as the day goes on.
If I still have it I bring a large pre made giant chair that visitors, including adults can sit on.

**TALL TOWERS, SWEETEST. Years 4, 5 & 6**

This activity can run on its own or as an introduction to a structures activity. Each team is given the same number of soft sweets and cocktail sticks and has to build the tallest free standing tower within a limited time.

**TETRAHEDRON, STIXX. Years 4, 5 & 6**

This is normally added to a STIXX activity as a short addition, teams have six STIXX rods and four rubber bands and are challenged, using all the materials logic, and Maths, to make a 3 D shape. The can be extended into a full length activity by then combining the tetrahedrons into a space frame or a load bearing bridge.



**TORCHES. Years 4 & 5**

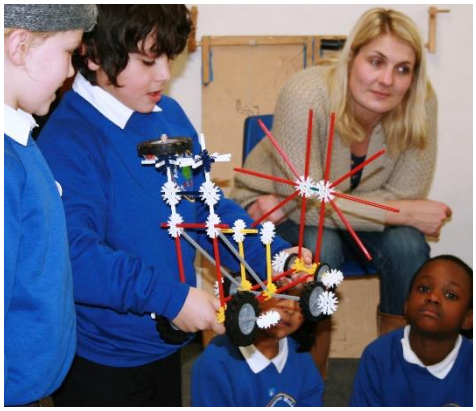
Pupils individually make a torch using a cardboard tube and a choice of switches that they make to activate the torch. They can investigate how to send messages using the torch, we look at Morse code and how it was used for communication.

**TORCHES, DYNAMO. Year 6**

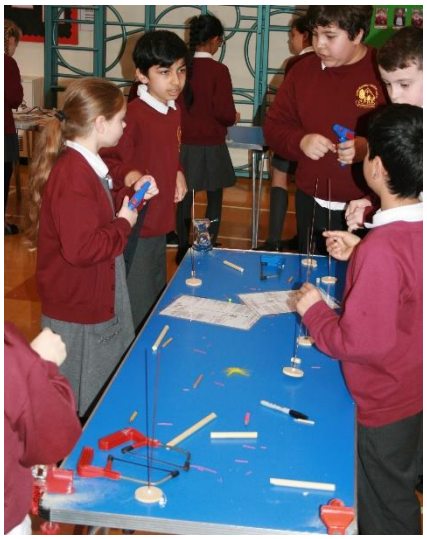
Individually the students make a torch that is powered by turning a handle that spins a dynamo to generate electricity and this is used to light one of two LEDs, which are wired up such that by spinning the handle in the opposite direction the other LED will be lit. This activity can be stretched by adding on either the first and/or second stages of Electrical Control using a pressure then slide switch to control a pre made buggy. (More details under Electrical Control.) If time they can investigate how to send messages using the torch, we look at Morse code and how it was used for communication.

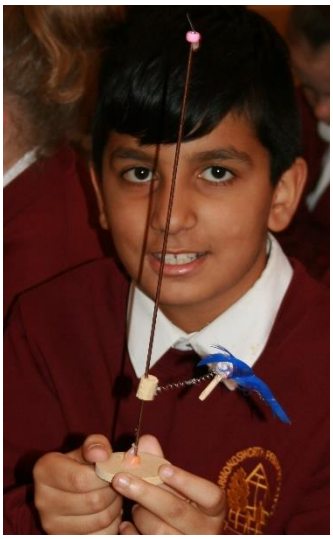
## VEHICLES & WINDING MECHANISMS, K'NEX. Years 2 & 3

The introduction is about types of forces, axles with fixed or free wheels. The students then work in pairs and make vehicles with some fixed and some free turning wheels. With fixed wheels it is possible to make a winding mechanism using a rubber band fixed to the axle.



## VICTORIAN TOYS & CAMS. Years 4, 5 & 6





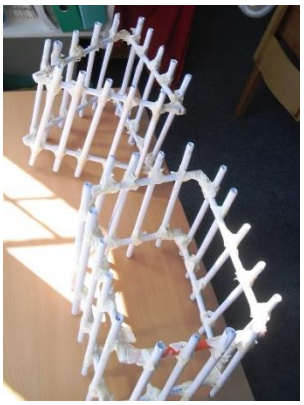
The introduction is about non-motorized and non-electronic toys with working examples. We look at cams and levers and how different movements can be achieved with their use. The students individually make a cam operated toy (all day) (Photo in Cross Curricular) or a Victorian Woodpecker (1½ hours) either of which they keep.
Or working in pairs using K'nex and Cams they design and construct a Cam operated toy, this can be static or if the students are more ambitious they can make a moving toy where they pull their toy along which turns the Cam and a figure on top of the framework moves up and down.

## VIKING ARTEFACTS, STIXX. Years 4, 5 & 6

Depending on age, size of the whole group and how long we have, using a STIXX machine the students work individually or in teams of up to 6 to make an artefact associated with the topic. For Vikings: - Longship, Shield, Axe, Helmet, Sword, Spear etc.

## WASTEPAPER BINS/CONTAINERS FROM RECYCLED MATERIALS. Years 5 & 6

Rolling A4 paper in the STIXX machine towards the long or short side gives rods of different lengths. Using these in combination with three or four sided shapes gives over ten different possible basic designs for the ribs/cross section of the Containers. The bins are constructed with two horizontal ribs and vertical rods joining them together. The students work in teams of three or four, designing their shape and then making and assembling the components required. With older students newspaper rods cut to different lengths can be used vertically. The bins can be designed to a theme i.e. basketball where a hoop and backboard can be built over the bin, then rubbish thrown against the backboard drops through the hoop (hopefully) into the bin. Cereal packet cardboard is then fitted inside to make the container. Following my session (if the teacher wishes) these can be decorated with papier maché and/or poster paint.



## WINDING MECHANISMS, COTTON REELS. Years 2 & 3

The introduction is about types of forces and how winding up can provide the mechanism to operate some non- motorized moving toys. The students then choose a shape, preprinted on thin cardboard, a butterfly, a car, a bat etc., colour in and cut out the shape. The shape is then folded and mounted on a rubber band/cotton reel mechanism I have previously made. The students drag their model backwards which winds up the rubber band, before releasing it to run forwards. The students keep their winding mechanism.

## WINDING MECHANISMS, COTTON REEL TANKS, Years 1, 2 & 3

The students working individually make a simple moving toy that can be wound up, using a rubber band and a cotton reel. It is quite a short activity so it is normally added onto one of the other activities. Or suitable for me to bring the materials and equipment for the teacher to run whilst I'm running another activity with another class.

## WINDING MECHANISM with PLASTER OF PARIS. Years 2 & 3

The introduction is the same as for cotton reel winding mechanisms. The Winding Mechanism is made from a cylinder of Plaster of Paris suspended on a rubber band within the bottom of a plastic bottle. As a string is pulled out it winds up the mechanism and as you let the string go the bottle scampers and jumps across the table. Due to the length of time to make them, I normally assemble these beforehand. The students choose what they want to decorate the bottle as, e.g. frog, ladybird etc. They use crêpe paper then add ears, eyes, mouth, feathers, legs, tails, and antennae and so on. They often end up looking very colourful and striking.

**WORK RELATED LEARNING**

One of the above activities, normally Garden Tripods or Shelters, run in a work context.