

John Scottus National School Whole School Science Plan 2017

Introductory Statement and Rationale

(a) Introductory Statement

This plan was formulated by the Principal, school Science co-ordinator and staff of John Scottus National School. It has arisen after a review of the previous plan and participation in whole school CPD in the RDS STEM learning programme. Through collaboration a final draft of the Science plan has been put forward.

(b) Rationale

This plan resulted from a review of our existing Science plan undertaken in October 2016. We focussed on this area of planning to ensure that the revised guidelines for Science were introduced in our school in an organised, coherent and accountable manner and reflected the ethos of our school. It is hoped that this plan will benefit teaching and learning in our school by providing teachers with the adequate materials to aid a spiral approach to the planning, teaching and learning of Science at each specific level. It is hoped that the plan will provide guidelines for developing students' scientific lessons in an engaging and enjoyable way.

Vision and Aims

Vision:

John Scottus offers a vision of education which gives children the self-mastery, strength of character and compassion to contribute meaningfully to society. This character development is through life skills of enquiry, attention and stillness.

We believe that our Science plan should be simple, yet effective in how it reflects the values of our school community and ethos. We believe the world of enquiry should be full of wonder and awe with a sense of limitlessness of the universe and an understanding of the evolution of Science. We wish to use students' innate levels of curiosity to enhance their scientific knowledge and skills. We believe the teaching and learning of Science should be child led.

We believe that Science should be practical with opportunities for students to engage in hands on, collaborative and investigative work. Our vision will aim to cultivate a positive attitude and a sense of responsibility among our students for the natural and human environments.

Aims:

The aims of social, environmental and scientific education are:

- to enable the child to acquire knowledge, skills and attitudes so as to develop an informed and critical understanding of social, environmental and scientific issues
- to reinforce and stimulate curiosity and imagination about local and wider environments
- to enable the child to play a responsible role as an individual, as a family member and as a member of local, regional, national, European and global communities
- to foster an understanding of, and concern for, the total interdependence of all humans, all living things and the Earth on which they live
- to foster a sense of responsibility for the long-term care of the environment and a commitment to promote the sustainable use of the Earth's resources through personal life-style and participation in collective environmental decision-making
- to cultivate humane and responsible attitudes and an appreciation of the world in accordance with beliefs and values (Primary Curriculum Science, 1999, p.5)

The aims of Science education are:

- to develop knowledge and understanding of scientific and technological concepts through the exploration of human, natural and physical aspects of the environment
- to develop a scientific approach to problem-solving which emphasises understanding and constructive thinking
- to encourage the child to explore, develop and apply scientific ideas and concepts through designing and making activities
- to foster the child's natural curiosity, so encouraging independent enquiry and creative action
- to help the child to appreciate the contribution of Science and technology to the social, economic, cultural and other dimensions of society
- to cultivate an appreciation and respect for the diversity of living and non-living things, their interdependence and interactions
- to encourage the child to behave responsibly to protect, improve and cherish the environment and to become involved in the identification, discussion, resolution and avoidance of environmental problems and so promote sustainable development
- to enable the child to communicate ideas, present work and report findings using a variety of media

Additional School Specific Aims To:

- Maintain our annual participation in the Green Schools Programme since commencing Litter and Waste initiative in 2015
- Participate in our annual Day of Action with the Dodder Action group by helping to clean the River Dodder banks
- Continue annual participation in the RDS Primary Science Fair (6th class)
- For teachers to continue to incorporate the school garden as an integral part of their Science planning
- Introduce basic programming initiatives (e.g. Scratch and Scratch Junior) to after school programme and mainstream classes
- Introduce Lego as part of STEM learning in senior classes
- Participate in Science and Maths week in alternate years
- Reduce the use of Science textbooks by teachers and students to zero

Content of Plan

Curriculum:

1 *Science Programme:*

1.1 *Strands and Strand Units:*

Teachers in our school are familiar with the strands, strand units and content objectives for their classes. Teachers will ensure within their individual planning that there will be progress from class to class as regards content and skills development of the Science programme. This will be aided by detailed school yearly plans per class level (See Google Drive for plans) ensuring that planning, teaching and learning are maintained to a high standard. This will also ensure continuity in learning if teachers change class levels and hand over plans to the incumbent teacher. Teachers at the next class level will be able to plan based on student's prior learning.

Equal emphasis will be given to each strand and strand unit. Focus will be given to the school garden project each term. As we have recently completed a whole school CPD programme in STEM learning, we aim to incorporate many of these investigations into our whole school plan. Investigations that are attached to this plan at each class level are not exhaustive and each teacher has the autonomy to add/replace an investigation based on their classes needs.

1.2 *Children's Ideas:*

We will use children's ideas as a starting point for all scientific activity. We encourage a hands on practical approach to Science that is inside and outside the classroom.

We find out what the children know already through the following:

- talk and discussion
- questioning and listening
- problem solving tasks
- annotated drawings
- teacher designed tasks
- Concept mapping (AFL and AOL) strategy
- Each class will be encouraged to have a "*Wonder wall*". Pupils will have opportunities to pose their own questions of enquiry and afforded the opportunity to test out their hypotheses on related topics. This can be guided as much as possible from the teacher.

1.3 *Practical Investigations:*

Hands-on, practical investigations are encouraged for all class levels in all areas of curriculum strand and strand units. Designing and making is also an integral part of practical investigations. This should be incorporated in teacher planning in a cross-curricular manner (e.g. Romans – Mangonal or Aztecs – Atlati). Investigations should encourage group work, collaboration, cooperative skills and critical thinking.

We will encourage open and closed questioning to trigger engagement, investigations and reflection.

Practical investigations will encourage the concept of **fair-testing** at all class levels. Students will also be encouraged to collect, present and communicate results and conclusions to their investigations in their own way, with the guidance and leadership of the class teacher.

1.4 Classroom Management:

Children partake in group work regardless of age and ability. Within the classes we will differentiate the work for the different ages by expecting the older children to cover more in content and presentation. We will take account of children with different needs and the Learning Support/Resource teacher and Special Needs Assistant may support the class if the need arises. At present we draw on a variety of resources to supplement the teaching of Science in the classroom. It is our aim to stop the use of class text books for Science, with the aim for class teachers to compile a Science folder/copy of student's works that can be passed on each year, showing progression of learning. Science work and work completed in the school garden should be displayed on class noticeboards and/or the Green School notice board.

Class teachers should be cognisant of how they form groups for their investigations. Students should be reminded of the appropriate and safe handling of equipment. Allocation of jobs to group members, provides clearly defined roles (e.g. recorder, reporter, resource, group leader). A risk assessment should always be carried out when visiting the school garden, to remind children of safe use of equipment and movement throughout the area.

1.5 Key Methodologies:

We will ensure that the key methodologies of the primary curriculum are used during scientific discovery, these include;

- Using the environment
- Active Learning
- Guided and discovery learning
- Free exploration of materials
- Spiral nature of the curriculum – building on prior learning
- Learning through language
- Brainstorming and concept mapping
- Free writing
- Q & A session
- Think and draw
- Think, pair, share

Pupils will be given opportunities to engage in outdoor seasonal habitat work both within the schools grounds and the local area. We have easy access to our school garden in the "Secret garden" and Herbert Park which provide a rich resource for fieldwork, due to the number of habitats (e.g. bug hotel, ponds, hedges, native tree hunt etc).

1.6 Linkage and Integration:

Linkage of the four strands in Science is encouraged. There are opportunities to link topics across the Science curriculum using strands and strand units. Teachers often make use of integrated topics. This will be reflected in their planning/project work. The curriculum allows for integration of the SESE subjects. Science naturally integrates with history and geography.

Examples of topics which link and integrate with Science include :

- Thematic approach e.g. seasons, festivals, Green Schools, Young Scientist, STEM learning
- SPHE: Human life units on growth and reproduction
- Art and History: Design and make activities
- Maths: Graphing results of investigations, measuring, colour, shape use of ICT and scratch programming
- Geography: Environmental awareness and Green School, school compost and garden
- English: Procedural writing for investigations, use of imperative verbs and sequencing, retelling what has happened already. Explanation and report writing in research areas.
- Aistear Themes: Space, Transport (push and pull) etc.

The Discovery Primary Science Fair is an integral part of Science Education in John Scottus. We feel it is the culmination of everything students have learned in the time they have spent in John Scottus. The Discovery Primary Science Fair offers teachers the opportunity to plan a project based on this cross curricular approach. Students will learn and understand how Science is linked across the curriculum.

1.7 Using the Environment:

We encourage children to take an interest in their immediate school, local and wider global environment, both through environmental awareness and through integration with the geography curriculum – people and other places, life, climate and life in homes in foreign countries. We have international children within the school and integrate their cultures, lifestyle where possible in the Science curriculum.

There are many possibilities provided by the surrounding environment for habitat work which will be explored by individual class teachers.

These include:

- Walls around school yard and stone walls at the school entrance
- Concrete/tarmac/artificial surface areas on school grounds
- The secret garden (trees, grow beds and hedgerows)
- Grass areas in secret garden
- Study of mini-beasts on concrete surface area, bug hotel, vegetable patch, wild area and planted area
- Study of trees in the secret garden and in Herbert Park tree trail
- Growing potted plants (sunflower and hyacinth in the classroom)
- Birds in our school grounds using bird house camera
- River Dodder
- Grand Canal
- Sandymount strand
- Dun Laoghaire harbour

Each class are given responsibility for the maintenance and enhancement of their grow beds in the secret garden. This includes the care for growing crops, preparing of beds, weeding, painting and other general maintenance. It is our aim to develop paths and colourful fences and garden decorations for each grow bed.

We will continue to use our indoor and outdoor environment as part of Science week. This has/will continue in the form of group projects, designing and making activities and an SESE trail using our school grounds and school garden. We hope to encourage students to enter and participate in Scratch programming competitions.

There are individuals and organisations both inside and outside our school community that can support us in the delivery of our Science curriculum;

- Claire Egan – Dublin City Council Green School Co-ordinator
- Mr Gibney – PE Teacher, Head of Active School Committee and co-ordinator of Super Trooper programme
- Paddy Madden – Former SESE lecturer at Marino Institute of Education, currently advises school garden on an informal capacity
- Quickcrop – organisation for sourcing seeds and gardening materials
- ReCreate – materials and workshops
- Pine forest
- Aqurium in Bray

- Dublin Zoo
- Airfield farm
- Natural History Museum
- Science Gallery, Trinity College
- AMBER – the Advanced Materials and BioEngineering Research Centre, Trinity College Dublin.

1.8 Balance between Knowledge and Skills:

“Education is not about filling a pail but about lighting a fire” (WB Yeats).

By offering our students the correct and accurate Scientific knowledge, in conjunction with guidance in scientific skills acquisition, we hope to inspire our students to become critical thinkers and not simply individuals who know lots of scientific knowledge. We hope to inspire the next generation of Scientists to be creative and inventive in their approach to Science discovery and problem solving. This is achieved through:

- Questioning
- Predicting
- Observing
- Investigating and experimenting
- Estimating and measuring
- Analysing
- Recording and Communicating

Teachers will refer to the curriculum appropriate to their class level for content of Science skills. The children will be working in a scientific way, questioning, observing, predicting, investigating, analysing and recording during Science class. The skills of the Science curriculum will be developed through teaching of the content of the strand units, with children actively participating in Science discovery. Children are given opportunities to play with and explore Science materials. Pupils will be given opportunities to engage in design and make activities in each class appropriate to their ability and area of study.

Examples of these include design and make:

- a lighthouse
- a boat
- percussion instruments
- an electric quiz
- a hibernaculum
- a bird table
- a minibeast hotel
- as part of the Discovery Primary Science Fair project. This will be reflected in teachers planning.

Through design and make activities the children will employ the following skills:

- Exploring
- Planning
- Making
- Evaluating

2 Assessment – Looking at Childrens’ Work:

Assessment in Science considers the following areas:

- Understanding of knowledge
- Scientific skills
- Attitudes towards science and investigation (as per school report)
- Ability to work collaboratively (e.g. listening, turn taking, sharing ideas)

Assessment will be in the form of:

- Teacher observation
- Annotated drawing/diagrams
- Concept mapping
- Teacher-designed tests and tasks
- Investigation worksheet completion (See Google Drive)
- Long term maintenance of student portfolio through class levels (e.g. the magic tube, magic bucket, mystery cube, fossil adventure, tricky tracks etc)
- Teacher skills checklist for each individual student based on subjective and objective teacher observation
- Display of project work on notice boards in hall or classroom
- Presentation of powerpoint/poster projects or home/school investigations to other classes or at assembly with emphasis on inquiry method used, audibility, clarity and pronunciation in speech
- Peer Assessment will be encouraged at all class levels whereby students can provide feedback on work to their peers in the form of **stars and wishes**.
- The use of **WALTs**, **WILFs**, and **assessment rubrics** should be used where necessary for **AfL** and **AoL**.

We will use an agreed format for the writing up of Science experiments appropriate for each class level. This format is not exhaustive and can be adapted appropriately wherever the class teachers deems necessary based on differentiation needs (See Google Drive for class level investigation sheets).

3 Children with Different Needs:

We endeavour to provide for children with Different Needs throughout the school. Children with differing needs will be encouraged to participate in all scientific activities and will have the opportunity to work with other children.

We provide for individual difference using some for the following strategies:

- Whole class teaching and focused group work
- Planning topics that provide opportunities for further investigative work for more/less able
- Planning topics that are based in a familiar context
- Starting with the children’s ideas
- Provide opportunities for interacting and working with other children in groups
- Allowing children to work with concrete materials
- Children will have the support of the SNA and the assistance of support teachers should the need (e.g. project work on natural disasters or how computers work)
- Teachers to identify exceptionally able pupils or pupils with a passion/flair for Science in September. From this Mr Sheils can provide Science topics that students can research in their own time using class library and chromebooks.
- The opportunity for an after –school Science club will be made available to all students. This club will be recommended to those specifically who have a keen interest in Science and/or represent exceptional ability (To be confirmed).

4 *Equality of Participation and Access:*

Science will be for all children regardless of gender, age or ability. Girls and boys are given equal opportunities to participate in all Science activities. Projects linking SESE subjects can research the role both men and women, young and old, have played in the area of STEM.

Organisation:

5 *Timetable:*

In keeping with the recommendations in the Primary School Curriculum Introduction (page 70) a minimum of three hours will be allocated to SESE per week, from first class to sixth, and two and a quarter hours with the infant classes. Teachers are free to integrate their Science lessons with other subject areas wherever possible. It is hoped this will help alleviate timetable pressures.

6 *Resources and Equipment:*

- All equipment will be stored in boxes appropriate for class level in Northumberland and Morehampton road. These resources will be maintained by the class teacher with an inventory conducted at the end of every school year by the class teacher. Science boxes will be stored in teachers classrooms
- Teachers are expected to take out and put away equipment and resources appropriately. It will not be the responsibility of students to pack away equipment and put it into storage at the end of each lesson
- Pupils to use ICT equipment to research and present project work. These devices are stored in a secure location in Northumberland Road and Morehampton Road buildings. Teachers are expected to take out and put away the ICT equipment appropriately after each use. The WebWise programme should be covered with students before using ICT equipment in order for safe online use
- The teaching of Science will be supported by materials provided by Discover Primary Science, online sources and resources from the STEM teacher CPD programme completed by the staff in 2015/2016
- Photocopiable resources for planning, designing and making and other activity work will be attached to this plan (See Google Drive)

7 *Safety:*

Please refer to school Health and Safety policy. Safety in Science guidelines are attached below for teachers reference.

http://www.hsa.ie/eng/Publications_and_Forms/Publications/Education/Safety_in_School_Laboratory.pdf

8 *Homework:*

Please refer to school Homework policy.

There is no specific need to prescribe “Science homework”. Students may show an interest in investigative learning. Students should be encouraged to participate in independent learning or in learning following on from work completed in class. They should be encouraged to present their findings to the whole school community at assembly.

9 Individual Teachers' Planning and Reporting:

To help improve and maintain a high standard planning in Science, teachers will be provided with the following:

- A planning template to help structure the flow of their Science lessons
- A number of samples using this planning template will be provided (SEE Google Drive) at each class level for teachers to familiarise themselves with the process
- A list of investigations and topics will be provided at each class level from which teachers can select when and what to do throughout the school year
- It is important to note the spiral approach to this method of planning. Topics that are covered at junior infants, senior infants, 1st class etc. will naturally lead on to topics to be covered in 2nd to 6th class. Both scientific knowledge and skills will be built upon accordingly
- Teachers will be encouraged to share their Science plans on the SSE Better Planning folder on the Google drive
- Teachers will report on their Science planning in Cúntas Míosiúl

We will also use a combination of the DPSM and John Scottus planning tool to focus learning. This will include 1. Engagement (the trigger, wondering, exploring), 2. Investigate (starter question, predicting, conduct investigation, share and interpret data/results), 3. Make connections through critical thinking (apply learning, make connections and thoughtful actions), 4. Reflection

10 Staff Development:

As a staff, we have participated in the RDS STEM learning programme 2015/2016. From this, we plan to use a number of these strategies and investigations as part of our whole school plan. Teachers will also be informed of further Science CPD programmes made through PDST, the Irish Science Teachers Association (ISTA), the Blackrock Education Centre or other events/conferences. As school Science Co-ordinator, Mr Sheils will provide support, assistance and guidance to teachers with regards to resources, materials and planning.

11 Parental Involvement:

Parents are an integral part of the school community. Parents are encouraged to participate and help in Science activities whenever the class teachers deems necessary. Parents are encouraged to help in garden projects, Science week and the Discover Primary Science Fair. Parents with and without expertise in STEM, are encouraged to come to school and give talks and demonstrations where it will help student learning.

In 2015/2016, parents from 4th class were involved in an action research project that required them to take on the role of students, while their son or daughter taught them a Science investigation. This research was aimed at encouraging greater parental involvement in Science education through empowerment and informing. Teachers may wish to pursue such a venture with their class. Mr Sheils will support them in this process.

12 Community Links:

Dodder Action group
Strand trust (secret garden)
Aviva Stadium Community Fund

Success Criteria

We intend to review the plan and measure our success under the following headings:

- Teacher's preparation based on this plan
- Teachers use of whole school plan when planning
- Procedures outlined in this plan are consistently followed

How will we know the plan has achieved its aims?

- Teacher feedback
- Student feedback
- Parent feedback
- Principal feedback
- Review of overall aims
- Feedback from inspector
- Skills assessment sheet

What evidence can be used to identify the success of the school Science plan?

- Practical activities in the classroom (photos for Google Drive and DPSM Plaque award)
- Classroom "Wonder Wall" and children's ideas being used to trigger talking points for investigations
- Environmental Awareness among students (Green School)
- Classes participating in outdoor habitat work and gardening programme
- Evidence of design and make activities throughout the school
- Observation and recording of student skill acquisition and use of Scientific language

Implementation

(a) Roles and Responsibilities:

Class teachers are responsible for the implementation of the Science programme for their own classes. Mr Sheils is responsible for maintenance of resources and materials.

(b) Timeframe:

This plan will be reviewed after the academic year 2019/2020.

Review

Teachers, parents and students should be involved in the review process to determine the effectiveness of this whole school plan. Where necessary, the plan will change accordingly. Teachers will be consulted by the school Science coordinator during the 2017-2018 academic year about the progress of the plan so far.

Ratification and Communication

This plan has been presented to the Board of Management and ratified in April 2017

A copy of this plan will be published on the school website.