ST VINCENT'S SCHOOL

A Specialist School for Sensory Impairment and Other Needs

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Philosophy

The philosophy ***'Science is everywhere'*** together with that of the school Mission Statement, is applied in developing the aims and objectives of science teaching and learning.

Learning and undertaking activities in science contribute to achievement of the curriculum aims for all young people to become:

- Successful learners who enjoy learning, making progress and achieve
- Confident individuals who can live safe, healthy and fulfilling lives
- Responsible citizens who make a positive contribution to society.

Aims

1. To develop an enquiring mind and a scientific approach.
2. To develop a greater awareness of, and a responsibility to, the world about us.
3. To stimulate interest in science and so encourage learning.
4. To develop an understanding and a working knowledge of the subject; and subsequently use that knowledge to solve problems and apply it to new situations/topics.
5. To develop the necessary practical skills needed to enhance pupil learning and facilitate progression.
6. To improve manipulative skills through practical work.
7. To increase pupils' knowledge and understanding of scientific ideas, principles and scientific language in keeping with their ability.
8. To develop a respect for life and the world in which we live, and an awareness of continuing research, changing ideas and the impact these have on our lives.
9. To provide the necessary information required for the pupil to achieve their potential.
10. To fulfil the aims set out in the National Curriculum.

Objectives - To be achieved within the individual pupil's ability

1. To be able to use scientific apparatus in a safe and confident manner, to the degree of accuracy achievable.

2. To be able to make accurate observations and record those observations/ findings in a logical and coherent form.
3. To be able to apply what they have learnt in science to their everyday lives, and hence bring more fulfilment and enjoyment to their learning and understanding, and to encourage healthy lifestyles.
4. To be able to recognise the relationship between man and his environment and be aware of mans effect on it.
5. To be able to formulate ways of improving man's own environment, and that of other living things.
6. To be able to reason with, and reach conclusions about, things of topical/current interest.
7. To be able to recall facts when required.
8. To be able to recognise scientific terms/words and use them correctly.
9. To fulfil the objectives as set out in the National Curriculum.
10. To be able to make deductions from given facts, and experimental findings/data.
11. To be able to use and apply principles and formulae and use mathematical skills, and information acquired in other subjects, to enhance and improve their scientific learning and understanding.
12. To be able to understand, interpret and use given data in the form of tables, charts and graphs.
13. To be able to reason, and think logically, in new situations and to apply known principles to them.

Organization

- At Key Stage 1 and 2 students are taught through 1 afternoon of science activities per week.
- At Key Stage 3 students are taught in 3 x 55 minute sessions.
- At Key Stage 4 students are taught in 3 x 55 minute lessons (AQA GCSE in Biology 8461) OR At Key Stage 4 students are taught in 4 x 55 minute lessons (AQA GCSE in Combined Science: Trilogy 8464).

Some students have an extra lesson used as a support session to consolidate the work covered in class.

Differentiation and Curriculum

The science curriculum throughout the school will allow for a progression of skills and ideas across a year and across key stages.

At Key Stages 1 and 2

- All pupils follow the Programme of Study for the National Curriculum at a level appropriate to their understanding and ability.
- There is no statutory assessment at Key Stage 1 and 2 and all pupils will be teacher assessed.

At Key Stage 3

- All pupils will follow the Programme of Study for the National Curriculum at a level appropriate to their understanding and ability.
- There are no statutory tests at end of Key Stage 3 and all pupils will be teacher assessed.

At Key Stage 4

- All pupils will follow the National Curriculum as detailed in the specifications/programme of study for the examination course, or accredited course, they are following.

Pupils will have the opportunity to follow a course of study leading to certification in either:
AQA GCSE in Combined Science: Trilogy (8464). Students will be entered for Foundation Tier 8464F (grades 1-1 to 5-5) or Higher Tier 8464H (grades 4-4 to 9-9).
Or
AQA GCSE in Biology (8461). Students will be entered for Foundation Tier 8461F (grades 1-1 to 5-5) or Higher Tier 8461H (grades 4-4 to 9-9).

or

- Entry Level certificate in Science, to be accredited in Year 11 or will follow the AQA Unit Award scheme, using the units chosen from the bank provided by AQA.

- Depending upon timetabling restrictions Post 16 pupils may have the opportunity to follow the BTEC Short Course in Healthy Eating (Level 1). Alternative courses of study may also be followed as part of BTEC Personal and Social development at Entry 2 and 3 and Level 1.

At Key Stage 3 the emphasis is on learning by discovery and so there will be a significant amount of practical work to link into the theory.

Teaching Methods

1. Teaching within Key Stage 3 is primarily through pupils' practical experience and involvement. Discussion and questioning is to be encouraged, both as a stimulus to learning and to understanding. Pupils will be given experience of diagrammatic presentation and data retrieval from charts, graphs and tables. Opportunities for involvement of ICT is to be encouraged whenever appropriate and relevant to the topic, both for data handling and researching skills.
2. Copies of the scheme of work for each group/year and the programmes of study are available for reference from the Science Lead, and any member of staff teaching science should, retain in their files (or memory pen), a copy of those pertaining to their teaching groups.
3. All pupils, where possible and practicable, are to carry out practical work/investigation individually. Pupils who need assistance with practical work will have access to LSA support.
4. Pupil's notes may be given in a combination of different means e.g. dictated, self-generated, teacher-generated on worksheets and notes, MP3 format.
5. When diagrammatic material or printed notes are provided for the pupil, both the printed version and the Braille version should give the same information/detail as far as possible. The diagrams, whether print or Braille, should be modified to remove superfluous detail. Tactile diagrams will conform to the GCSE specifications document produced by RNIB and VIEW. Pupils will need to acquire the necessary skills for the completion of drawing film diagrams and graphs, whenever possible, especially for those who are expected to undergo formal assessment e.g. GCSE, and this will necessitate liaison with the Maths department.
6. Class work is to be reinforced by appropriate homework. Homework, when given, should be meaningful and relevant. A print copy of homework is provided to all students including those given Braille copies.
7. Lesson plans and the recording of pupils' marks/achievements are the responsibility of the teacher for the group but should be available to the Principal/Science Subject Leader when necessary, to facilitate continuity in the event of teacher absence/change of staff.
8. More discussion of topics and oral work is required to compensate for lack of natural visual input.
9. Use of the school grounds and the environment outside of the classroom.

10. More verbal instruction/explanation of experimental method, and more demonstration of experimental technique and equipment, is required due to lack of visual input. Practical work will sometimes take considerably longer, so flexibility needs to be incorporated in the lesson planning.
11. More time for preparation of practical work is necessary in order to anticipate, and attempt to remove, any problems likely to be encountered by some pupils or groups.
12. The help of an LSA will be required, during practical work for all groups, particularly those with a high proportion of totally blind pupils, or for those pupils with poor manipulative skills and/or other special educational needs.

Assessment Procedures

Written Work

Written work is marked and corrected as required. Specific difficulties or strengths to be noted by teachers.

Assessment in Key Stage 3

- When appropriate use of end of unit assessments will test both recall of facts, understanding of concepts and data handling. These tests must be devised to contain questions of graded difficulty.
- Practical skills will be continually assessed during the practical sessions, and improvements or failures noted by the teacher.

Assessment in Key Stage 4

Note: -

1. Modified examination papers – Braille, N24, N18, - are available from the examinations board on request in advance of entry details. Access arrangements including use of readers, scribes, word processors and extra time (up to 100%), are available and must be applied for separately and in advance of final entry details.
2. Practical skills are assessed through 'required practical activities' and through questions on the written papers that draw on the experience gained from the required practical activities.

3. Those pupils entered for the Entry Level Certificate will complete end of unit tests, some/all of which will be submitted to the examination board for accreditation, together with other written evidence specified in the syllabus.

Oral Work

There is no formal assessment of oral/discussion work but, as this feedback from the pupils is an essential part of facilitating understanding and interest, a record of an individual's ability in this area can be recorded on the teacher's assessment/lesson records, if appropriate. However, when a pupil records their answers/work orally, this should be included within the pupils' records of assignments/records.

Progression

- Due to their visual impairment, progress within the National Curriculum by some pupils may be lower than those of their sighted peers of the same ability and age. The impact of this can be reduced by the extra time given to compensate for lack of experience and 'speed,' and judicious selection and modification of learning objectives.
- Progression is to be monitored by use of teacher comments, review comments and records and end of year reports.

Tracking of Progress

The progress made by individual pupils is currently recorded in Classroom Monitor.

Cross Curricular Links

As science is all encompassing, it is possible to find cross curricular links will all school subjects. For example, maths is an obvious link with literacy skills necessary to expand their vocabulary. Links to PE regarding fitness and the body, cooking and nutrition, geography with tectonic plates and earthquakes, music involving sound and vibrations, and more.

Citizenship

Citizenship provides learning opportunities for pupils, from Foundation through Key Stages 1 to 4 to gain the knowledge, skills and understanding necessary to play an effective role in local, national and international levels. Within the teaching of Science aspects of citizenship contributions are made to pupils' moral, social and cultural development and through the

opportunities to promote an understanding of, and responsible attitudes towards, environmental issues.

Spiritual, moral and ethical, and social and cultural issues

The study of Science can contribute to an understanding of spiritual, moral and ethical, and social and cultural issues in the following ways

- Through pupils considering the natural, material and physical world they live in, reflecting on their part in it, exploring questions such as when life starts and where life comes from, and experiencing a sense of awe and wonder at the natural world.
- Through helping pupils realise the need to draw conclusions using observational skills and evidence rather than preconception or prejudice, and through discussion of the implications of the uses of scientific knowledge, including that such uses can have both beneficial and harmful effects. Exploration of values and ethics relating to the applications of science and technology is possible.
- Through helping pupils recognise how the formation of opinion and the justification of decisions can be informed by experimental evidence and drawing attention to how different interpretations of scientific evidence can be used in discussing social issues.
- Through helping pupils recognise how scientific discoveries and ideas have affected the way people think, feel and create, behave and live, and drawing attention to how cultural differences can influence the extent to which scientific ideas are accepted, used and valued.
- Through enabling pupils to recognise that modern science has its roots in many different societies and culture and draws on a variety of valid approaches to scientific practice.

In these ways Science helps pupils to become informed, thoughtful and responsible citizens aware of their duties and rights; promotes spiritual, moral, social and cultural development, making them self-confident and responsible both in and beyond the classroom; encourages pupils to play a helpful part in the life of their schools, neighbourhoods, communities and the wider world.

Special Educational Needs

- The VI pupil will have a more limited experience of ‘everyday’ science, and ‘observational’ techniques. Unless time is spent initially on developing those observational skills they may not have used, plus improving their own observational skills, there will be a slower

progression to the higher levels in Science, which could subsequently affect the level they achieve in public examinations.

- Practice in the use of the specialist equipment to enhance and facilitate observation is of great importance, as in the encouragement of the pupils to use the observational skills they often use more effectively than their sighted peers e.g. touch, hearing.
- In Science, not only is the VI pupil's experience limited as far as scientific issues are concerned, but as part of the Science curriculum is mathematical in nature, any difficulties/lack of progression or understanding the pupil has in Maths compounds his/her problems in Science and so can limit progression to the higher levels of scientific concepts. Also, mathematical skills, such as the drawing and interpretation of graphs, may not have been covered in Maths when they are required in Science and this can delay or impede progress in these areas of Science.
- It is important to remember that if a concept is outside the pupils' own experience it should not necessarily be omitted from the curriculum, as it may not be beyond the pupils' understanding, especially with the more able students (e.g. shadows/light). Alternatively, it is acceptable (and desirable) to make use of appropriate scientific models to clarify or explain some concepts.
- Help with practical and diagrammatic work, initially for all pupils, is a necessity; but it is to be hoped that all pupils will achieve a degree of independence in these areas. The totally blind pupils will obviously experience problems with diagrammatic work because of lack of previous experience and spatial awareness.
- Time is a factor with practical and diagrammatic work; more time is required by the VI pupil than their sighted peer to complete a practical assignment. Also diagrammatic work can take considerably longer as the VI student lacks the ability to scan a diagram quickly and effectively. To alleviate this problem to some extent, only essential practical work and diagrams are presented to the pupils.
- Whilst it is desirable that practical work is done individually by the pupils, collaboration during practical work may be necessary to enable the VI pupil to take an active part in some if not all of the exercise.

Disability specific skills

- The VI pupil should always have suitably produced copies of any visual material. However, reader and/or practical assistance may be necessary. Experimental results which are purely

visual (e.g. colour changes) should still be explained to the pupil so that he/she is able to draw the appropriate conclusions and have the fullest understanding.

- Organisational skills in the pupil are of paramount importance and these will need to be taught, encouraged and constantly reinforced.
- Diagrammatic and practical work should be introduced as early as possible, beginning simply with single step practical and outline diagrams, and building in complexity over a period of time (up to the level the individual can cope with).
- The level of accuracy in measuring, drawing, graphical work and diagrammatic work will vary according to the pupils' level of vision, the medium used, the developments and availability of technology and the ability of the pupil.
- Due to the adaptations and modifications necessary to make a science course accessible to the VI pupil extra time is needed for lessons. Given the necessary time, resources and expertise the VI pupil should be able to maximise their potential.

Manual dexterity, spatial awareness and practical work

- Problems in manual dexterity and spatial awareness need to be considered when planning any practical or diagrammatic work, with particular attention to safety in practical classes. However, one of aims of practical work is to improve manual dexterity and so the practical should be challenging as well as achievable.
- Motor skills necessary for diagram and practical work include:
    a. Picking up small objects
    b. Use of rulers inc. reading of scales and drawing straight lines
    c. Placing things carefully and accurately on balances, tripods, workbenches etc.
    d. Putting materials into appropriate containers with care and accuracy.
    e. Pouring liquids
    f. Placing equipment in a position of safety
    g. Using a spatula (as a simple way of measuring quantity, and also as a means of transferring substances from containers)
    h. Using a measuring cylinder accurately may necessitate the use of a light probe, and so a simpler and more accurate alternative is the use of suitably marked syringes
    i. Using the Bunsen burner safely – including 'techniques for lighting the burner'
    j. Turning on and regulating flow from gas and water taps.

Resources

Specialist/adapted equipment available

- All science equipment is to be stored in the main preparation room so that it is available when required by a member of staff.
- If equipment is to be removed from the preparation room (for longer than the lesson it is to be used for) by any member of staff for lessons, the Science Subject Leader should be consulted to ensure it is not required elsewhere.
- Notification of long-term borrowing/use of Science equipment should be given to the Subject leader in advance. However, priority will be given to the use of the equipment for a science lesson, unless requested well in advance of the lesson.

Specialist/adapted equipment includes:

- Tactile diagrams (Minolta paper and thermoform)
- Drawing film and graph making equipment
- Talking and digital thermometers
- Braille and large display digital stopwatches and timers
- Measuring equipment with tactile markings, including syringes and rulers
- Light probes
- Digital balance
- Talking and large display calculators- available from Maths dept. if pupils do not have their own
- Anatomical models and 3D wall charts

The following is also available in the Science room:

- A selection of writing paper suitable to the needs of individual pupils e.g. a range of different colours, line thickness, Braille paper of different sizes (and colours).
- Computers (with speech output and magnification software)
- Reading lamps
- 'Sloping desk' stands
- Braillers and mats

Adaptations to equipment (tips and techniques)

Much of the equipment available, and used, has not been adapted in any way for use by the VI. However, the way in which some pieces of equipment are used may differ from the norm.

Adaptations to standard equipment and/or their use

- Measuring cylinders: - Use of the polypropylene type enables the pupil to 'feel' the scale on the outside of the cylinder, and together with the use of the light probe make reasonably accurate volume measurement. The tops of the measuring cylinders can be marked with bright yellow tape or paint, to make them easier to spot/locate.
- Syringes: - These are available in a variety of volumes, and can be used to obtain volumes of liquid accurately. A notch is cut out on the plunger when it is pulled out to the required volume, and the pupil can feel for this rather than have to look at the scale.
- Stands and Clamps: - Whilst heating beakers of water, and other substances, it is advisable that the beakers are clamped in place to prevent them being knocked off. However, as this means that they cannot be removed quickly from the source of heat, an alternative to the retort type of clamp is the ring type, which allows the beaker to be removed quickly yet will provide an audible clue to the VI if the beaker is in danger of falling off. Stands and clamps **must always** be positioned to the sides of the experimental set-up.
- Bunsen burners: - When lighting Bunsen burner all normal safety procedures must be followed. Pupils must use a taper, or suitable gas lighter, to light the Bunsen. The technique that is used is to tap the 'chimney' of the Bunsen from the bottom to the top with the taper, and only when the lit taper is in the correct position is the gas turned on. In order that the pupil does not have to lean across the gas taps to handle the Bunsen burner, they will light the Bunsen from the 'wrong' side of the bench, and will also switch it off from this position. If the Bunsen is to be left on, but not in use, for safety reasons it may be better to leave the air hole open (against normal safety procedures) so that the VI pupil can hear the flame. Teacher to assess the risk with each pupil.
- Washing glassware: - The glassware must always be placed in the sink before turning the tap on, regulating the pressure of the taps can be difficult for some.
- Anti-spill netting: - This can be put on the larger glass bottles to improve grip.

- Test-tube racks: - Some pupils benefit from having a white background on them. Some prefer to use the ‘gripping’ type of rack, whilst others need the wooden ones because of poor manual dexterity.
- Elastic bands: - These can be useful to show changes of level in a test tube or measuring cylinder.
- Use of trays on which to carry out practical work not requiring heat. These provide a raised outer ‘lip’ which will prevent equipment from falling off, whilst also providing a location tool/device.