SciFest - Science by Inquiry

Transition Year Module

Name: _____ **Class:** _____

Teacher: _____

About this booklet

This *Science by Inquiry* booklet is intended in the first instance as a stand-alone TY science module for students interested in doing a project for a SciFest science fair. The module could also be used as a source of worksheets to take students through the process of project-based learning. The module is downloadable from the Resources section of the SciFest website – www.scifest.ie.

It is important to recognise that the booklet acts only as a guide and that the main aim of participation in SciFest is to engage students in creative problem solving without the restriction of having the 'correct answer'. There is no set formula for choosing the perfect project. It can be in any area of science, technology, engineering or maths (STEM). Students should be encouraged to work collaboratively and come up with their own idea for a project. By doing this students learn how to take initiative and responsibility for their own learning, work in teams, become more confident and manage themselves more effectively.

Many students are engaging in outside the classroom activities which involve coding and are experimenting with Raspberry Pi or Intel Galileo at home. SciFest creates an ideal opportunity to inspire such students to use technology to create innovative solutions to real world problems. By applying their skills in computational techniques and writing new programs even very young students are designing exciting new products. These are the inventors and innovators of the future who will play a vital role in the continued development of our economy and in addressing global challenges such as climate change.

A companion booklet to this module, *SciFest – A Beginner's Guide to Doing a Science Project*, is also available in the Resources section of the SciFest website. While the objective of this booklet is similar to that of the TY module it is intended to be accessible to a younger audience.

Where Can You Find Information About SciFest?

The best way to find out all about SciFest is to visit the official SciFest website: www.scifest.ie.
On the website you will find lots of resources and advice on how to do your project.

You can also

☺ Like SciFest on Facebook ☺ Follow SciFest on Twitter ☺ Follow SciFest on Instagram
☺ Watch SciFest on YouTube ☺ Read SciFest on Yudu Express ☺ See SciFest on Flickr

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- Module Evaluation (for student)
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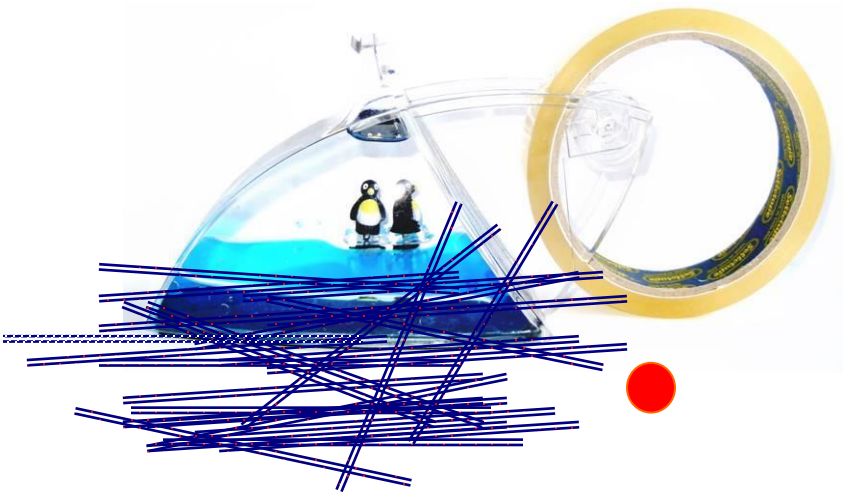
1. Scientific Problem Solving

Sample Task

Build a structure out of 25 straws and 1 metre of sellotape to support the weight of a marble at the maximum possible vertical height above the bench.

NOTE

- The marble may not be sellotaped on.
- The structure may not be sellotaped to the bench.



Scientific Problem Solving

1 Defining the problem as a specific question or a statement (hypothesis) that can be tested experimentally.

2 Devising and researching experimental methods, evaluating them, selecting the most appropriate.

3 Designing scientifically controlled experiments, which will be a 'fair' test of the hypothesis. Identifying variables.

4 Conducting these experiments responsibly, accurately recording observations, data, etc.

5 Analysing results, drawing graphs, etc.

6 Finding patterns in data or observations, drawing conclusions, evaluating possible explanations, etc.

7 Evaluating investigations critically and looking at their limitations and implications in the context of the original problem and further work.

8 Communicating your work effectively to others, both orally and in writing, answering questions, criticisms, etc.

Ref: 'Problem Solving Skills' by Dr Alison Graham (ISTA Publication)

Don't Believe Everything You Read

When carrying out research, particularly on the Internet, it is essential to check the source to make sure that the information given is not just somebody's opinion. Remember anybody can set up a website so be sure if you are going to quote data that the website is reliable.

Opinion Activity

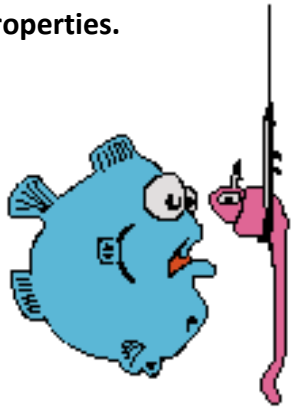
If you look up the chemical dihydrogen oxide (sometimes called dihydrogen monoxide) on the Internet you will find a number of warnings about its toxicity.

Read the following information carefully and then complete the questionnaire on page 7.

Dihydrogen Oxide

Dihydrogen oxide is colourless, odourless, tasteless, and kills thousands of people every year. Most of these deaths are caused by accidental inhalation of the chemical, but the dangers of dihydrogen oxide do not end there.

Some people wish to ban dihydrogen oxide because of its toxic properties.



Properties of dihydrogen oxide

- Causes excessive sweating and vomiting
- Is a major component of acid rain
- Can cause severe burns in the gaseous state
- Is a primary contributor to erosion
- Prolonged exposure to its solid form causes severe tissue damage
- Can be found as an additive in certain 'junk-foods' and other food products
- May cause electrical failures and decreased effectiveness of brakes
- Has been found in tumours of cancer patients
- Speeds up corrosion and rusting of many metals
- Used in the distribution of pesticides; even after washing, produce can remain contaminated by this chemical

Questionnaire

STRONGLY AGREE SA	AGREE A	UNDECIDED U	DISAGREE D	STRONGLY DISAGREE SD

1. Toxic wastes should be disposed of in the county where they originated.

   SA A U D SD

2. Cigarette smokers should not be allowed to smoke in any public place.

   SA A U D SD

3. No chemical should be put on the market unless it is proven to be 100% safe.

   SA A U D SD

4. Animals should not be used in medical research.

   SA A U D SD

5. Chemicals are bad for people's health.

   SA A U D SD

6. The cleaning products in my house do not have an impact on the environment.

   SA A U D SD

7. Uniforms should be mandatory at all public schools.

   SA A U D SD

8. Chemicals are toxic to the environment.

   SA A U D SD

9. Recycling should be mandatory.

   SA A U D SD

10. Dihydrogen oxide should be banned in all public places.

    SA A U D SD

(From 'Recipe for sustainable science' – The Keystone Center, Colorado)

Teacher's signature _____ **Date** _____

Deciding on an Idea

The most difficult part of doing a science fair project can be coming up with a workable idea. Don't worry – many students have the same problem. Choose a topic that interests you. Maybe there's a problem/issue you've often wondered about and would like to solve/learn more about? If not, you may find the following useful in coming up with an idea.

Deciding on an idea

- Talk to your parents, teachers, and friends.
- Check out the Internet and the school library.
- Watch the news, check out a newspaper, a science book or magazine.
- Think about interesting topics in science class.
- Do you have a hobby or play sports? Is there some aspect of these that you could measure or test?
- Get a large sheet of paper and brainstorm with your team.
- Make a shortlist of '3 best ideas'.
- Research and brainstorm further.
- Discuss the ideas with your teachers, parents and friends.

Helpful Hint

Visit the SciFest website for lots of Project Ideas

Is the idea workable?

- Make out a list of all the things you will need.
- Are all the experiments safe and are no harmful chemicals required?
- Is there something that can be measured (dependent variable)?
- Is there something that can be changed (independent variable)?
- Can all other variables be controlled?
- Is the equipment available? Is the equipment too costly?
- Could the project be completed in time?
- Write or email companies for information about your topic.
- Is there enough information available?
- Is there a mentor, e.g. someone from a company, a hospital or a third level college who might be a source of information and/or resources?

Helpful Hint

Keep a project notebook. This is for storing and recording everything about your project

Social Sciences Projects

- Some social sciences projects may use questionnaires to collect data.
- These appear easy but don't be deceived.
- Questionnaires and surveys require careful design.
- Interview a number of experts in the area you are about to study to get ideas and to identify themes to include in your questionnaire or survey.
- A pilot survey or questionnaire should be carried out.
- A representative sample should always be used.
- To do a good project you will need to go beyond basic statistics, therefore you may need to get help from somebody, e.g. a maths teacher.

Best Ideas

Date to be completed by: _____

Make a list below, of your 3 'Best ideas'

1. _____

_____

2. _____

_____

3. _____

_____

Review the above list with your partner/s, parents, teachers, etc. Decide on one idea and write, in the space below, a short paragraph describing what you would like to do for your project.

Teacher's signature _____ **Date** _____

Hypothesis

Research, research, and research again until you are an expert on the topic!

Now that you think you have decided on a topic you need to do even more research. This is very important as you need to know everything about the topic before you can write a **HYPOTHESIS.**

Hypothesis – A hypothesis (plural – hypotheses) is an 'educated guess' or a working assumption. A theory is a hypothesis that has been confirmed by repeated experimentation.

Your Hypothesis

_____

_____

_____

_____

_____

_____

_____

_____

Teacher's signature _____ **Date** _____

Testing a Hypothesis

Hypothesis: An object that is streamlined will move faster through water than an object that is not streamlined

Materials: Blu-Tack
Tall measuring cylinder
Stopwatch

If you think you require any other materials or equipment, please ask.

1. Use the above materials to test the hypothesis.
2. Before you begin discuss the hypothesis with the other members of your team.
3. Draw up an experimental plan.
4. Design a chart on which to record the data you collect (see sample chart below).
5. Remember you may have to modify your plan.
6. Write an account of your experiment into your copybook, explaining your method and describing your results and conclusions.

Sample chart of results

Sample Shapes	Trial 1 Time (s)	Trial 2 Time (s)	Trial 3 Time (s)	Average Time (s)	Distance cm	Speed cm/s
1 						
2 						
3 						

Fair Test and Variables

Fair Test: Have you carried out a fair test?

Independent Variable (The factor or variable that you changed)	Shape
Dependent Variable (What you observed and measured as a result of changing the independent variable)	Time taken to travel distance
Constants or Fixed Variables (What you kept the same)	1. Mass of object 2. Distance/Height of water 3. Height of drop
Replicates (Number of times you investigated each shape)	Three

Great white shark 'Jaws'

Answer the following questions in your copybook

1. Some fish have fusiform (streamlined) bodies, e.g. salmon, while others are laterally compressed (flattened from side to side), e.g. sole. The shape of the fish's body tells us a lot about its lifestyle. Comment on this statement.

2. In what way might the results be useful if you were designing swimwear?

3. What problems did you come across in your experiment and how did you overcome them?

2. Research Record

Source 1 – Internet

Date to be completed by: _____

Author(s): _____

Date of publication: _____

Title of article: _____

URL (web address): _____

Write in your own words two things you learned from this source

1. _____

_____

_____

_____

_____

2. _____

_____

_____

_____

_____

_____

Teacher's Comments: _____

_____

_____

_____

_____

Teacher's signature _____ **Date** _____

Source 2 - Book or Periodical

Date to be completed by: _____

1. Author(s): _____

2. Date of publication (in brackets): _____

3. Book/Article Title: _____

4. City where it was published/Name of periodical: _____

5. Publishing company/relevant pages: _____

Now rewrite this information in the proper bibliographic format – 1. (2).3.4:5.

_____

_____

Page(s) you used in your research: _____

Write in your own words two things you learned from this source.

1. _____

_____

_____

_____

_____

2. _____

_____

_____

_____

_____

Teacher's comments: _____

_____

_____

_____

_____

Teacher's signature _____ **Date** _____

Source 3 – Other

Date to be completed by: _____

Source:

Author(s): _____

Date of publication: _____

Title of article: _____

http://address: _____

Name and title of person you interviewed: _____

Job description: _____

Name of company/university/etc. at which they work: _____

Write in your own words two things you learned from this source.

1. _____

_____

_____

_____

_____

2. _____

_____

_____

_____

_____

Teacher's comments: _____

_____

_____

_____

_____

Teacher's signature _____ **Date** _____

Source 4 – Other

Date to be completed by: _____

Source:

Author(s): _____

Date of publication: _____

Title of article: _____

http://address: _____

Name and title of person you interviewed: _____

Job description: _____

Name of company/university/etc. at which they work: _____

Write in your own words two things you learned from this source.

1. _____

_____

_____

_____

_____

2. _____

_____

_____

_____

_____

Teacher's comments: _____

_____

_____

_____

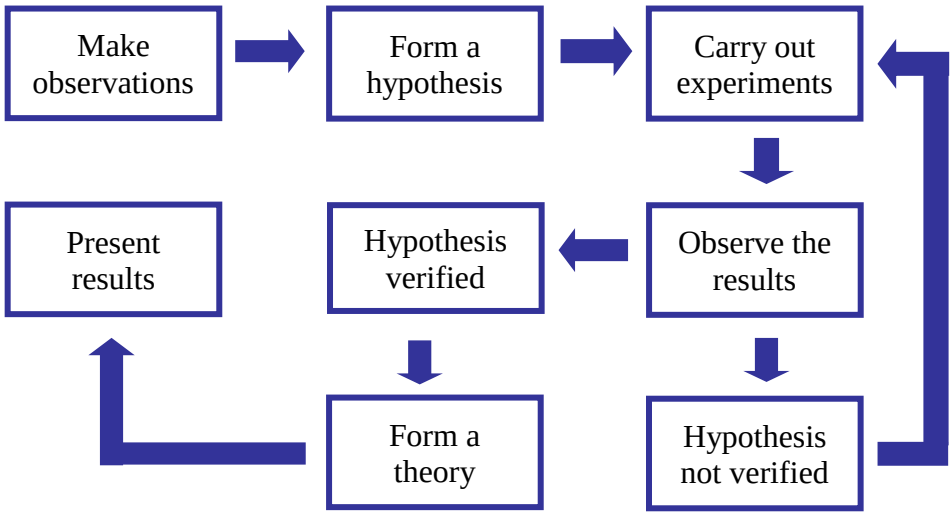
_____

Teacher's signature _____ **Date** _____

3. Scientific Investigation

The Scientific Method

An approach to scientific investigation, sometimes known as the scientific method, is illustrated in the following diagram.



Example of Experimental Design

Title: To investigate if the temperature of water rises as more calcium chloride is added

Hypothesis: The more calcium chloride added to water the more the temperature increases

Independent variable	Mass of calcium chloride (g)		
Dependent variable	Temperature of water (°C)		
Constants or fixed variables	1. Same volume of water (75 ml) 2. Same time to dissolve (2 min) 3. Constant stirring		
Control **(Standard of comparison; the control may be a no treatment group)**	0 g		
Levels of Independent Variable	1 g	2 g	3 g
Replicates – Number of times the experiment was repeated for each level of the independent variable	3 trials	3 trials	3 trials

Complete a similar table for your project

Date to be completed by: _____

Title: _____

_____

_____

Hypothesis: _____

_____

_____

_____

Independent variable			
Dependent variable			
Constants or fixed variables			
Control			
Levels of independent variable			
Replicates – Number of times the experiment was repeated for each level of the independent variable			

Remember the following.

- **Log on to www.scifest.ie.**
- Keep your teacher informed at all times.
- Repeat the experiment a number of times.
- Investigate only one variable.
- Keep all other factors constant.
- Be prepared to change your experimental plan if necessary.
- Ensure that it is a fair test.

- **REMEMBER TO OBSERVE ALL SAFETY PROCEDURES**

Teacher's signature _____ **Date** _____

Worksheet on Scientific Investigation

Date to be completed by: _____

1. The statements below are unscientific. Can you explain why?

(a) 'My car is very economical to run. I only put €20 worth of petrol in it each week.'

_____

_____

_____

(b) 'Smoking 60 cigarettes a day causes cancer.'

_____

_____

_____

(c) 'Red jelly babies taste better than green ones.'

_____

_____

_____

(d) 'The fresh smell tells you that the disinfectant keeps on killing germs.'

_____

_____

_____

2 The following equation summarises the process of photosynthesis.

Carbon dioxide + Water $\xrightarrow[\text{Chlorophyll}]{\text{Light}}$ Glucose + Oxygen

Study the above equation, and the diagram on the following page, carefully and answer the following questions.

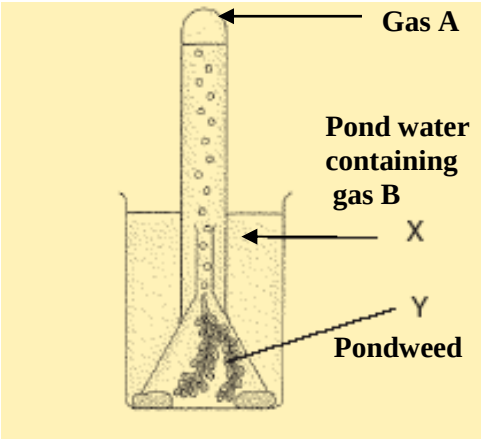
(i) Name Gas A. _____

(ii) Name Gas B (found in the pond water). _____

(iii) Name the energy source. _____

(iv) Plants obtain Gas B from the air. Name a process that releases this gas into the air.

_____



(v) What term is used to describe the nutrition of plants?

_____

(vi) The apparatus shown may be used to investigate the effect of the environmental factor, light intensity, on the rate of photosynthesis.

(a) Briefly describe how you would measure the rate of photosynthesis if you were carrying out this investigation.

_____

_____

_____

(b) Name the environmental factor that you would vary. _____

(c) Explain how you would vary the factor that you have named in (b). _____

_____

_____

_____

(d) Other environmental factors should be kept constant during the experiment. Name two of these factors.

1._____

2._____

Teacher's comments: _____

_____

_____

_____

Teacher's signature _____ **Date** _____

Your Investigation – Plan

Date to be completed by: _____

- Use the space below to make a list of the steps you need to follow to carry out your investigation.
- You should carry out a trial investigation.
- Expect the unexpected and be prepared to make the necessary changes.
- Draw a diagram of the apparatus you intend to set up.
- Design a table or chart on which to record the data you collect. Have this table ready before you carry out your experiment.
- Analyse the data collected and graph the results where possible.

Teacher's comments: _____

_____

_____

_____

_____

Teacher's signature _____ **Date** _____

Work Assessment Record

Date to be completed by: _____

Project Title

Category

Please ✓ the relevant boxes

Individual Project ☐ Group Project ☐ Junior ☐ Intermediate ☐ Senior ☐

Physical Sciences ☐ Life Sciences ☐ Technology ☐

Name/s of group member/s (Block Capitals)		**Class**
1 Group Leader		
2		
3		

What **experimental work** have you carried out to date?

What **apparatus and facilities** are needed for your project? Make a list in the box below.

Teacher's signature _____ **Date** _____

4. Project Presentation

Project Report Book

To present your project at a SciFest exhibition you need to have:

- Project Report Book
- Visual Display
- Oral Presentation

Project Report Book

Your Project Report Book should be no more than 50 pages of text. The diagrams, charts, results, appendices, references, etc., are not part of the 50 pages.

The Project Report Book should contain:

a) Cover/Title Page
This gives the project title, the name/s of the student/s and the name of the school.

b) Contents Page

c) Meet the Team (optional)
This section contains three or four lines of information about each team member and their contribution to the project.
(A photograph of the team adds a nice touch.)

d) Summary/Abstract
The summary/abstract is a short description of what your science project is about. It should be no more than 250 words or 1,800 characters and should highlight the main points of your project. The abstract should allow judges and visitors to the exhibition to quickly determine the nature and scope of your project.

e) Introduction
The introduction contains a brief statement of your hypothesis and refers to the research you carried out to develop the hypothesis. It explains why you chose this particular topic and what you hoped to achieve. You should briefly mention any experiments, surveys, etc., you carried out.

REMEMBER TO CHECK THE GRAMMAR AND SPELLING

f) Background Research

Background research includes a reference to what is already known about the topic and experiments that have already been carried out. It sets the scene for the project and links it to the "real world". Remember you cannot download and include big chunks of information from the Internet. Everything should be written in your own words. Check that the websites you are using are reliable and write down every reference for the 'References' section.

g) Experimental Methods

These are the experiments that you have designed and carried out. They should be written up in the same format as the experiments you do in science class. Even if you carried out a survey you still have to describe the method, e.g. how many students were involved, how you sourced the sample, how you carried out a pilot survey, etc.

h) Results

Results should be clear and presented in a table when possible. Graphs or bar charts produced using a spreadsheet or other appropriate software should also be included. Try to do a statistical analysis if you have done a survey.

i) Conclusions and Recommendations

The conclusions summarise what you discovered based on the data you have collected. You should restate the hypothesis and indicate whether your results support the hypothesis. The conclusions also include possible sources of error and a brief description of how your work could be extended and improved.

j) Acknowledgements

Your project is meant to be your own work but it is permissible to have some help. The acknowledgments section consists of a short paragraph stating the names of people who helped you and how they helped.

k) Appendices

This section contains material such as extra tables of results and copies of any letters and emails you sent or received.

l) References

This is a list of all the books, journals, websites, etc., that you used. Remember to write them down as you go along.

Helpful Hint

Type up your report in font 12 or 14. Using a larger font does not look well, means there is very little information on each page and the judge has to turn over page after page to read your report.

Visual Display

As well as writing your results in a report book you also have to set up a visual display. Before you decide what to include in your display check out the size and shape of the display board that is available. The size and shape may vary from one SciFest regional venue to another. You cannot include everything in the display. It has to be thorough, but not too crowded, so keep it simple. It is important when designing your presentation board to keep in mind several design principles. Attention to the principles of graphic design will make your presentation more enticing and easier for others to use. Good design should attract viewers' attention to your project and then guide their understanding of the information you wish to convey.

Design Principles

Consistency

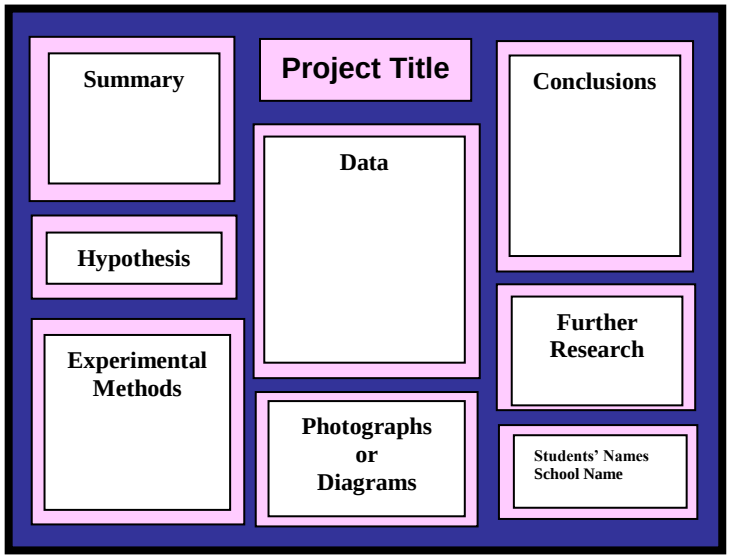
- Establish a style for your display and stick to it. Too much variation will make your display seem disjointed. Be consistent with all the elements.

Clarity

- Keep questioning whether your message is being conveyed clearly. Do the illustrations and charts convey what they are supposed to?
- Think about the clarity of your visual presentation. Is it too cluttered? Question any possibly unnecessary elements like cute stickers, doodles, patterns, etc.

Attention to Detail

- Judges will notice if a display has grammar and spelling errors. Get people to proofread your work.
- Make a checklist of the points you want to cover in your display and double-check that you present each.
- Make sure all your pieces are cut out with straight lines (use a ruler) as this will make your presentation look more polished and professional.



Visual Display

Colour

- Limit your design to two or three colours. Use tints and shades of these. A large number of colours makes designs seem less planned and inconsistent.
- Determine how colour will be used and why. For example, you might want all your headers to be one colour and text blocks to be another, so the headers will stand out.

- Keep in mind that different colours have different connotations and a power of their own. For instance, red usually demands attention. It can be used effectively for this purpose, but only if used in moderation.

Type

- Pick only one or two fonts for the text so your display will look consistent and unified. A large number of fonts, like too many colours, can seem disjointed and confusing.
- Decide on one or two techniques for emphasis in your type style. Some possibilities are: bold, italic, all caps (capitalising all the letters of a word), colour and choice of font.
- Avoid writing words vertically as this will reduce readability.
- 'All caps' is less readable than standard text, so if you choose to use it, do so only with small quantities of text, such as titles.
- Narrow columns of text are easier to read than wide columns of text. Left-justified or full-justified text is easier to read than centred text (for longer items).

(ref. Intel Design and Discovery (http://www.skoool.ie)

REMEMBER TO CHECK THE GRAMMAR AND SPELLING

Oral Presentation

Now that you have completed your project you need to spend some time improving your presentation skills. It is natural to feel nervous so it is very important to be prepared. It is important to capture the interest of the judges at the beginning of your presentation. Start by explaining how you came up with the idea and how excited you are about the project. Briefly describe the experiments you carried out, your results and conclusions. Compare your results to what is already known about the topic and suggest what you would like to do next. Expect to be interrupted by the judges with questions like:

- What was your role?
- What worked?
- What didn't work?
- How much help did you receive from others?
- What would be your next step?
- What problems did you encounter and how did you overcome them?

Presentation Tips

- Be involved in, and enthusiastic about, your project.
- Make eye contact with the judges at all times.
- Speak slowly and clearly. Avoid saying things like "er", "um", "like", "you know", etc.
- Practise in front of your friends and get them to ask questions.
- Practise in front of a mirror at home.
- Be polite, neatly dressed and smile.
- If you don't know the answer to a question say so but present the judges with other relevant information.
- If you are involved in a group project remember to give each member of the team a chance to speak.

Plagiarism

What is Plagiarism? **According to the Merriam-Webster Online Dictionary to "plagiarise" means:**

1. to steal and pass off (the ideas or words of another) as one's own
2. to use (another's production) without crediting the source
3. to commit literary theft
4. to present as new and original an idea or product derived from an existing source.

Changing the words of an original source is not sufficient to prevent plagiarism. If you have retained the essential idea of an original source, and have not cited it, then no matter how drastically you may have altered its context or presentation, you have still plagiarised.

Helpful Hint

Remember to read the SciFest Guidelines for Students.

5. Timetable and Checklist

Meeting Deadlines

Project Title: _____

_____

Name/s:

1. _____ Class: _____
2. _____ Class: _____
3. _____ Class: _____

	Task		Date Due	Accomplished
1.	Idea			
2.	Research Record			
3.	List of equipment & materials			
4.	Hypothesis			
5.	Entry Forms			
6.	Parent's/Guardian's Signatures	Student 1		
		Student 2		
		Student 3		
7.	Work Assessment Record			
8.	Experimental work and Results			
9.	Bibliography and Acknowledgements			
10.	Editing by parent, teacher, peer……			
11.	Project Report Book			
12.	Visual Display			
13.	Exhibition			

Teacher's signature _____ **Date** _____

Project Checklist

Date to be completed by: _____

Please ✓ each box when you have completed the task.

I have checked the spelling in the Report Book and on the Display Board	
Somebody else, parent, teacher, guardian, relation has read my Report Book	
I have discussed my project and Report Book with the above person and made the necessary changes	
I have included the following pages in my Report Book *Cover ☐ *Research Team ☐ *Summary ☐ *Introduction ☐ *Background Research ☐ *Experimental Methods ☐ *Results ☐ *Conclusions ☐ *Recommendations ☐ *Acknowledgements ☐ *Appendices ☐ *References ☐	
The Cover Page includes the following *Title of Project ☐ *Name/s of Team Members ☐ *Name of School ☐	
I have included as many references in the Report Book as possible ☐ For all books I have listed the information in the proper bibliographic format ☐ The list is in alphabetical order ☐ I have also listed all the websites I used ☐ I have listed persons or institutions that have helped me ☐	
I have included any copies of letters or emails that I sent or received	
I know everything there is to be known about the project	
I have gone beyond basic statistics for my survey. I have not just done pie charts or bar charts for each question	
I have met with my team and we have run through how we will present the project to the judges, including how we will divide up the answering	
I am happy with my contribution to the project	
I have checked if I need to put the Team Member Name/s, the Project Title and the School Name on the display board	
I have organised transport to SciFest so that I will arrive on time	
I have written thank you cards or letters to people (university professors, school principals, teachers, etc.) who helped me with my project	
I have thanked my parents for their support	

6. Useful Websites

- **http://www.scifest.ie**
  SciFest is the largest science fair programme in Ireland. Entry is free and all second-level students are encouraged to participate. The SciFest website offers support to students and teachers with resources such as this TY module, sample projects, etc. Top award winners represent Ireland at Intel ISEF in America and INESPO in the Netherlands.
- **http://www.sfi.ie**
  Science Foundation Ireland promotes and supports the study of, education in, and engagement with, STEM and promotes an awareness and understanding of the value of STEM to society and, in particular, to the growth of the economy.
- **http://www.smartfutures.ie**
  Smart Futures is a government-industry programme that provides secondary school students in Ireland with access to role models working in science, technology, engineering and maths (STEM). Large scale volunteer organisations exist, such as Engineers Ireland, Business in the Community, Junior Achievement Ireland, the Ada Lovelace Initiative and Connecting Women in Technology, that are working with industry to bring role models into schools. Should you wish to have a role model come to speak at your school please contact one of these partners listed above or Smart Futures directly at Smartfutures@sfi.ie.
- **http://www.discoversensors.ie**
  Discover Sensors supports teachers of Junior Certificate Science in the use of inquiry based science teaching, learning and assessment. Central to the project is the Discover Sensors Framework by science teachers, for science teachers.
- **http://www.sentinus.co.uk**
  The Sentinus Young Innovators/Northern Ireland Young Scientist Competition takes place in June in Belfast each year. Schools from all over Ireland participate and winners attend Intel ISEF in America and The Big Bang Science Fair in the UK.
- **http://www.sta.ie**
  Science and Technology in Action (STA) annually produce a set of industry-led lessons designed to support the teaching of science and related subjects in second level schools.
- **http://www.btyoungscientist.com**
  The BT Young Scientist & Technology Exhibition takes place in the RDS in Dublin each January. Students enter this competition online at the end of September by submitting a one-page proposal of their idea. Approximately 550 projects are accepted for exhibition.
- **http://www.sciencebuddies.org**
  On this site you will find hundreds of ideas for science projects along with notes on the scientific method, a teacher's guide to science projects, grading rubrics, an ask the experts section and lots more.
- **http://www.biopharmachemireland.ie**
  The education section of the BioPharmaChem Ireland website includes a host of science materials for teachers and students.
- **http://www.seai.ie**
  The website of the Sustainable Energy Authority of Ireland – includes resources and activities related to the teaching of energy and related topics.

- **http://www.saltersinstitute.co.uk/club/club-publications/**
  The Salters' Chemistry Club – Handbook Volumes 1 and 2. Hands-on Chemistry designed to make chemistry more exciting and fun.
- **http://www.esa.int/education**
  The European Space Agency (ESA) 'Watching over the Earth' Secondary Level Teacher's Pack (worksheets and teacher's notes).
- **http://www.bco.ie**
  CIT Blackrock Castle Observatory is a science centre and is home to *Cosmos at The Castle*, an award winning interactive astronomy exhibition which highlights recent scientific discoveries and their implications for life in outer space. Check out the education section of the website for resources and details of school visits and teacher professional development opportunities.
- **http://www.tryscience.org**
  Experience the excitement of contemporary science and technology through online and offline interactivity with science and technology centres worldwide.
- **http://www.puzzlemaker.com**
  Create puzzles online.
- **http://www.schoolscience.co.uk**
  Written for teachers and students of National Curriculum science in the UK, the site covers some biology, chemistry and physics topics and is well illustrated.
- **http://www.webweaver.nu/clipart**
  Free clipart.
- **http://www.ncca.ie**
  The role of the National Council for Curriculum and Assessment (NCCA) is to lead developments in curriculum and assessment and to support the implementation of changes resulting from this work. The website is a source of invaluable information for the teacher on curriculum and assessment.
- **http://www.science.ie**
  Science.ie provides a comprehensive listing of all news articles, events, science features, careers information, scientist profiles and activities relevant to science in Ireland.
- **http://www.xplora.org**
  Xplora is the European gateway to science education. It is aimed at teachers, pupils, scientists, science communicators and science educators.
- **http://www.ista.ie**
  The Irish Science Teachers' Association (ISTA) is the subject association for teachers of science in the Republic of Ireland.
- **http://www.ase.org.uk**
  Association for Science Education – teachers helping teachers teach science. The ASE is the UK's largest science association dedicated to the teaching of science.
- **http://www.engagingscience.eu/en**
  This website is a source of information and discussions on topical scientific issues appropriate to Junior Cycle level.

7. EVALUATION

Module Evaluation (for student)

1. Title of module

Science by Inquiry

2. What part of the module did you most enjoy?

Why?

3. What part of the module did you find most beneficial?

Why?

4. What part of the module did you least enjoy?

Why?

5. How would you rate your own level of participation during this module?

You May (if you wish) Sign Your Name _____

Date _____

Ref: National Council for Curriculum and Assessment – http://www.ncca.ie

Project Evaluation (for teacher)

Student's Name _____ **Class** _____

Project Title _____

_____

Teacher's Comments	Features	
	3 = Excellent 2 = Good 1 = Weak n/a = Not Applicable	
	Clear aims	
	Evidence of Research	
	Methodologies used	
	Investigation	
	Development of theme	
	Accuracy of data	
	Original work	
	Evidence of understanding	
	Initiative shown	
	Presentation (written, oral, visual, aural, dramatic, etc.)	
	Results – conclusions	
	References	
	Overall Grade (A, B, C, D, E)	

Signed: _____ _(Teacher) Date: _____

Ref: National Council for Curriculum and Assessment – http://www.ncca.ie

REMEMBER
Log on to
www.scifest.ie

SciFest

The SciFest science fairs programme is a national initiative founded by Sheila Porter in 2006 to encourage a love of science, technology, engineering and maths (STEM) through active, collaborative, inquiry-based learning. Following two successful pilot SciFest science fairs hosted by the Institute of Technology Tallaght the programme was launched nationwide in 2008. SciFest expanded rapidly and today encompasses four distinct levels of participation: SciFest@School, SciFest@College, SciFest National Final and SciFest International.

SciFest is accessible, inclusive and free to enter. Participation in the programme offers an innovative way to expose second-level students to, and enhance their understanding of, STEM subjects. Own choice of topic, collaboration, hands-on activities, presentation skills and recognition of work done are all attractive aspects of the programme. The emphasis on real-world problems helps make STEM relevant to all students. They grow in confidence, develop their critical thinking, problem solving and communication skills and become aware of the variety of exciting careers associated with a STEM qualification.

SciFest is funded primarily by Science Foundation Ireland, Boston Scientific, Intel Ireland and Specsavers. It is supported by a number of other partners, including the Institutes of Technology, TU Dublin, DCU, St Mary's College, Derry, Smart Futures, Abbott, Newstalk, BioPharmaChem Ireland, iClass, Seagate, Sentinus, RSC(Ireland) IOPI, ISTA, ESERO Ireland and the Business Excellence Institute BEX). The project thus creates a valuable link between the second and third level education sectors and between education and industry.

See www.scifest.ie for more details.

Contact Us

e: info@scifest.ie
m: 086 379 6143 w: www.scifest.ie