

PROJECT MANAGEMENT

Science curriculum links

AT 1 Exploration of science

Syllabus links

- GCSE Science
- Sixth-form General Studies
- Technology

Lesson time

1 hour

Links with other SATIS materials

605 The Great Chunnel Debate

NERIS

Search on
PROJECTS and PLANNING
and UPPER SECONDARY

SUMMARY

The material is designed for students working in pairs. It shows how a project may be divided into a series of activities, arranged in the best sequence and organised to complete it in the shortest time by a process of 'critical path analysis'.

This unit links with both the Technology and the Science National Curriculum.

STUDENT ACTIVITIES

- Introduction to project management: sequencing the setting up of a fish tank.
- Producing a network and finding the critical path: demolition of the school.

AIMS

- To link with project work in science and technology
- To simulate the management of large projects
- To introduce the key terms of activity, network, critical path, activity float
- To introduce the technique of critical path analysis
- To provide an opportunity for collaborative problem solving

USING AND ADAPTING THE UNIT

- In trials, the unit has been used to help students plan project work in science and to introduce study skills.
- Activity A is for students working in pairs. (It may help them to write the activities on paper, as has been done for activity B, so that they can rearrange them in any order.) Students need 5 minutes or so to solve the problem when the teacher may ask groups to compare their results and discuss their strategies.
- Activity B is for students working in groups of 2 to 4. Pages 4 and 5 are designed for photocopying on thin card and cutting up.

REQUIREMENTS

- Copies of pages 5 and 6 should be printed single-sided onto paper or card. Cards sets may be stored in envelopes for further use.

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General information

The unit is designed to introduce students to the idea of project management. By the end of the unit students should understand how to get a logical sequence, find the critical path and recognise float as an idea. (The examples in this unit are deliberately kept simple and restricted to produce a network showing activities and not events, or dummy activities etc.)

Changing the critical path to reduce the time taken may be done by increasing the resources e.g. by using twice the labour and completing in half the time. It should be noted however, that reducing the time for an activity may remove it from the critical path.

Teaching notes

Activity B The activities listed on page 3 are already roughly in sequence to encourage students to consider float activities. (It would be unrealistic and would make the task very much harder to present the activities in a random order.) There is one blank card on page 5 for students to add an activity of their choice.

It is important that students do not waste time when drawing out their final network. Naming the activity and the number of days is sufficient for each stage.

Less able students may be given the cards to cut out.

Answers to the questions

Q1 7

Q2 *Buying the tank, gravel, lights and plants; washing the gravel and putting it in the tank.*

Q3 *Five and a half weeks:*

Week one – ‘Buy tank etc.’ and ‘Wash gravel’

*Week two – ‘Fill tank’ and ‘Plant plants’**

Week three – (plants establishing)

Week four – (plants establishing)

Week five – (plants establishing)

Week six – ‘Buy fish etc.’

‘Set up the pump’ and ‘Wire up the lighting’ can be done during any of the lessons. They are ‘float activities’, as described on page 4.

** Assumes plants are kept in water after purchase until planted.*

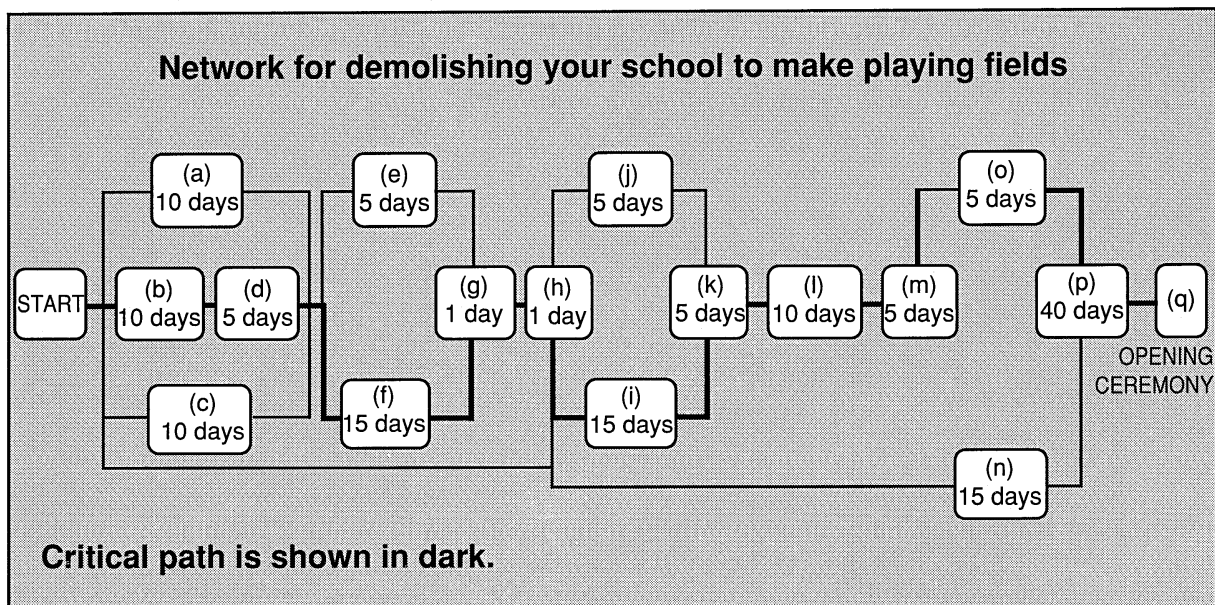
Q5 and Q6 *See network below – several variations are possible. (The network would look more simple if space permitted the critical path to be drawn as a straight line.)*

Q7 112 days

Q8 *(a) Fence site, (c) Publicity, (e) Disconnect services, (j) Strip tarmac, (n) Order equipment, (o) Topsoil.*

Q9 *Add 5 days to critical path.*

Q10 *This activity becomes critical and the project will be delayed by 5 days.*



PROJECT MANAGEMENT

Any project needs management if it is to run smoothly.

This unit shows you how to plan projects of any size and scale.



This unit is about planning and managing projects. It contains two activities:

- sequencing the task of setting up of a fish tank,
- a simulation exercise: involving critical path analysis of managing the demolition of the school and turning it into a green field site.

Activity A – Setting up a fish tank

Work in pairs on this task.

Imagine that you and your partner are to set up a fish tank as part of a science project. You plan to buy a tank with lighting, pump, gravel, plants and fish.

The problem is that the plants need three weeks to establish themselves and grow roots before you can put the fish in.

The job has been divided into activities for you. You may assume that each activity will take one person one science lesson. You have two science lessons a week in which to work on this project. You and your partner could decide to work on different activities at the same time.

- Plant plants. Wait three weeks.
- Buy fish. Put in fish.
- Fill the tank with water.
- Set up pump to aerate and circulate the water.
- Buy the tank, gravel, lights and plants.
- Wash the gravel and put it in the tank.
- Wire up the lighting.

Work out the best order in which to set up the tank in the shortest time. Drawing a flow chart listing each activity may help you.

Questions

Q1 How many activities was the project divided into?

Q2 Which activities had to be complete before filling the tank with water?

Q3 How long would it take you to set up the tank and put in the fish?

Q4 Assuming you were to start the fish tank project next science lesson and spend two lessons a week on it, use a calendar or diary to plan a schedule for the project (that is the date of each science lesson and what you would do during it).

What is project management?

Have you ever wondered how people organise *really large projects* like building a hospital?

Although such projects are complex, they have to be planned just like setting up the fish tank. It is the task of project managers to ensure that the hospital is completed with all the equipment *to the agreed specification on time and within the cost allowed* – before the patients arrive!

Activity B lets you try your hand at managing a larger project – demolishing your school. Demolition requires expert knowledge of civil engineering so some of the planning has been started for you.

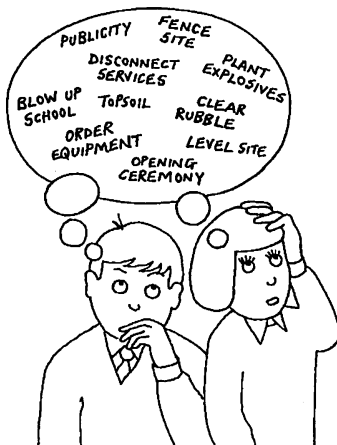


Activity B – Demolish your school

Due to a lower birthrate there are fewer children in your area and your school is to be closed and demolished. The local council will use the site for playing fields.

Local council managers in the works department have decided to break down the job into the stages set out on the next sheet.

- As project managers your task is to sort these stages into the best order and to find shortest time to do the job.
- The 17 stages are printed on card. Cut them out. Arrange and rearrange them as you like. See if some stages can be done at the same time. Put them in the order that gives the shortest time to do the job.



PROJECT MANAGEMENT

LIST OF ACTIVITIES

- (a) **FENCE SITE** The school has closed. To stop vandalism a high fence must be built around the school and this has to be finished before the contractor can go onto site. **10 days**
- (b) **FIRMS QUOTE** A demolition firm needs to be chosen so several are asked to quote a price (tender) for blowing up the school. **10 days**
- (c) **PUBLICITY** You need to publicise in the local paper what is happening on the old school site before work starts. **10 days**
- (d) **FIRM SELECTED** Tenders are compared and a firm is chosen and told to proceed. **5 days**
- (e) **DISCONNECT SERVICES** The demolition firm has to disconnect electricity, gas and water supplies to the school before any demolition occurs. **5 days**
- (f) **REMOVE FITTINGS** The fittings inside the buildings must be removed by the demolition firm before the buildings are blown up. **15 days**
- (g) **PLANT EXPLOSIVES** Explosives are set after the services are disconnected and the building is cleared of fittings. **1 day**
- (h) **DEMOLISH SCHOOL** Press the button. Bang!! **1 day**
- (i) **CRUSH RUBBLE and SORT METAL** The building rubble needs to be crushed and the metal girders sorted. **15 days**
- (j) **STRIP TARMAC** Strip the tarmac from the playgrounds etc., which can be done while the concrete from the buildings is being crushed. **5 days**
- (k) **CLEAR RUBBLE** The crushed concrete, sorted metal and stripped tarmac must be removed from the site in lorries. **5 days**
- (l) **DIG OUT FOUNDATIONS** The deep foundations must be dug up and taken away before the land can be levelled. **10 days**
- (m) **LEVEL SITE** The site is to be levelled ready to receive the topsoil. **5 days**
- (n) **ORDER PLAYING FIELD EQUIPMENT** Playing field equipment needs to be ordered, e.g. goal posts. **15 days**
- (o) **TOPSOIL** Topsoil is delivered and spread on site, grass is seeded. **5 days**
- (p) **FINAL PREPARATIONS** Grass on pitches matures and the equipment is installed. **40 days**
- (q) **OPENING CEREMONY** Mayor opens playing fields.

Critical path analysis

The method you have used to plan the the setting up of a fish tank or the demolition of your school is called **critical path analysis**. You do it in your head when you organise a busy day – which homework has to be finished before another and before you can go out! But large projects have to be organised more formally.

Project managers firstly break down the project into stages or **activities**.

Each stage is **analysed** to decide which activities must be done first, which must be finished before another can begin and which can be carried out at the same time. From this they produce a flow chart called a **network** giving the order in which the activities should be done.

To work out how long the project should take, they look for the shortest route through the network. This is called the **critical path**. Activities which do not lie on the critical path are called **float activities**. It is not critical when they are done – like wiring up the lighting in the fish tank project.

When the starting date is known, they work out a **schedule** of dates when each activity is to start and end.

While the project is going on, the managers monitor progress and compare it with the schedule. If progress is not according to plan, they can make adjustments to the network and use it to reschedule the remaining activities.

Project management involves

Planning
The process of dividing the task into activities and building up a network.

Analysing
Working out the earliest and latest times for starting and finishing activities.

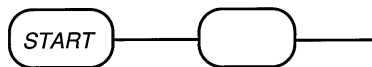
Scheduling
Preparing a schedule of activities with dates when they are to take place.

Control
Monitoring progress, comparing with the plan, deciding what action to take.



Questions about activity B

Q5 Make a copy of your **network** of cards, for example:



Q6 Use a coloured pen to mark the **critical path** – the way through the network that gives the shortest time.

Q7 How quickly can the job be done?

Q8 Some activities are not on the critical path. These are called 'float' activities. Which are they?

Q9 Suppose the transport firm let you down and shifting the rubble takes you twice as long. What effect will this have on the time it takes to do the job?

Q10 The subcontractors due to strip the tarmac arrive 15 days late. Will this delay the project and if so by how much?

(a)

START

(a)

FENCE SITE

10 days

(b)

FIRMS QUOTE

10 days

(c)

PUBLICITY

10 days

(d)

**FIRM
SELECTED**

5 days

(e)

**DISCONNECT
SERVICES**

5 days

(g)

**PLANT
EXPLOSIVES**

1 day

(f)

**REMOVE
FITTINGS**

15 days

(h)

**DEMOLISH
SCHOOL**

1 day

You may use this card to add an activity of your choice

(i)
CRUSH RUBBLE
& SORT METAL
15 days

(j)
STRIP
TARMAC
5 days

(k)
CLEAR
RUBBLE
5 days

(l)
DIG OUT
FOUNDATIONS
10 days

(m)
LEVEL SITE
5 days

(n)
ORDER
PLAYING FIELD
EQUIPMENT
15 days

(o)
TOPSOIL
5 days

(p)
FINAL
PREPARATIONS
40 days

(q)
OPENING CEREMONY

The SATIS Team

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Janet Major, Diss High School

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*List of units in this book***1101 Breast or Bottle?**

A look at the nutritional aspects of breast and bottle feeding in the UK and the developing world. It includes a design brief for a baby's bottle warmer.

Attainment targets 1, 3, 11, 12 and 13.

1102 A Special Type of Hearing Aid

Mrs Alison Heath was one of the first people in the UK to receive a cochlear implant. In telling her story, the unit describes the functioning of the human ear and explores some of the problems associated with deafness.

Attainment targets 12 and 14.

1103 Save the Salmon! – a problem of pH

The unit looks at the economic importance of the wild salmon and at reasons for its decline. In October 1989, more than 100 000 salmon died in the River Torridge from unforeseen acidification. Students are asked to investigate a solution to such a tragedy.

Attainment targets 1, 4, 5 and 7.

1104 Materials to Repair Teeth

Dental filling materials exemplify the properties of metals and of polymer composites.

Attainment targets 1 and 6.

1105a Radon in Homes

This starts with the story of Stanley Watrass and considers the problems caused by a radioactive gas called radon.

Attainment targets 1 and 8.

1105b Radon – an investigation

This is a practical investigation taking measurements of radon activity. The apparatus is simple. Students may contribute their results to a national data base.

Attainment targets 1 and 8.

1106 Tin Cans

What are those food and drinks cans really made of? Why should they be recycled? Practical work, questions and discussion.

Attainment targets 1, 5, 6 and 7.

1107 The Eruption of Mount St Helens

This unit describes work of geologists in assessing the hazards posed by an active volcano. What sort of information do the public need?

Attainment target 9.

1108 Telephones

Alexander Graham Bell's invention has now evolved into an electronic tone-dialling instrument.

Attainment targets 11, 12 and 17.

1109 Electricity Supply and Demand

How is demand for electricity met in the restructured electricity supply industry? This is a simulation exercise.

Attainment targets 11 and 13

1110 Project Management

Project work needs to be managed. The experts do it by critical path analysis.

Attainment target 1.