# Design and Technology in the Primary Curriculum

# Introducing the Nuffield Approach

# Computers helping design at lower KS2

## Design and make a mosaic picture

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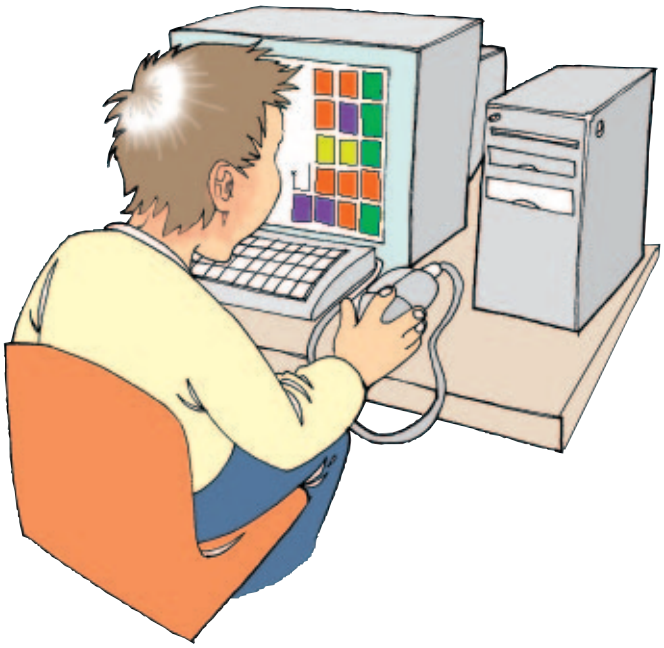


**Key to icons:**

whole class work

small group work

individual work

design decision

planning and preparation

# Design and make a mosaic picture

## 1 Possible outcomes

## 2 Context and purpose

The purpose of this activity is to learn the skills necessary to design and make a mosaic from clay, using computer software to help design the pattern or picture. Making a complex design using small coloured pieces is quite difficult at this age, especially for some children. Modelling the design on screen should make the task easier, if simple software is used, and if the children are taught to use it efficiently. This activity could link to topic work on the Romans. The examples of mosaics shown to the children will raise awareness of patterns used for making pictures as well as decoration for floors and walls. They would also be more aware of mosaics in the local environment, sometimes in unexpected places.

## 3 The big task

The task is to design and make a framed clay mosaic which can be displayed at school before being taken home to be displayed there. If it is designed as a gift for someone, the design of the mosaic may reflect the interests of that person.

# 4 The small tasks

Children will learn:

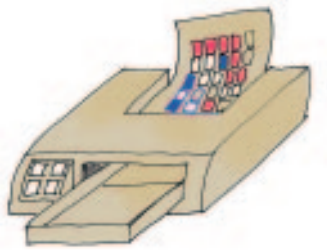
- to measure, mark, cut and join wood to make a frame – this will introduce children to the safe use of tools;
  Q: How will you make sure that your pieces of wood are the right size for your frame? What are all these tools called? What is each tool used for? What are the safety rules for these tools?
- to explore the use of clay to make small tiles – this will develop skills in manipulating, measuring and cutting accurately a mouldable material;
  Q: How will you make sure all the tiles are the same thickness? If all the tiles were made different sizes, would it be more difficult to make your mosaic?
- to use computer software as a modelling tool in their designing.
  Q: Is it easier to make a complicated design on screen than on paper? Is it possible to change your design and try lots of others?

# 5 The stories/language resource

Any text, fiction or nonfiction, about Roman mosaics, combined with illustrations or examples, would help to set the context in Session 1.

Roman Palace by Tim Wood, published by A&C Black, ISBN 0-7136-3812-5. This book has a description of how rich Romans would order mosaic floors from pattern books, and has a good photograph of a modern girl making a mosaic with real Roman tesserae.

The class could follow this theme and print out their mosaics as samples for a famous Roman to choose for his floor decoration. This could be developed into a play which the whole class could take part in.



# 6 Learning possibilities in design and technology

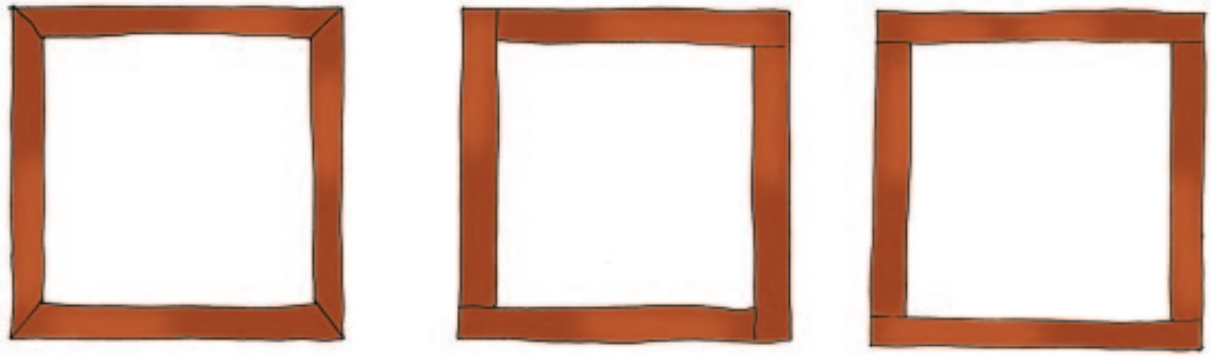
In this activity children will learn:

- to research from a variety of sources to inform their designing; (Session 1)
- to write a design specification; (Session 1)
- to design and model on screen; (Session 2)
- to work with a mouldable material, clay; (Session 3)
- safety rules for using tools; (Session 4)
- to measure accurately, mark and cut wood to make a frame; (Session 4)
- to use a junior hacksaw, sandpaper, vice/bench hook, clamps; (Session 4)
- to follow a printed plan to paint tiles in the required colours; (Session 5)
- to assemble and join the component parts of the final product, being aware of the quality of the finish; (Session 6)
- to evaluate the final product against the design specification. (Session 7)

# 7 Children's design decisions

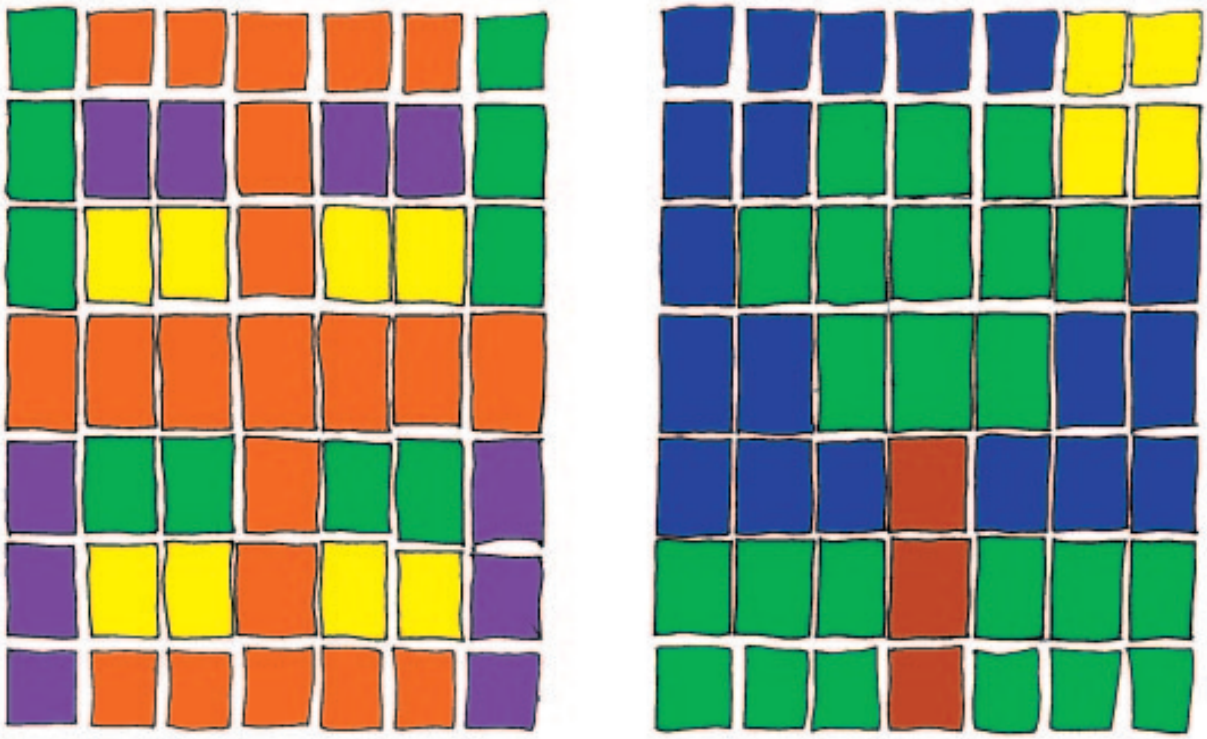
Deciding how to make the frame, which will require knowledge of different ways to make a wooden frame:

- to be learned in Session 4;
- decision to be made in Session 4.



Deciding on the theme/type of pattern for the mosaic, based on the introduction to mosaics and any later research:

- to be learned in Session 1;
- decision to be made in Session 2.



Deciding on the colours to use on the clay tiles, which will draw upon the stimulus of pictures and other examples of mosaics:

- to be learned in Session 1;
- decision to be made in Session 2.

Deciding on the final design to be printed out:

- to be learned in Session 2;
- decision to be made in Session 2.

# 8 How you might teach this activity

## Session 1: Setting the context and writing a design specification

### (approximately 30 minutes)

**Resource summary:** pictures of modern and ancient mosaics

The aim of this session is to introduce mosaics, how and where they are used today as well as in ancient times. A visit to a museum or other site to see mosaics would be an excellent starting point. Roman Palace by Tim Wood has a photograph of real Roman tesserae (small stone pieces for mosaics). The method used to fix them, and the time it would take, should be discussed

A useful homework task, to be done before this session, is to ask each child to spot as many mosaics as they can over a weekly period. They should write down where they saw them and do a quick sketch of what they looked like. These sketches can become a design resource for the whole class during later sessions. Good places to look are in churches, shopping centres, museums, libraries, bathrooms, kitchens.

The tools and materials to be used in later sessions should be shown to the class and they should have a chance to question and discuss the planned activity.

Children should each write or draw a design specification for their own mosaic, including for whom it is being made. This can be as simple as the three statements below.

My mosaic will be a present for my Mum.

My mosaic will have a repeating pattern.

My mosaic will have my Mum's initial on it.

This specification will be used to evaluate their final product in Session 7. During the following sessions, children should have the opportunity to record their planning and their progress on paper, so that more able children can demonstrate their capabilities. These plans can be used for assessment.

## Session 2: Learning to use the software and modelling and making a mosaic pattern or picture

### (approximately 30 minutes per group)

**Resource summary:** computer, software, colour printer

The aim of this session is to learn how to use the chosen computer software, and then to model and make individual mosaic designs on screen

If you start with a whole class session it will save on the time needed by each group when they start to experiment at the computer. The features of the software should be introduced, and the help available on screen should be described, which will save children having to come back to you for help each time they are stuck.

The skills which should be taught are:

- how to set up a grid or use an existing one;
- how to change colours on the grid;
- how to save, retrieve and print out designs.

Small groups can learn and experiment together for a few minutes.

Children should work individually on their designs, unless they need help. If there are children who cannot get started on their own, the previous child to use the software could spend a couple of minutes starting them off. The final design should be printed out and kept safe with the child's name written on it.

## Session 3: Learning to shape and cut clay and making the tiles

### (approximately 30 minutes)

**Resource summary:** clay, roller, spacer dowel, card strips for measuring, shallow trays, knife or cutting tool, protective cover for worktop, overalls or aprons for children

The aim of this session is to learn to handle and to cut clay to make regular sized tiles for the mosaics.

The tools and materials can be introduced as a class lesson, and then children can work in groups. The size of the groups will depend on the amount of space in the room and on the number of tools available. Each child should learn:

- how to roll out the clay;
- how to use a dowel or other aid to regulate the thickness of the rolled clay;
- how to use the card strip to measure and cut the correct width of rolled clay;
- how to handle the soft tiles and store them on trays ready for drying out and possibly firing in a kiln, depending on the type of clay you use.

The clay tiles made can all be stored together as a central resource for the later making session. Each child should make just over the number of tiles they will need to allow for mistakes and breakages later on. If the grid used was 7 x 7, each child should make about 52 tiles. If the tiles are laid out in rows in the trays, it will be easier to count how many have been made. If your clay needs firing, you can stack the tiles in bundles inside the kiln.

## Session 4: Learning how to mark and cut wood and making a frame

### (approximately 30 minutes)

**Resources summary:** wood strips, hardboard bases ready cut, glue, junior hacksaws, rulers, pencils, sandpaper or a sanding block, vice / bench hook and clamp, mitre block

The session can start with the whole class together, and the teacher demonstrating. The aim of this session is for each child needs to learn:

- safety rules and reasons for them;
- how to use a ruler effectively;

- how to mark accurately by holding the pencil at an angle;
- how a saw works and how to cut wood steadily and accurately;
- why a clamp or vice makes the job easier and safer;
- how to use sandpaper or a sanding block to smooth off the cut ends of the hardboard base and the wood strip.

Three different ways of making a frame should be shown and children will decide which one they will use. The measurements for their wood pieces will vary according to the type of frame. The mitred frame is only suitable for children with high level making skills, and this should be pointed out to the whole class. If you have spare wood strip you might want everyone to try making at least one mitred corner.

The size of the groups will depend on the amount of space in the room and on the number of tools available. There should be adult supervision of the group, so a classroom helper would be very useful. The helper should also know the above skills, processes and safety rules. When a child has measured, marked, and cut their wood pieces, they should sand off their base and wood pieces, write their name on the back of the base, and then glue the pieces onto the hardboard base and leave it to dry.

## Session 5: Painting the clay tiles

### (approximately 20 minutes)

**Resources summary:** clay tiles, paint, brushes, overalls or aprons, printed designs

The aim of this session is to use the printed mosaic design from Session 2 to paint the clay tiles in the colours needed for the pattern/picture. They will need only a short time to dry and could be kept in envelopes marked with names so each child's set of tiles is kept together. Children should follow the usual classroom routine for painting and clearing away their equipment themselves.

Some children will find it difficult to count out the number of each colour they need and may need help to do it carefully, row by row.

# Session 6 – Making the final mosaic

## (approximately 30 minutes)

**Resource summary:** frames from Session 4, printed designs, painted clay tiles, glue, framed bases, PVA glue, hanging hooks (optional)

The aim of this session is to put together the final product. It can be done over a few days, with a few children at a time working at a table set up with the resources they need, or the whole class could do it at the same time – this would mean a lot of glued work needing a flat area to dry at the same time.

The painted tiles should be arranged on the framed base, and then one by one lifted, glued and replaced. Some children will find this difficult to do, especially spacing the tiles out evenly. If there are children with poor spatial awareness or pattern-making skills they should show you the tiles on their base before they stick them down, in case they have not been able to follow their printed design. They may need a session with a helper to overcome their difficulty before they go any further.

You may want to apply a finish to the whole mosaic. PVA glue can be brushed over the whole thing, frame and tiles, and will give a glossy finish. There might be a problem with paint colour running if the brushing is too slow or too vigorous. The most likely colour to run is often red or pink.

When the glue is dry, a hanging hook could be stuck on the back of each frame, or the mosaic could be displayed just leaning upright on a shelf.

# Session 7: Evaluation

## (approximately 30 minutes)

**Resources summary:** finished mosaics, design specifications, printed designs from computer

The aim of this session is to evaluate the finished mosaics against the design specification produced in Session 1. The role of IT as a design tool should also be evaluated. Some good questions for this session are these.

- Does your mosaic meet all the criteria on your design specification? If not, why not?
- Was it easy to design your mosaic using the computer?
- What was the hardest bit to do?
- Would you make any different decisions if you were to make another mosaic?
- Would you like to be a mosaic maker who did this for a living? Why?

Each child should then write an individual evaluation. For less confident writers, this could be as simple as ticking the criteria on the specification. These evaluations will be useful for assessment. They could also be displayed with the finished mosaics in the classroom. The story of making the mosaics could be shown on a display with samples of all the materials, tools, designs, specifications, evaluations and several finished products. This kind of display would be useful in a corridor or other shared space so other classes can learn from it.

# 9 Resource requirements

## Session 1:

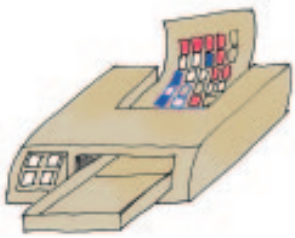
### Stimulus materials

- Pictures / books about mosaics

### Consumables

- paper, pencils for writing specifications

## Session 2:



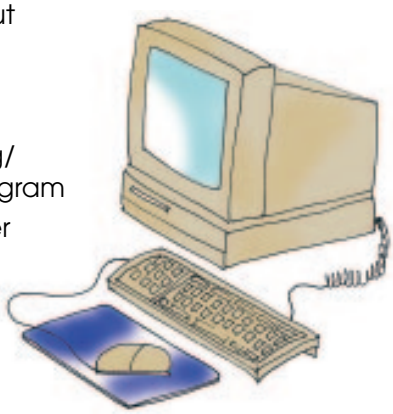
### Stimulus materials

- Design specification from Session 1

### Consumables

- clear adhesive plastic one piece for each printout

### Tools

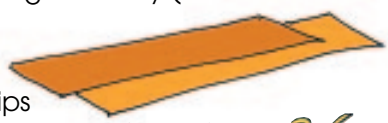


- computer
- mosaic/tiling/ drawing program
- colour printer

## Session 3:

### Consumables

- clay
- pieces of dowel or other firm material for regulating height of clay (see Technical Tips)



- firm card strips for regulating width of clay (see Technical Tips)

- protective surface cover for clay work
- trays to hold clay shapes

### Tools

- rolling pin or other rolling out tool

## Session 4:

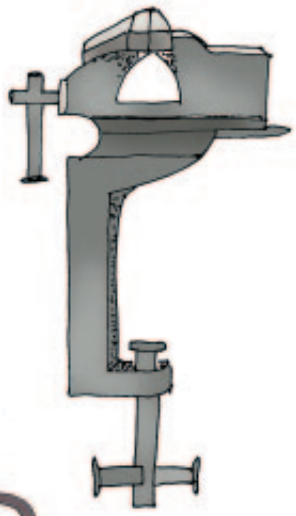
### Consumables

- precut pieces of hardboard for base, not sanded off – one per child

### Tools

- Junior hacksaw
- sandpaper block or sheet

- bench hook with clamp or vice or cutting block
- ruler
- pencil



## Session 5:

### Stimulus materials

- printed designs from computer

### Consumables

- paints, clay tiles

### Tools

- paint brushes

## Session 6:

### Stimulus materials

- printed designs from computer

### Consumables

- pva glue
- framed hardboard bases
- painted clay tiles in individual envelopes
- hanging hooks (optional)

## Session 7:

### Stimulus materials

- finished mosaics
- design specifications
- printed designs from computer

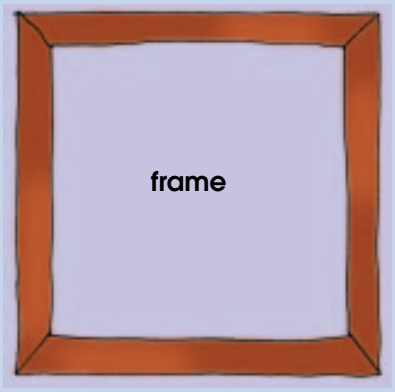
### Consumables

- paper and pencils

# 10 Important vocabulary

## Session 1

tiles
tesserae
mosaic
Roman
pattern books
hardboard
wood strip
frame

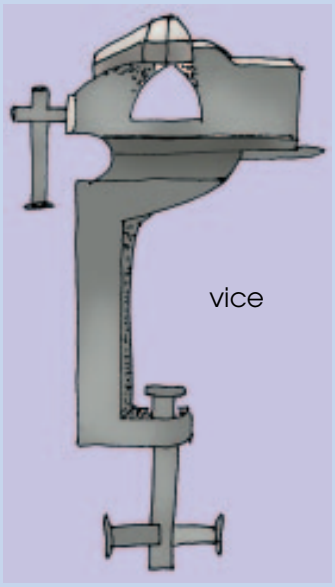



## Session 2

grid
modelling
save
load / retrieve
print
protective covering

## Session 3

clay
kiln
fired
accurate measuring




## Session 4

bench hook
clamp
vice
junior hacksaw
blade
teeth
PVA glue

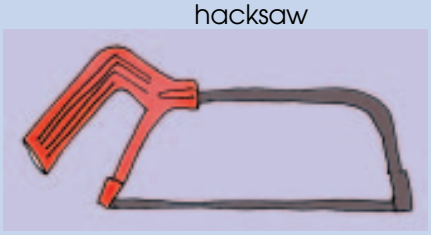
## Session 6

applying a finish
varnish (if used)

## Session 7

evaluate
improve
compare

junior hacksaw



# 11 Technical advice

When children are sawing wood using a bench hook, it should be clamped to the work surface to make it easier for them to cut steadily.

A base piece of hardboard 20 cm square will hold a grid of 7 x 7 clay tiles which are 2 cm square, with a small space around each tile. The wood-strip frame would be 76 cm total perimeter length for this size of base if you use 10 mm wood.

The size of the printouts of the designs will depend on the software you use. It is a good idea to stick each one onto a piece of card using sticky backed clear plastic, to protect them during the painting and gluing sessions.

Make sure the type of clay you have in school can be rolled out and cut easily to make the tiles. Some air drying clay may be too fibrous.

If a piece of dowel or other firm material is put alongside the clay as it is rolled, the height of the rolled clay can be regulated.

A strip of stiff card cut to the required dimensions, e.g. 2 cm wide, can be used as a cutting guide when children are cutting the clay tiles out.

# 12 Learning possibilities in the wider primary curriculum

## English

You may have a stonemason in your local community, or a tiler who uses mosaic tiles could be invited in to speak to the class about their work. This would put an ancient craft into a modern context. The visit would be an excellent opportunity for interviewing and listening practice, note taking, summarising and letter writing after the visit.

## History

This activity could be linked to work on Romans in Britain. There are many good examples of mosaics to be seen in different parts of the country and investigating their significance can lead to greater understanding of the everyday life of the Romans.

## Maths

Pattern making, measuring accurately and marking measurements on wood to be cut.

## Science

If fired clay is used for the tiles, this could link to work on permanent changes to materials.

## Art

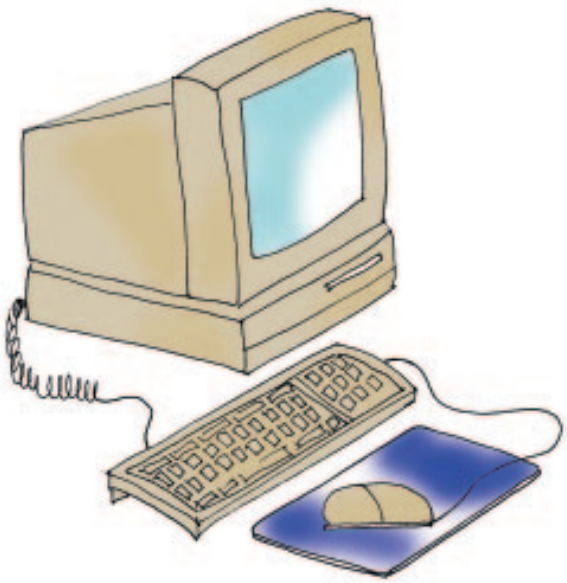
Learning about the work of craftsmen, and the craft of mosaic making.

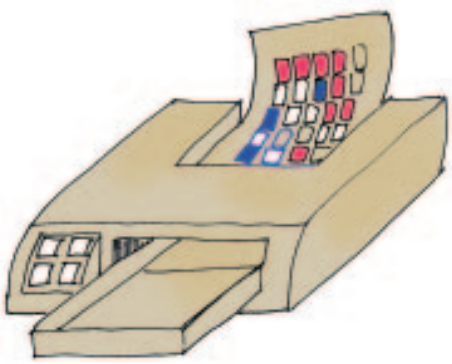
## IT

Using a computer as a design tool, and evaluating its usefulness.

# 13 Classroom management

Most session start with a whole class lesson, and the following practical part of the session can be arranged as part of a carousel of activities which can go on all at once or be spread out over several weeks, depending on time, space and helpers available.





# 14 Assessing the children's work

The evaluation written in Session 7 is a good example of self assessment.

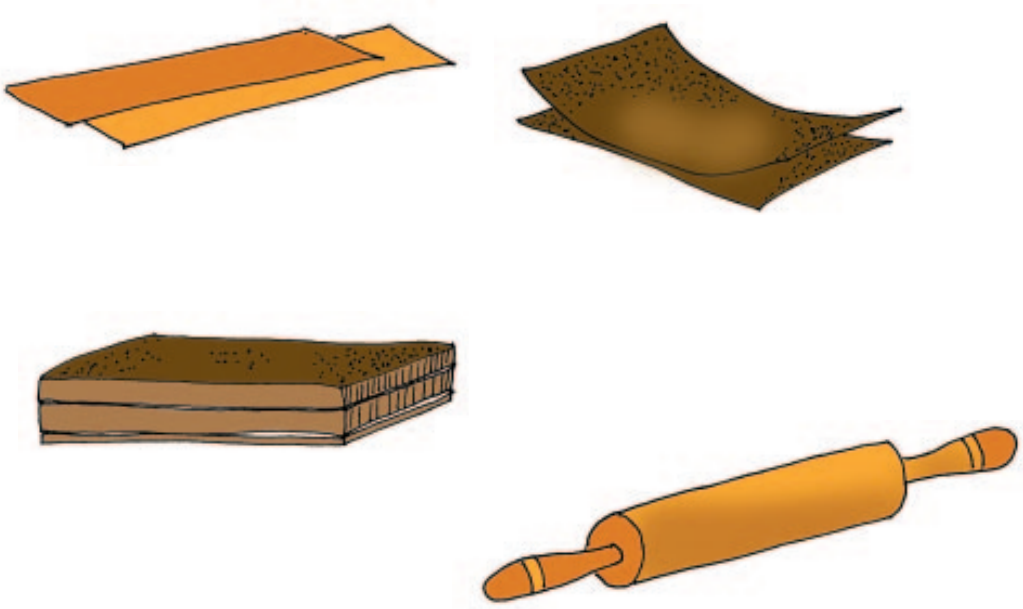
This activity is aimed at lower KS2. The children's work may show evidence of attainment at levels 2 to 4.

Designing

| | |
|---|---|
| At level 2 a child would: | be able to describe in their specification how they wanted their mosaic to look. |
| At level 3 a child would: | show understanding of the limitations of mosaics in their design specification. |
| At level 4 a child would: | prepare several detailed designs and explain their choice between them. |

Making

| | |
|---|---|
| At level 2 a child would: | explain their choice of frame. |
| At level 3 a child would: | cut clay tiles accurately. |
| At level 4 a child would: | record their step by step plan for making their mosaic, with materials, tools, processes all detailed, and would produce a well finished product. |



# 15 Grid showing how each session meets POS for all relevant subjects

| KS2 POS | D&T 1a | D&T 1b | D&T 2a | D&T 2c | D&T 3a | D&T 4b | D&T 4d | D&T 4f | D&T 5j | D&T 5k |
|---|---|---|---|---|---|---|---|---|---|---|
| **Session 1** | ✓ | | | | | | | | | |
| **Session 2** | | ✓ | ✓ | ✓ | | | | | | ✓ |
| **Session 3** | | ✓ | ✓ | ✓ | | ✓ | | | | ✓ |
| **Session 4** | | ✓ | ✓ | ✓ | | ✓ | | | ✓ | ✓ |
| **Session 5** | | ✓ | ✓ | ✓ | | | | | | ✓ |
| **Session 6** | ✓ | | ✓ | | | | ✓ | | ✓ | ✓ |
| **Session 7** | | | | | | | | ✓ | | ✓ |

| KS2 POS | Maths measures 1e | English Listening 1c, 2b | IT 1c | Science Materials 2b | History Romans 2a | Art 4a, d | Art 5b |
|---|---|---|---|---|---|---|---|
| **Session 1** | | | | | ✓ | ✓ | ✓ |
| **Session 2** | | | ✓ | | | ✓ | |
| **Session 3** | ✓ | | | ✓ | | | |
| **Session 4** | ✓ | | | | | | |
| **Session 5** | | | | | | | |
| **Session 6** | | | | | | | |
| **Session 7** | | | ✓ | | | | |
| **Additional time needed** | | ✓ | | | | | |