Activating Personal Capabilities in Science

smart science

Key Stage 2 incorporates AfL

smart science

Authors: Lynne Bianchi and Richard Barnett
Editor: Gareth Price
Project Manager: Merisa Thompson
Project Director: Ken Mannion

About this pack

This pack is for teachers working with children of 9-11 years of age. It introduces 'Smart Science' – a way of developing children's Personal Capabilities. It embeds the Personal Capabilities of teamwork, self management, creativity, problem solving and communication into science learning activities and reinforces work in thinking skills and personal, social and emotional development. The pack helps all teachers, teaching assistants, senior managers and parents or carers to improve children's self awareness and Personal Capabilities. It is not just for science teachers.

The pack is significant in the way that it helps schools to address key areas of the ***Every Child Matters, Assessment for Learning and Social, Emotional Aspects of Learning*** educational improvements in a single easy-to-use resource.

The developers would like to thank the Comino Foundation for sponsoring this resource. Further information is given about their work on page 9.

What are Personal Capabilities?

The *Smart Science* pack builds on *The Personal Capabilities in Science Programme*, born in 1999 at the Centre for Science Education, Sheffield Hallam University. This research showed that by pro-actively using Personal Capabilities children are increasingly scientifically capable and responsible learners.

There are 10 Personal Capabilities but this pack focuses on the development of the 'core' capabilities – the five Personal Capabilities considered to be the first steps towards children's better learning.

The Core Personal Capabilities:

Teamwork: working well in groups and teams

Creativity: thinking of, sharing and playing with new or unusual ideas

Communication: communicating opinions and feelings appropriately

Self Management: taking charge of your learning

Problem Solving: working towards a solution by analysing a problem and forming strategies

The Wider Personal Capabilities:

Tenacity: sticking at a task in order to meet deadlines

Positive Self Image: valuing yourself and your achievements

Self Motivation: motivating yourself to do what needs to be done

Critical Thinking: critically reviewing and evaluating what you do and how you do it

Social Intelligence: responding appropriately to people and situations

Why are Personal Capabilities so important?

An active classroom relies on positive interactions between children, teachers, teaching assistants, parents, carers and visitors. Very often the skills and capabilities that children use to demonstrate positive working relationships, active learning, self reflection and overall good behaviour remain implicit and taken for granted. The active infusion approach, in *Smart Science*, encourages children to think about and improve their learning and behaviour when explicitly developing the Personal Capabilities in a science context.

The benefits of this approach include:

- increased awareness of 'how' to learn and 'how' to behave
- increased responsibility for themselves, their learning and their improvement
- improved behaviour and co-operation with others
- increased self-awareness and self-monitoring
- viewing learning as something more exciting and relevant than fact-recollection
- improved engagement in learning
- improved dialogue and communication
- increased motivation to learn and take part
- active involvement in self and peer assessment for learning.

Many schools use *Smart Science* activities in assemblies to introduce the Personal Capabilities and demonstrate how particular capabilities influence learning. School reward strategies are also a great way to further encourage children's development. Viewing Personal Capabilities on a whole school basis promotes a positive ethos, where parents/carers and family members can also be involved in supporting their children's personal development.

Using science activities

Smart Science incorporates learning objectives from the Science National Curriculum. It focuses largely, but not exclusively, on Scientific Enquiry, developing both Ideas and Evidence and Investigative Skills. The activities enrich and broaden the scope of science learning for 9-11 year olds by using stimulating contexts. Children are challenged to think abstractly and apply their science knowledge and skills creatively in varied contexts.

Although *Smart Science* activities embed the Personal Capabilities in science, the skills and capabilities are generic and apply across the whole curriculum. For example, many of the generic tasks in *Smart Science* apply to much broader contexts and can be extended into other subject areas, as well as Circle Time, Religious Education and Personal and Social Health Education.

Special educational needs

As *Smart Science* focuses attention on the ***process*** of learning, all children can be rewarded for their willingness to engage, to collaborate and to think. Research has shown that by emphasising Personal Capability objectives all children, irrespective of academic achievement or level, can demonstrate success in learning and hence increase their self confidence.

The pack

The *Smart Science* pack provides:

4 *Smart Science* Poster Sets
to be used as display and reinforcement cards in the classroom

16 Activities
4 for Self Management
4 for Communication
4 for Teamwork
4 for Creativity and Problem Solving

All activities include:

- a **generic task** to teach children about a specific Personal Capability objective as a stand-alone activity – activities appropriate for any curriculum area, Circle Time, after school clubs, PSHE, RE etc.
- a **science embedded task** which is where a Personal Capability is developed and exemplified in science learning – activities to be used during science lessons, after school Science Clubs, transition events etc.
- ideas for **assessment for learning** through self, peer and teacher assessment.

'Alongside work on thinking skills and accelerated learning this project has formed one of our key targets. We are very keen to develop the independent learning skills of the children and we can see clear links between these and Personal Capabilities. A very practical example is the way we have extended our use of learning intentions in each lesson to include success criteria so that the children are able to evaluate their own work both in Science and in their Personal Capability development.'
Deputy Head teacher, Rotherham

'Children are more aware of the skills that they need to succeed when carrying out collaborative tasks using Personal Capabilities. During a recent lesson observation it was noted, by the head teacher, how well they worked together in a team.'
Science Coordinator, Birmingham

'This work has impacted on more children than any other initiative, across the whole range of ability, and it has inspired staff in way that I have never experienced before.'
Year 5 teacher, Manchester

'It has made the children more aware of the fact that success is not just achieved through test results – it is helping to raise their self-confidence.'
Year 6 teacher, Birmingham

smart grid
Assessment *for* Learning

Each activity incorporates opportunities to involve the children in self and peer assessment using a Smart Grid. These encourage children to use the 'Thumbs Up' approach to review their learning against the success criteria. It extends this idea by prompting them to give reasons or examples for their choice and to consider how this will influence their learning in the future.

See the Smart Grid on page 10 to learn more about how to use the Assessment *for* Learning Smart Grid.

Support cards

Many of the science embedded tasks include Support Cards, which are designed to help children with as wide a range of abilities and experiences as possible engage with the tasks. The cards are intended to help differentiation by 'unblocking' specific problems the children may encounter. The cards are a flexible resource which can be printed and distributed individually, distributed as sets or displayed to the whole class.

They can be used to provide:

- focused support for individuals
- focused support for teams
- a whole class resource to stimulate discussion and scientific thinking
- teaching assistants or other adults supporting the activity with information about the sorts of issues which might challenge children doing the task.

GRASP®: Getting Results and Solving Problems

This approach, described more fully on page 9, is specifically incorporated into the 'GRASP It!' and 'Ice Cream Heaven' tasks. The GRASP approach can, however, be useful in other areas of the *Smart Science* pack, in particular scientific investigation planning activities, such as 'Professor Bill', 'Pirate Ship Orca' and 'Sensory Science'.

Getting started

How often should I use the tasks?

The ideal is to tackle one generic and one embedded task at least every half term.

When in the year are the tasks appropriate?

The tasks can be tackled at any time. Linked generic and science embedded tasks are best undertaken within the same week.

All of the tasks are context based and many encourage the use of different science ideas and concepts. The main topic links are indicated in the table on page 6. Most are suitable for use in either Year 5 and 6; however teachers may choose to link them to a science topic they are covering.

How long will they take?

Generic tasks – minimum of 15-20 minutes.
Science Embedded tasks – minimum of 1 hour.
Together – a morning or afternoon session.

How should I use a generic task?

As an introductory activity to help the children to understand more about the Personal Capability objective.

How should I use a science embedded task?

- to contextualize and put to use the Personal Capability the children have been introduced to.
- to broaden and enrich science curriculum.
- to support the development of Scientific Enquiry skills.

Are the activities differentiated?

All the science embedded tasks incorporate Support Cards or suggestions for additional support. These will assist teachers in differentiating the tasks.

Smart Science breakdown

Personal Capability	Learning objective	Science Embedded Task	Generic Task	Task Type	Suggested year group
Self Management	to keep track of what I am doing	Bodywatch	When I went to…	Doing an investigation – human body	Year 5
	to clarify what needs to be done	Ice Cream Heaven	GRASP it!	Planning an investigation – properties of materials	Year 5
	to organise and plan how to go about a task	Roundhorn Reef	The Big Picture	Planning an investigation – ecosystems	Year 6
	to avoid giving up easily	Bacteria and Custard	Topple Towers	Talking and explaining scientifically – microorganisms	Year 6
Communication	to ask different types of questions	Quick on the Draw	Electric Headband Game	Talking and explaining scientifically – various contexts	Year 5
	to share ideas, opinions and feelings with others	Picture Power	Chatterbox	Presenting, explaining opinions scientifically – various contexts	Year 5
	to justify opinions	Smart Scientific Inventions	But Why?	Presenting, explaining opinions scientifically – materials and physical processes	Year 6
	to show ideas and information in different ways	Great Granny Green	Hear Say	Presenting, using different methods – various contexts	Year 6
Teamwork	to overcome challenges together	Pirate Ship Orca	Dragon Mystery	Planning an investigation – physical processes	Year 5
	to make sense of what the team has done	EcoConsultants	The Blind Men and the Elephant	Applying scientific knowledge – habitats	Year 5
	to co-operate with others	Crossword Compilers	Human Grid	Reinforcing scientific language	Year 6
	to help reach agreements with others	Safari Camp	Scrambled Stories	Exploring alternative scientific methods – electricity and energy sources	Year 6
Creativity & Problem Solving	to consider Why? How? and What if?	Hedgehog Crime Scene	If… Then…	Considering and interpreting evidence – various contexts	Year 5
	to use different senses to stimulate ideas	Sensory Science	Feely Snap	Reinforcing scientific vocabulary – human body	Year 5
	to take time to be imaginative and curious	Rescue Venice	Tall stories	Exploring and explaining ideas using scientific knowledge – various contexts	Year 6
	to make decisions after exploring alternatives	Professor Bill	Call my Bluff	Reinforcing investigation skills – various contexts	Year 6

A bit more info if you need it...

Helping your children become smarter scientists

1. Be explicit

Make Personal Capability objectives explicit in science lessons by including them in lesson objectives, classroom displays, reward systems and review. This is especially significant when engaging children in learning about 'how' they learn.

Top tips:

- Display *Smart Science* posters around the classroom or on the board.
- Have a 'Today's Personal Capability is…' or 'Today's *Smart Science* focus is…' sentence starter in a prominent place, so that you or the children can identify which specific capability they are going to use, e.g. 'to justify opinions'.
- Look out for examples of positive behaviours, stop momentarily and ask children to model or talk about how they are working towards the Personal Capability.
- Reward children with stickers, badges, merits or stars for having worked towards or shown the Personal Capability.
- Use simple self and peer assessment tactics to review learning and the Personal Capability, e.g. thumbs up, traffic lights or 'nominate someone who' (See page 10).

Valuing Personal Capabilities in science learning encourages children to appreciate 'how' their behaviour influences 'what' they learn. Teachers comment that children increasingly recognise the impact of Personal Capabilities on their learning and are more self-aware and knowledgeable about how to improve their own skills and capabilities.

'With the Personal Capability being continuously displayed in the classroom and references made to them throughout the day the pupils were able to identify for themselves the capabilities that they felt should be developed within a particular activity. Whilst planning the scheme of work, a conscious effort was made to include as many opportunities for team and group work, and therefore the encouragement of discussions and co-operation between pupils.'
KS2 Teacher

2. Support Self and Peer Assessment

All *Smart Science* activities incorporate opportunities for **Assessment *for* Learning**. They encourage teachers to use:

Self assessment... the opportunity for a child to think about themselves as learners.

and

Peer assessment... the opportunity for a child to help a friend or partner in thinking about themselves as learners.

Top tips:

- Involve the children in talking about their learning and help them to identify their next steps.
- Provide and encourage constructive feedback to help them improve.
- Dedicate time to the process.
- Encourage commitment to personal goals.
- Foster motivation by emphasising progress and achievement rather than failure.
- Discuss and share success criteria.
- Talk about learning and successful ways of working.
- Reward achievements judged valuable by the teacher, the class and the individual.

Links to educational initiatives and strategies

DfES publications have outlined how these skills and capabilities enhance learning by creating more co-operative, creative and inclusive environments. *Every Child Matters* (2003) set out the need to help every child achieve his/her potential. By 'Enjoying and Achieving' such strategies help children get the most out of life and develop the skills for adulthood. The Personal Capabilities are the skills that all children need to do well in learning and in life.

This resource enables schools, through the context of science, to address key aims of *Every Child Matters.*

By 'Enjoying and Achieving' children will:

- achieve stretching national educational standards at primary school
- achieve personal and social development.

By 'Making a Positive Contribution' children will:

- engage in positive behaviour, in and out of school
- develop positive relationships
- develop self confidence and successfully deal with significant life changes and challenges
- develop enterprising behaviour.

Significant links can be made between the Personal Capabilities and other English educational initiatives, e.g. Social, Emotional Aspects of Learning; Speaking and Listening; PSHE Science Enquiry Skills. Further links can be drawn with The Revised Curriculum for Northern Ireland which targets the development of Thinking Skills and Personal Capabilities; and the common requirements of the National Curriculum in Wales which includes Thinking Skills, PSE and Communication Skills.

Smart Science brings together these many initiatives in an easy to use, coherent and motivating way.

Personal Capabilities	Social, Emotional Aspects of Learning	Speaking and Listening	Personal Social Health Education and Citizenship	Science Enquiry	The Revised Northern Ireland Curriculum	Wales
Positive Self Image	Managing feelings, self awareness	Group work	1b, 5c, 5e		Self management	Determining self knowledge, skills and understanding
Teamwork	Social skills	Group work	2b, 5c, 5f	2m	Working with others	Personal and social education
Self Management	Evaluation, managing feelings	Group work	1b, 4a, 5a	1g	Self management	Determining success criteria, monitoring progress, evaluating success
Self Motivation	Motivation		1b, 4a, 5a		Self management	Personal and social education
Critical Thinking	Enquiry, reasoning, information processing	Speaking	1c, 2c, 5c, 5d	1b, 1i	Thinking, Problem Solving and Decision Making	Thinking logically and seeking patterns
Creativity	Creative thinking			1a, 2a, 2h	Being creative	Creative skills, taking risks
Tenacity	Motivation		1c, 3f	2g	Self management	Valuing errors and unexpected outcomes
Communication	Communication	Speaking, listening, group work, drama	1a, 2a, 2f, 5c, 5e	2h	Speaking and Listening	Communication skills
Problem Solving	Problem solving, enquiry, information processing	Speaking, Group work	5c, 5d	1a, 2a, 2c, 2j, 2k, 2l	Thinking, Problem Solving and Decision Making	Problem solving skills, determining the approach or method
Social Intelligence	Social skills, empathy	Group work	2c, 4a, 4c, 5f	2m	Working with others	Personal and social education

About the COMINO Foundation www.cominofoundation.org.uk

The Comino Foundation is an Educational Trust. Its work is currently based in England, though it has links with work in other parts of the United Kingdom. Its aim is to support the achievements of groups and individuals within a prosperous and responsible society.

Within contexts where social responsibility is actively being explored, the Foundation therefore seeks to promote the understanding of the process of achievement, so that through greater understanding of the nature of this process, people become:

- more focused on achievement
- more attuned to achieving successful outcomes
- more capable of achieving what they set out to achieve
- more fully equipped to realise their own potential and to serve others.

The Foundation seeks to realise its vision through a range of activities designed to:

- enable people to understand the process of achieving, within a framework of their personal and social responsibility
- support the development of people's potential to work for the benefit of themselves and others
- encourage groups and individuals to work at building a prosperous and responsible society.

These activities are carried out mainly through a network of Comino Centres including the Sheffield Comino Centre at Sheffield Hallam University.

About GRASP

The Comino Approach uses the acronym GRASP® (Getting Results and Solving Problems).

The key elements of the process are consciously to:

- identify purpose, focusing clearly on the desired result
- decide criteria for the successful achievement of that result
- generate alternative ways of achieving that result
- select the most promising course of action to satisfy the success criteria
- put the chosen plan into action
- monitor and control the process of reaching the desired outcome against the criteria
- continuously review the purpose, criteria and progress
- review the outcome.

When seeking to bring about an outcome, it is often helpful to continually ask ourselves the following questions:

Purpose

What do we want to achieve?

Criteria

How will we know if we have been successful?

Alternatives and Selection

What different ways might there be to do it?
Which one is best?

Monitor and Control

How will we keep track of what we're doing?

Review

Did we achieve what we wanted to?

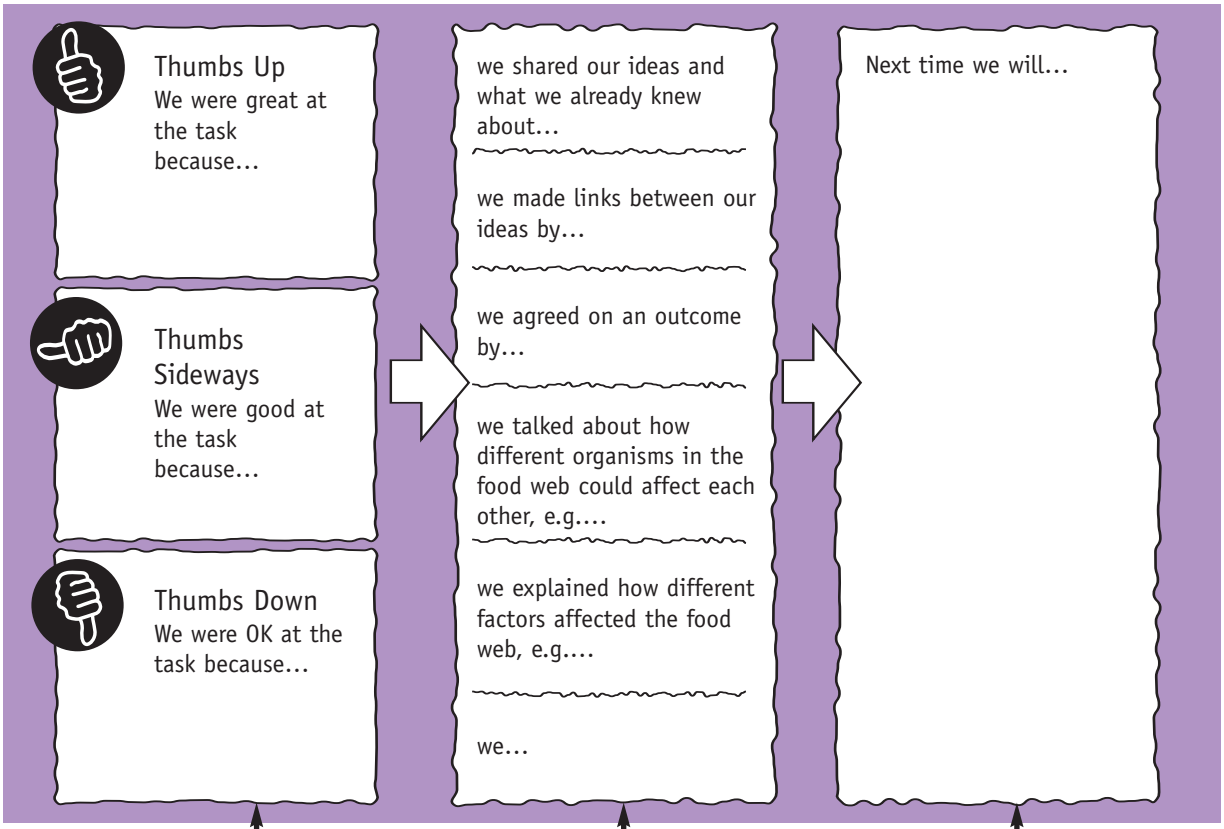
This approach encourages people to want to succeed and enables them to develop their self-esteem, enterprise and initiative, their ability to lead and to work with others, to be creative in their thinking and decision making, and to accept personal responsibility for their decisions and actions. It has been incorporated specifically into *Smart Science* Tasks 'GRASP it!', 'Sensory Science' and 'Ice Cream Heaven'.

smart grid
Assessment *for* Learning

Assessment *for* Learning: Smart Grid

The Smart Grid is an easy way to enhance Assessment *for* Learning and has been incorporated into each set of tasks.

- Each grid is built using the 'Thumbs Up, Thumbs Sideways, Thumbs Down' technique.
- The purpose of the grid is to give structure to self-assessment and encouragement to the children.
- The grid is designed to be used orally; however if teachers wish to collect written evidence the children can be asked to shade in and complete the boxes in Column 2 that they choose, and to fill in text in the space provided in Column 3. A blank grid is provided on the Smart Science website.
- The grid is written as a collaborative self-assessment tool, using 'we' statements. If they choose, teachers could adapt the grid for individual self-assessment by using 'I' statements. A grid of this type is also provided on the Smart Science website.



How to use the Smart Grid

Column 1:

Children should choose a symbol from this column to give an overall indication of how well they feel they approached the tasks in hand.

Column 2:

A selection of reasons are provided in this column which link directly back to the success criteria for the tasks. The children can select as many or as few reasons as they wish from this column to help to justify their choice from column 1. Space is provided for the children to add reasons to the list if they wish to.

Column 3:

It is important that the assessment leads to action, and therefore the children are encouraged to consider and, if appropriate, to record in Column 3 some of the key points they have learnt and how they will use them next time. Teachers should, where necessary, help the children identify ways in which they can improve their learning in future activities, focusing on step by step methods and short term targets.

Acknowledgements

Working with enthusiastic teachers is key to all the creative developments that the Centre for Science Education engages in. *Smart Science* is just the same.

We would like to thank all the teachers who have assisted with the research into Personal Capabilities and have helped to trial and modify activities for this pack.
We also recognise the children who are photographed in this resource.

It is important to also thank Professor Bill Harrison for his dedication and continued enthusiasm for the work into Personal Capability development.

On-line support, help and resources

You can access a range of key resources from the *Smart Science* pack on-line at **www.personalcapabilities.co.uk/smartscience** and also find further information, ideas and up-to-date links.

A range of *Smart Science* training courses and events, classroom display materials, games and projects are available from the Centre for Science Education, Sheffield Hallam University. http://extra.shu.ac.uk/cse

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References

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Smart Science

Activating Personal Capabilities in Science

www.personalcapabilities.co.uk/smartscience

The Centre for Science Education
Sheffield Hallam University,
Howard Street,
Sheffield, S1 1WB

http://extra.shu.ac.uk/cse

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smart grid
Assessment *for* Learning

Smart Grids are part of the Smart Science Series, available at the Centre for Science Education, Sheffield Hallam University.
For more information go to www.personalcapabilities.co.uk/smartscience

How to use the Smart Grid

Column 1:

Children should choose a symbol from this column to give an overall indication of how well they feel they approached the tasks in hand.

Column 2:

A selection of reasons are provided in this column which link directly back to the success criteria for the tasks. The children can select as many or as few reasons as they wish from this column to help to justify their choice from column 1. Space is provided for the children to add reasons to the list if they wish to.

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smart grid
Assessment *for* Learning

Thumbs Up
I was great at the task because...

Thumbs Sideways
I was good at the task because...

Thumbs Down
I was OK at the task because...

Next time I will...

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smart grid
Assessment *for* Learning

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

Next time we will...

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