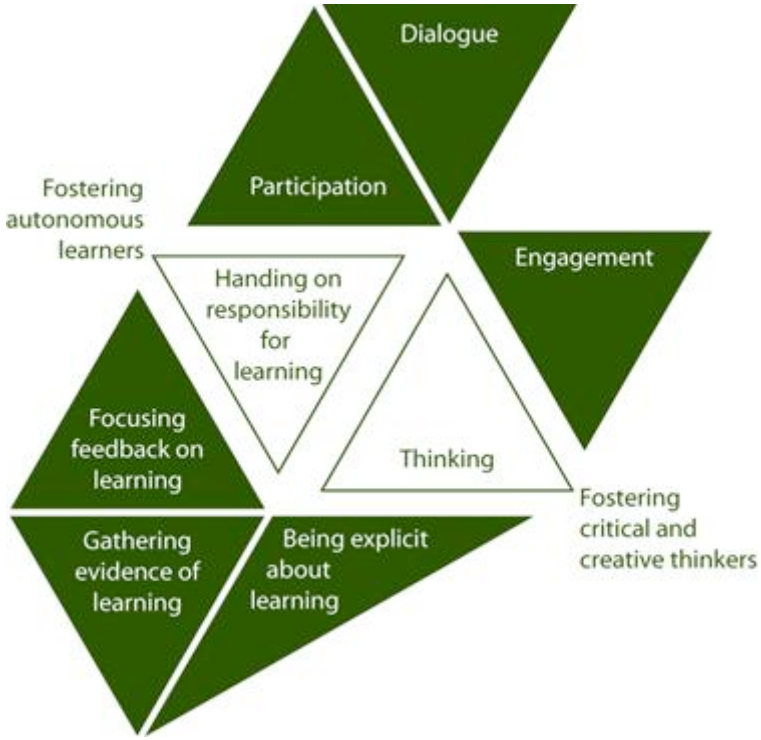
Fostering
Curriculum for Excellence Capacities
Thinking to learn: learning to think

*(The curriculum) needs to promote learning across a wide range of contexts and experiences. It should equip young people with high levels of literacy, numeracy and **thinking skills** and support development of their health and wellbeing.*

Curriculum for Excellence, Progress and Proposals p.9



Robert Fisher
in collaboration with Highland teachers

Reflective Professionals and Thinking Children

Fostering Curriculum for Excellence Capacities

Professor Robert Fisher
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This paper has been devised to provide a resource for exploring and developing the quality of thinking used in classroom interactions capable of achieving the aims of a Curriculum for Excellence.

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Introduction

The main purpose of teaching is to empower students to become self-directed learners capable of taking responsibility for their own learning. Teachers can stimulate and support this by enabling students to participate and become actively engaged in their own learning through dialogue. As *Curriculum for Excellence* says, '*success in achieving the purposes and principles of the curriculum is likely if pupils are helped to become actively involved in their own learning'*.

At the heart of Highland Council CPD Reflection Framework is the development of thinking and learning through the principles and practice of formative assessment. The Highland framework aims to guide and support the work undertaken by schools in planning new approaches to address the values, purposes and principles of *Curriculum for Excellence*. Teachers have welcomed AifL as one of the most powerful teaching tools in Scottish Education.

Formative assessment is a powerful and practical approach because it develops:

- self-direction and self-assessment,
- a deeper engagement in learning,
- thinking and learning skills

through dialogue and 'thinking together'.

Principles outlined in *CfE* (2004, p14) include pushing for 'depth' in thinking 'to develop their full capacity for different types of thinking and learning'. As they progress, it says, 'pupils should develop and apply increasing intellectual rigour, drawing different strands of learning together and exploring and achieving more advanced levels of understanding.'

The purpose of this paper - 'Thinking to Learn', is to show how, by applying the principles of formative assessment, we can extend our practice by pushing for depth in pupils thinking and enable them to become independent learners.

This paper was devised to provide a coherent framework for developing the attributes and capabilities leading to the four capacities of Curriculum for Excellence described in page 22 of Building the Curriculum 3.

1
Principles of Formative Assessment

'It's about being interested in what they think, not just whether they give the right answer'

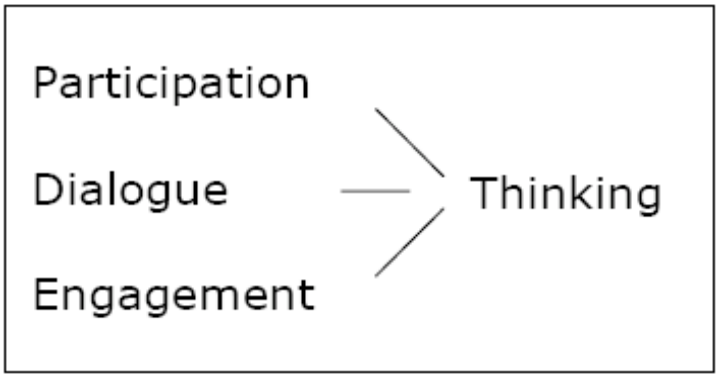
Teacher

Formative assessment is not a matter of 'recipes' and ready-made answers. It derives from principles that underpin good practice in teaching and learning and is developed through the research and practice of teachers in schools.

The principles that underpin the Highland model drawn from research and the experience of teachers include:

- Participation
- Dialogue
- Engagement
- Thinking

Participation, dialogue and engagement are necessary conditions of learning, but are not in themselves sufficient. Children may be working in groups, discussing what they do and be fully engaged in an activity but not learning much from it. Activity and interest is not sufficient for learning, you may be doing it and like doing it but still may not learn much from it. Learning requires activity of mind, in other words *thinking*. The relationship between these factors is shown below.



Participation

All successful learning requires interaction, involving the active participation of the learner. A passive approach to learning does not result in learning that lasts. Two key aspects of participation in learning are independent learning, that is the active response of individual learners, through for example self-directed reading, writing, questioning, problem solving etc. The second aspect is learning with others through collaborative and co-operative activities such as paired learning, group work, community of enquiry etc. These aspects link to affective capacities such as an student's emotional intelligence (Goleman 1995), and social intelligence (Goleman 2006).

The following shows how independent and co-operative learning of thinking link to some of the *Curriculum for Excellence* capacities

Elements of participation	*CfE* capacities
Independent learning	*manage themselves*
	pursue a healthy and active lifestyle
	live as independently as they can
Colaborative Learning	*relate* to others
	work in partnership and in teams
	take the initiative and lead

Dialogue

Learning depends not on mere 'conversations' with students, but through purposeful dialogue which leads to understanding of content and the processes of learning. Dialogic teaching can help to develop

cognitive and metacognitive awareness when the teacher asks questions that probe the child's assumptions about their learning. Dialogue can develop students' awareness of self, task and strategy and the capacity to be responsible for and manage their own learning. Dialogue is necessary to engage pupils in thinking and to push for depth in thinking, both to investigate pupils' learning as it occurs and to dispel misconceptions before they get in the way of future learning. See below for more on dialogue, questioning and alternatives to questions .

Engagement

Motivation is essential to fostering thinking. Firstly it is about relevance. Is the curriculum we offer relevant and engaging to the learner? Can they see the point? Does it interest and motivate? Does it meet their needs both now and in the future?

Secondly it is about responses to their efforts. Pupils are not best motivated by rewards such as grades, marks or merits. If they think learning is a competition of winners and losers many will see little point in trying. If the aim is to motivate everyone the type of feedback given is very important, especially as some are bound to achieve less than others.

Dweck's research (2000) shows that if feedback is in the form of marks pupils are likely to see it simply as a way of comparing themselves with others (ego-involvement), those given comments tend to see it as helping them to improve (task-involvement). Research shows the latter group tend to out-perform the former and that such a diet damages the self-esteem of low attainers. It also leads high-attainers to be reluctant to take risks as failure may damage the ego. Feedback should focus on what needs to be done to encourage all to believe that they can improve, so that they are motivated to engage their best efforts in the work.

Thinking

'We need to think better if we are going to become better people.'

Paul, aged 10

Thinking skills are essential because mastery of the 'basics' in education (literacy, communication and numeracy), however well taught, are not sufficient to teach children *how* to learn, or to be confident, responsible and effective citizens. The challenge is to enable all individuals, not just an elite, to become effective thinkers because these competencies are now required of everyone. Learners need to develop awareness of themselves as thinkers and learners, practise strategies for effective thinking and develop the habits of intelligent behaviour that are needed for lifelong learning. The general principles of 'teaching for learning' need to be translated into a set of practical teaching strategies. These strategies can then be applied to any lesson material and to assessment for learning discussions with children.

Thinking skills are not mysterious entities existing somewhere in the mind. Nor are they like mental muscles that have a physical presence in the brain. What the term refers to is the human capacity to think in conscious ways to achieve certain purposes at the cognitive and metacognitive level.

Processes at the cognitive level include imagining, reasoning, remembering, questioning, forming concepts, planning, solving problems, making decisions and judgements, and translating thoughts into words. A thinking skill is a practical ability to think in ways that are judged to be more or less effective or skilled. They are the habits of intelligent behaviour learned through practice, for example students become better at giving reasons or asking questions the more they practice doing so.

Pushing for depth

Thinking skills can be grouped under three categories: creative thinking, critical thinking and information processing. We develop learning power and important capacities of mind when we push for depth through these different kinds of thinking. The following shows how these ways of thinking link to key capacities identified in *Curriculum for Excellence*.

Thinking skills	CfE capacities (see Curriculum for Excellence (2004) p12
Creative thinking	think creatively and independently
	link learning to new situations
	communicate in different ways/settings
	create and develop
	solve problems
Critical thinking	make reasoned evaluations
	assess risk and take informed decisions
	make informed choices and decisions
	evaluate environmental, scientific and technological issues
	develop informed ethical views of complex issues
	apply critical thinking in new contexts
Information processing	develop knowledge and understanding
	understand different beliefs and cultures
	learn independently and as part of a group
	use technology for learning
	be self aware

Creative thinking

'Every problem can be solved again in a better way.'

Child, aged 10

Creative thinking is shown when children generate ideas, show imagination and originality, and can judge the value of what they have done. What promotes creativity is a questioning classroom, where teachers and pupils value diversity, ask unusual and challenging questions; make new connections; represent ideas in different ways – visually, physically and verbally; try fresh approaches and solutions to problems; and critically evaluate new ideas and actions.

Any lesson can develop creative thinking if it involves pupils generating and extending ideas, suggesting hypotheses, applying imagination and finding new or innovative outcomes. Try to include opportunities for creativity in the lessons you teach. Look for evidence of pupils':

Creative thinking	Questions to ask
Apply imagination	*What might be?*
Generate hypotheses, ideas and outcomes	*What is a possible (idea/way/solution)?*
Develop creative skills or techniques	*What methods could you use for?*
Assess own or others' creative work	*How well did you/they succeed in?*

Creativity cannot be left to chance, it must be valued, encouraged and expected - and seen as essential to all teaching and learning.

For ways to develop creative thinking skills see 'Tools for Thinking' (Tools 1-10)

Critical thinking

'There are reasons for everything, if only you can find them.'

Child, aged 11

Critical thinking helps young people develop insight into the problematical nature of learning, and the need to subject what they read, see and hear to critical enquiry. It is about challenging them to:

Critical thinking	Questions to ask
Make reasoned evaluations	*What reasons are there for?*
Make choices informed by evidence	*What kinds of evidence support?*
Ask critical questions	*What questions could be asked?*
To argue a case	*How would you justify thinking?*

To be an effective thinker and learner one needs both creative and critical thinking. The following are different ways these two kinds of thinking have been described:

Critical thinking	**Creative thinking**
analytic	generative
convergent	divergent
vertical	lateral
probability	possibility
judgement	suspended judgement
hypothesis testing	hypothesis forming
objective	subjective
answer	an answer
left brain	right brain
closed	open-ended
linear	associative
reasoning	speculating
logic	intuition
yes but	yes and

For ways to develop critical thinking skills see 'Tools for Thinking' (Tools 11-20)

Information processing

'You have to work on what you know to fully understand it.'

Child, aged 10

All thinking must be about something, some knowledge or information. Knowledge at a basic or literal level is about facts, in other words 'knowing that' something is the case. Information processing is also about 'know how', that is knowing what rules and strategies to use to find things out or solve problems. For knowledge to be shared and fully understood it must be expressed in words or concepts. Concepts are the words or organising ideas we use to communicate and understand what we think, know and believe. In every field of study there are key ideas or concepts that pupils may or may not fully understand. We need to challenge pupils to think about what they learn not only at the literal level, but also at strategic and conceptual levels of thinking.

Kinds of information processing	Questions to ask
The literal level – 'knowing that'	*What you know about?*
The strategic level – 'knowing how'	*What strategy do you use to?*
The conceptual level – organising ideas	*What does (the key idea) mean?*

Students should be encouraged to interpret information in their own words and to process it through critical and creative thinking. Critical thinking is concerned with the ability to perceive and understand relationships between existing beliefs, strategies or concepts. Creative thinking is concerned with the ability to make new connections between ideas and the generation of new ideas. Creative and critical thinking are ways we use to process information to improve understanding.

Information processing is taking place when young people engaged in:

- evaluating sources of knowledge
- knowing what rules and strategies to use
- understanding key ideas and concepts
- researching and creating new knowledge (see 'Students as researchers' below)

The brain can multi-task at a cognitive level, as any busy teacher knows, thinking about several tasks in mind at once. But research tells us that we do not have the cognitive capacity to think about a task and think about thinking (meta-think) at the same time. Meta-thinking needs our full attention and rightly so because it is through meta-thinking that we develop self awareness and self regulation.

'Thinking skills' are not isolated cognitive capacities but are inextricably connected to emotions and dispositions, including 'emotional' and 'social' intelligence', which is our ability to understand our own emotions and the emotions of others (Goleman 1995, 2006; Dweck 2005). Understanding of self and others is developed through metacognition, which is explored in more detail below.

For ways to develop information processing skills see 'Tools for Thinking' (Tools 21-30)

Task: Assessing Dialogue in the Classroom

Alexander (2006, p30) describes five types of classroom talk, which can be summarised as follows:

1. **rote** (teacher-class): drilling of facts and ideas through repetition.
2. **recitation** (teacher-class or teacher-group): asking questions for recall or to cue pupil answers
3. **instruction/exposition** (teacher-class, or teacher-group or teacher-individual): giving pupils information or explanations.
4. **discussion** (teacher-class, or teacher-group or pupil-pupil): sharing ideas and information and solving problems.
5. **dialogue** (teacher-class, teacher-group, teacher-pupil or pupil-pupil): building a common understanding through structured questions and purposeful discussion.

The first three of these types of talk may have value, but if pupils' are to take responsibility for their own learning they need to engage in formative discussion and dialogue with the teacher and with each other.

Think of a particular lesson, involving yourself or one of your colleagues, and

- decide on which of the above five best describes the classroom discourse
- reflect on the strengths and weaknesses of the teacher's talk, and consider how the dialogue might have been improved.

2
Extending Formative Assessment

'You learn a lot from helping others'

James, aged 12

The aim of formative assessment is to give young people greater responsibility for their own learning. This is achieved by being explicit about learning, gathering evidence of learning, focusing feedback on improvement and encouraging peer and self assessment.

- Feedback on learning
- Questioning
- From questioning to dialogue
- Peer and self assessment

2.1 Feedback on learning

'The trouble about getting something wrong is that you know if you don't do it differently you are only going to get it wrong again. That's the problem.'

Shaun, aged 12

A simple definition of formative assessment is that it is *interaction through feedback*. Assessment is formative if this interaction provides information that helps learners to assess themselves and to modify and improve their learning behaviour. Feedback from teachers is helpful if it does not just say what was right or wrong, but helps pupils understand why it was right or wrong. Improvement in learning is about change in learning behaviour. No change in behaviour usually means no improvement in outcomes.

Feedback from pupils on their learning can help teachers see where their teaching has been successful and where it needs to be modified to meet the learning needs of pupils. Teaching that is based on evidence is more likely to meet with success than teaching based on routines, tests or assumptions. 'Assessment becomes 'formative assessment' when the evidence is actually used to adapt the teaching work to meet learning needs.' (Black et al. 2002)

Assessment helps learning if feedback provides evidence for:

- teachers to modify the teaching activities
- pupils to modify their learning behaviour through assessing themselves and each other.

It is not formative assessment when teachers use a weekly test to produce a record of marks. That is summative assessment. Unless some learning action follows from the outcomes it is not *formative* assessment. The key feature of formative assessment is interaction through feedback. The interaction is through dialogue, that is talk about teaching and learning between pupil and teacher or between pupils.

Assessment by grades, without feedback, may ascribe some numerical value to how much one can assume has been learnt but it does not aid learning. Neither does coursework, unless it involves active feedback to improve pupils' work as part of the process.

The interaction in formative assessment is 'thinking together' through questioning and dialogue, leading to peer and self assessment. Through such interaction we can create the conditions for metacognitive discussion to take place which is crucial to the ultimate aim of pupils taking greater responsibility for their own learning and becoming independent, self-directed learners.

2.2 Questioning

'I don't just want to give an answer I want to talk about it.'

Child, aged 11

Learning depends on 'conversations', on the negotiation of personal meanings through dialogue with others, which leads to both understanding of content and the processes of learning. Dialogic teaching can challenge pupils' thinking and helps develop their awareness of their own learning. It begins with the teacher asking open questions that probe the child's assumptions about their learning. Such questioning can help them develop their awareness of self, task and strategy and models ways in which they can question their own learning.

Questioning can be used at any of three stages during a learning task:

- *before* the task
- *during* a task
- *after* the task is completed.

1. Before the task: planning stage

We can encourage thinking before doing – both at the cognitive (What we are we going to do?), and the metacognitive level (What do we need to think about?). Before a task we do this, for example, by discussing the learning objectives and making links to previous learning and previous ways of learning. Because metacognition is about what *the children themselves think* it is not enough to tell them what they have previously learnt and what the learning objectives are, we need to help them to think and express these in their own words. Questions that might help this process include:

- Have you learnt anything like this before?
- What do we need to think about/remember?
- What are we trying to learn today?

We begin by showing them what a plan or strategy for learning is, we model it for them by talking it through, they internalise the process and come to express it for themselves in their own words. It is through internalising the model that the teacher provides that metacognitive awareness of learning develops.

2. During the task: monitoring stage

We can stop and monitor our thinking during the task. This means not just talking about what we have done (though it might include this) but what we should be thinking about and how we should be learning. Because metacognition is about the 'me' in thinking, again we encourage children to reflect and say what they should be thinking about what they are doing.

This monitoring or self-regulation of learning can be prompted by metacognitive questions, at first shared and hopefully internalised at an individual level, such as:

At the shared level	At the individual level
'How are you doing?'	*'How am I doing?'*
'What must you remember?'	*'What must I remember?'*
'What is the process/strategy involved?'	*'What is the process/strategy?'*
'What do you find difficult?'	*'What do I find difficult?'*
'What do you need to think about and do?'	*'What do I need to think about/do?'*
'What will happen if you do this?'	*'What will happen if I do this?'*
'Does it work/make sense?'	*'Does it work/make sense?'*

3. After the task: review stage

At the end of a task can come the review, plenary or de-briefing stage. Review involves reflecting back on your own thinking and learning. Socratic questions – that is using questions to lead children's thinking from concrete examples towards organising ideas. Plenary discussion can help this process. Thinking about thinking at this stage depends on:

- tasks being worth serious thought
- thinking and reasoning being valued
- time being given for discussion and review

Leading a metacognitive discussion in a review or plenary session is a complex skill, characterised by open questions, lengthy pupil responses, reference to the 'big' concepts and connections to other subjects or strategies for learning.

Thinking time

Increasing 'wait time' to 3-5 seconds can result in significant changes, such as:pupils giving longer answers more pupils offering to answer pupils willing to ask more questions pupil's responses becoming more thoughtful and creative. Here are two aspects to thinking time - after the question and the answer:

- allowing pupils time to think of more thoughtful answers
- the teacher responding by thinking for a few seconds about the answer.

Allowing silence is a deliberate act by the teacher to encourage a more thoughtful response.

Some teachers provide their children with a learning log, journal or 'think book' to provide another space to show their thinking and help reflection through writing. During the review stage the focus is not on what we have done but what we have thought and learnt, what we found hard and how we responded, and what we need to learn next.

A number of questioning skills have been identified in research. These include:

- sequencing a set of questions - moving from literal to higher order
- pitching appropriately - putting the questions clearly
- distributing questions around the class - to the shy as well as the 'stars')
- prompting and probing - giving clues where necessary
- listening and responding in a positive way - inviting pupil questions
- challenging right as well as wrong answers
- using written questions effectively – key questions for further thinking

Formative interaction however involves more than having good questions. Questions should open up a dialogue, with pupils being given time to discuss their learning with the teacher and with one another, and invited to share their with others. Pupils need more than questions they need dialogue.

2.3 From Questioning to Dialogue: dialogic alternatives to questions

'It's good to talk about what you've done, what you got right and what you got wrong – which is sometimes a real mystery!'

Sarah, aged 11

There is a danger, even with skilful questioning of following a pre-set agenda, and not encouraging student initiative. In adopting a 'teacherly role' we can dominate the talk by asking too many questions and imposing our own meaning. Teachers who ask too many questions tend to discourage students from giving elaborate or thoughtful answers. Overusing a pattern of repetitive fixed questions - *who? what? where? when? why?* will face pupils who ask fewer questions themselves, give short responses, rarely discuss with peers, volunteer few ideas and show confusion. What then is to be done? One answer is to use alternatives to questions.

It is not only questions that encourage thinking and talking things through. There are alternative strategies to questions that can prove more effective in stimulating thoughtful discussion. The following shows some alternative strategies and examples

Different students need differing sorts of alternatives. Often the "puzzled listener" role will be effective, if it reflects genuine interest and attention to the learner's answer. Strategies to support thinking and talking include - '*pause, prompt and praise*'.

Pausing

Giving thinking time, and opportunities for re-thinking and re-stating an idea – '"Can you explain / Tell us again?' Sometimes a minimal encouragement will prompt further response- 'Hmmm', 'Umm', 'Uh huh', 'Yes?', 'OK', 'I see', 'And?' Non-verbal reinforcement includes eye contact facial signals e.g. smiles and body gestures

Prompting and probing

Giving verbal encouragement, for example by 'reflecting back' to check whether we have understood what the student has said. Examples of probing questions include; Why do you think that...? How do you know...? What do you mean by…? What if...? Is it possible that...?

Praising

Giving positive feedback. Being specific and personal with praise –'That's an interesting answer ..', "Thanks for that answer …" can foster general participation by supporting the hesitant, rewarding risk-takers and valuing contributions.

In dialogic talk more extended answers are sought and the teacher takes on a more challenging role on occasions, disagreeing or putting an opposing argument and not rewarding children simply for making a response.

CPD activity **Beyond questioning to dialogue**

After undertaking classroom observations of lessons, share your observations and the type of questions used.

In small groups discuss or list different ways of responding to children that do not involve the use of questions. Give an example for each of the alternatives to show how it might be used in practice. Share and discuss your lists. Compare them to those below and add any further examples. Create an agreed guide to 'Developing dialogue' that could be shared with staff and parents.

Alternatives to teacher questions

Using alternatives to routine questions can actively encourage thinking and dialogue. Ways to do this include:

Withhold judgement	Respond in a non-evaluative fashion. Ask others to respond
Invite pupils to elaborate	Say more about …
Cue alternative responses	There is no one right answer. What are the alternatives? Who's got a different point of view?
Challenge pupils to provide reasons	Give reasons why
Make a challenging statement	Supposing someone said
Contribute your own thoughts/experience	I think that/remember when
Use 'think-pair-share'	Allow thinking time, discuss with partner, then group
Allow 'rehearsal' of response	Try out the answer, in your head and to partner
Invite student questions	Anyone like to ask Pat a question about that?
Use 'think alouds'	Model rhetorical questions. 'I don't quite understand.'
Child to invite response	Ali, ask someone else what they think.
Don't ask for show of hands	Expect everyone to respond

Dialogue involves sharing ideas, summarizing the main points and then challenging them with further questions to extend their thinking. The task of promoting learning through dialogue is difficult, it is a

delicate balance between letting discussion wander at random, and dominating it so pupils do not feel free to say what they think. The crucial indicators of good dialogue are the ways:

- thinking is challenged by teachers
- pupils' responses show extended reasoned thinking

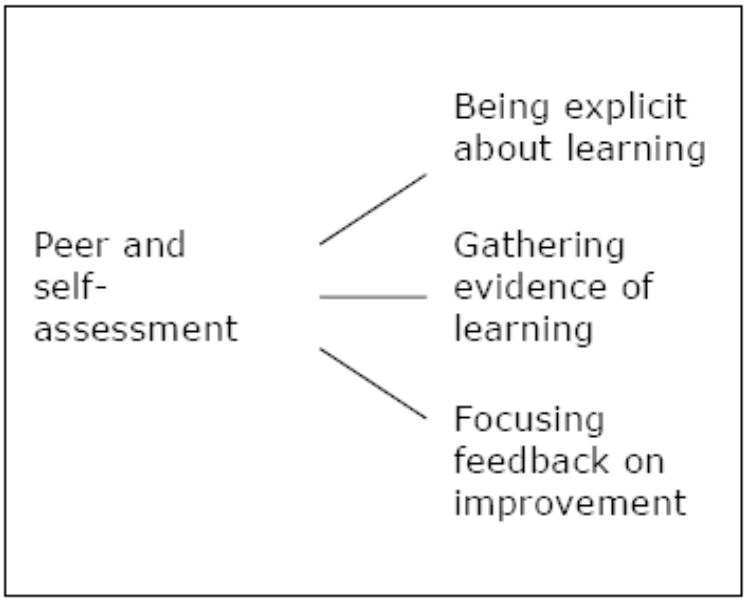
Pupils must be encouraged to express arguments in fully formed sentences using such words as 'think' and 'because', not merely give short one word or one phrase answers. For many pupils school may be the only place where they experience and develop habits of reasoned talk (Alexander (2006).

2.4 Peer and self assessment

What kind of learner are you?

Child's question to teacher

The aim is to develop peer and self-assessment so that young people can take greater responsibility for their own learning. This process is not simply about teaching pupils a new set of techniques to help them improve their critical and creative thinking. It is also about fostering among them a belief that, with more active involvement in their own learning, they can make real and sustainable progress.



Self-assessment is essential to learning if pupils are to understand for themselves whether they have reached a learning goal. In practice, peer-assessment can be an important aid to self-assessment because it puts pupils in the role as 'teachers' with the need to assess and explain to themselves and each other the strengths and weaknesses in a given piece of work. Peer work is particularly valuable because pupils learn by trying to teach, and by being assessed language they naturally use by their peers.

It is a real challenge to help pupils to assess their work in relation to learning targets. First they must understand what the target means, and have some idea of what it would be like to achieve it, in other words they must understand the criteria they must apply in judging any work. The task for teachers is to choose and specify targets with their pupils and then agree success criteria, which pupil can' understand, so they can visualise what achieving specific targets looks like. What teachers need to do is to ensure these targets present a realistic challenge. Understanding criteria is often the hardest part - it can be helped if pupils practice ranking pieces of work of varying quality and then are asked to justify their judgments.

Peer- and self-assessment, personal learning planning, small-group and team-learningand the whole range of strategies for co-operative learning are important if the goal is pupil understanding. Teachers

can facilitate, promote and encourage understanding, but they cannot do it for the learners. Engage pupils in discussion about their own learning behaviour, during lessons/sessions and in plenaries.

Questions that encourage children to reflect on themselves as learners include, for example:

Question	**Self awareness**
What have you learnt?	reflection on learning
What have you achieved?	reflection on achievement
What do you feel good about/proud of?	identify reasons to feel positive
What do you like doing/learning?	think about preferences
What do you do well?	be aware of strengths
What do you find hard	be aware of difficulties/problems
What don't you know/understand?	identify any obstacles to learning
What do you want to do/improve/learn?	plan and set targets for the future
What do you need to do to achieve that?	own responsibility for learning
What help do you need?	Reflection on help that is required/available
What ways helped you learn this?	Reflection on different ways of learning
What ways did you learn best/prefer?	Reflection on most effective learning style
What do I think of myself as a learner?	Self assessment as learner

Curriculum for Excellence describes outcomes and experiences from the perspective of the learner. Much of what is to be learned is expressed as 'I have….' for experiences, and 'I can….' for outcomes. If young people can chart their own progress against this sort of description, they will become more confident about their own learning and abilities.

Record achievements in learning

Ask children to complete a record of achievement in learning, to help them have a clear and positive view of themselves as a learner and to identify key points in their progress. Such a record could be used for any area of the curriculum/area of learning.

Record of achievement in learning

1. My target or goal

2. How I know I have achieved it

3. What I have done well

4. What I have worked hard on to improve

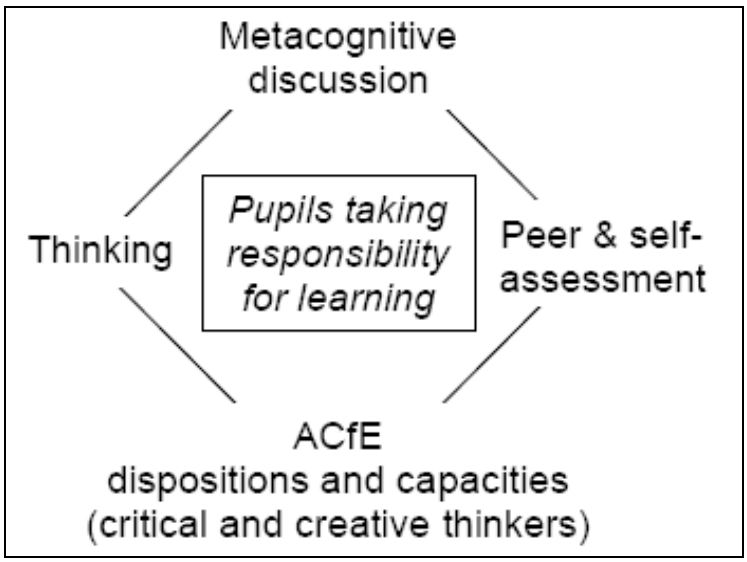
5. Who or what has helped me

6. What I am pleased about

7. My next target or goal

Signed…….. Date …….

Embedding formative assessment is about pupils taking responsibility for and becoming fully engaged with their own learning. It is not about teachers using certain given teaching strategies like 'no hands up'. A Curriculum for Excellence argues that it is a pupils' level of engagement in learning and self assessment that makes for a successful curriculum. Only if pupils develop a real belief in their capacity to learn will they become life-long learners.



Building independent, self-motivated learners often requires both pupils and teachers to change well established classroom habits and practices, including the distribution of learning power.

In seeking to provide the stimulus and support for meaningful change in how teachers and pupils interact in the classroom, the framework has drawn together a number of well-established strands including thinking, peer and self-assessment and
metacognitive discussion to provide a practical framework within

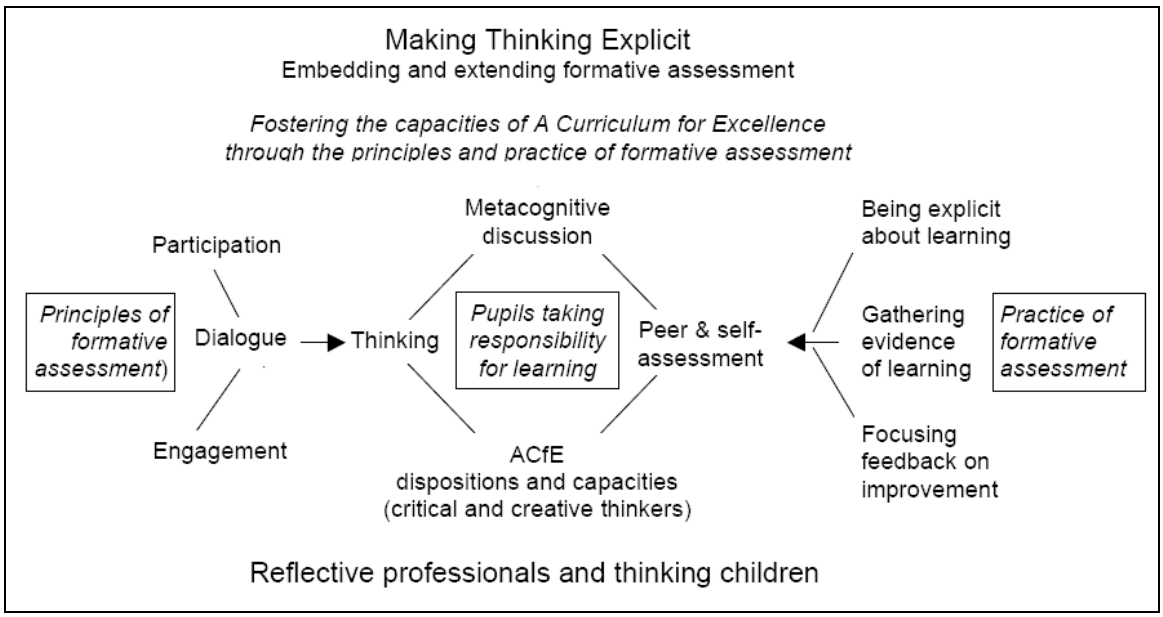
Peer- and self-assessment, personal learning planning, small-group and team-learning and other strategies for co-operative learning are essential if the goal is pupil understanding. Teachers can facilitate, promote and encourage understanding, but they cannot do it for the learners. Teaching for understanding means engaging pupils in discussion about their own learning behaviour before a lesson, during lessons/sessions and in plenary reviews.

3
Creating independent learners

'I like to think I could do it by myself, without the teacher being there.'

Clive, aged 10

If we want pupils to take responsibility for their own learning we need to engage them in thinking for themselves, both critically and creatively, to develop and use organising ideas and concepts related to their learning and to develop self awareness as learners through metacognitive discussion (see 'Making Thinking Explicit' below)



Metacognitive discussion (see also Thinking Tools 27-29)

Tradition says that over the entrance to the Delphic Oracle in ancient Greece were carved the words 'Know Thyself'. A modern version of this would be: 'learn about yourself'. This could also be the slogan for formative assessment, in other words helping students to know themselves as learners and to be aware of their own learning success and needs.

Self-awareness in learning refers to the capacity we have to understand our own learning thoughts and emotions, what pupils think and feel and why they do things. It is a key component of human intelligence as it can influence all aspects of behaviour including the development of thinking and learning. Self-awareness enables us to reflect on ourselves and on our interaction with others and become more 'in tune' with ourselves and with others. Self-awareness enables us to be more authentic in our dealings with other people, and to make better choices and decisions for ourselves, because they are based on more complete self-knowledge.

Self-awareness is the most personal form of knowledge and understanding. It enables us to 'know ourselves' as thinkers and learners. It is something that develops slowly from a young age and which can keep developing throughout life. Self awareness is developed through metacognition – young people being encouraged to think about their own thinking, feeling and learning, for example by finding answers to questions such as: *What do I think about myself? What do I know about myself? What do I feel about myself? What makes me different from other people? Am I a good learner? What would help me become a good learner?*

Metacognition is a form of cognition at a second or higher level. It refers to a uniquely human capacity - to be self-reflexive, that is thinking about one's own thinking and coming to know and understand one's mental states. Such metacognitive knowledge is a key factor in the success of learning - in knowing how best to plan, predict and remember.

The term *metacognition* was introduced by Flavell to refer to 'the individual's own awareness and consideration of his or her cognitive processes and strategies' (Flavell 1979). Flavell argued that if we can bring the process of learning to a conscious level, we can help children to be more aware of their own thought processes and thus enable them to gain control or mastery over the organisation of their learning (Flavel et al 1995). Vygotsky (1962) argued that such *conscious reflective control* was an essential factor in human learning. Effective learning involves gaining knowledge but also reflection on and conscious control over that knowledge.

Cognitive and metacognitive aspects of learning differ. Metacognition is about self-knowledge and self-regulation not the cognitive processing of subject knowledge. It is about becoming consciously aware of how one thinks, learns and knows. Its focus is not just on *what* we think and know but *how*. It can be said to put the 'me' into cognition.

Much of the cognitive activity in learning is about doing, remembering and responding to others. Metacognition is about *me* thinking about my thinking and how *I* learn. This can involve thinking about:

- what one knows and how (meta knowledge)
- what one is doing and how, including tasks, goals and strategies (meta skill)
- what one is thinking and feeling (meta experience)

Metacognitive thoughts do not spring from a child's immediate external reality but are about their mental representations of reality - which is why it is often defined as 'thinking about thinking'.

Metacognition involves being aware of what one knows, what one has learnt, what one can and cannot do and ways to improve one's learning or achievement. Developing metacognition involves making learners aware of themselves as thinkers and learners, developing knowledge of oneself and, by not relying on others to define who we are and what we can do, so as to take greater responsibility for our learning and our lives.

Foster student questions (see also Thinking Tool 11)
One way to facilitate this is to discuss with pupils the sorts of questions they can ask themselves, for example:
Questions assessing awareness of learning:
What have you learnt?
What did you find hard?
What do you need to learn/do next?).
Questions prompting thinking about thinking
What kinds of thinking have you been doing?
Has your thinking changed?
Did anyone say/do something that influenced/changed your thinking?

Questions probing attitudes and feelings:
What do you like doing/learning?
What do you feel good/not good about?
What do you feel proud of?

Questions setting targets:
What do you need to do better?
What would help you?
What are your targets? .

Research shows that children who are trained in metacognitive self-checking routines improve their learning skills and become more successful learners. One way to develop this is to model the process yourself, with such prompts as 'What do we need to think about ..?', 'What are we learning ...?', 'What strategy could we use ...?' Such self-checking builds autonomy by helping children become more self aware, self-managing and self evaluative.

Students as researchers (see also Thinking Tool 30)

'If you know how to find out, you can find the answer to everything'

Child, aged 10

One of the principles underpinning *Curriculum for Excellence* is depth. A common complaint about the current curriculum is that 'coverage' is all and that pupils are expected to take in too much content. The pressure of exams and testing, real or imagined, encourages a surface approach to learning and often sees pupil understanding as a luxury. *Curriculum for Excellence* has signalled that 'de-cluttering' of the curriculum needs to take place if teachers are to focus on pupil understanding and if pupils are to be given time and opportunities to perform their understanding as their learning progresses. One of the best ways to do this is to train young people in the skills of research.

Involving students in research topics, 'rich tasks' and challenging contexts are important ways of engaging learners in practicing the skills of research. This may involve teachers in looking differently at the content of the learning, working in teams with colleagues from across subjects and across sectors and presenting challenges to pupils which are engaging, extending the scope of their research and embedding their understanding of key concepts and process

When working on a theme, perhaps across several curriculum areas, divide the children into five or six 'research teams', and have each team find out about one aspect of the theme. After they have been practising their research skills for a while, reorganise the class into 'jigsaw groups' which contain one delegate from each of the research teams. Get the children to explain to their 'new colleagues' what their research team has been doing, and what they have found out. Each jigsaw group should then consider the project as a whole, and be ready to contribute to a whole-class discussion about overall progress, and what needs to happen next.

Vygotsky's notion of learning as a social process where learners construct and re-construct meaning through dialogue, questioning, collaborative working, teamwork, debate and argument is a powerful one. For the teacher it means not only setting up opportunities for such activities to take place but also enabling the learners to acquire the skills to participate fully and actively in such dialogue. Approaches such as *Dialogic Teaching, Co-operative Learning* and *Critical Skills* are all based on the principles of collaborative research.

Personal learning planning may involve students identifying a specific research strategy to employ. At other times it will mean identifying a range of processes needed to tackle a specific research task. Students should be encouraged to plan their research tasks in a step-by-step approach breaking down complex tasks into manageable stages. The planning process can be summed up in the following series of steps:

1. defining the problem - what do we want to achieve?
2. gathering information - what do we need to know to tackle the problem?
3. forming a strategy - how can we tackle the problem?
4. implementing the strategy - how are we tackling the problem?
5. monitoring outcomes - have we achieved our aim?

A research plan does not need to be a set order of steps, often plans need to be flexible to allow for the use of a range of possible strategies that may help in achieving our objective. As we move to a solution we may need to try out new ideas, to take account of new obstacles and opportunities. Planning in its simplest form means we have thought about what we are going to do. In teaching children how to plan their research we are teaching them to be thoughtful about what they are doing and to be independent in their learning. Planning can take place at different stages during a learning task: before, during or after the task is completed.

The following are some possible personal learning activities for children to plan:

- *daily plan* - record / discuss their planned learning for the day
- *weekly plan* - record / discuss the planned learning objectives for the week

- *long-term* plan_- record / discuss the major learning objectives of the term or year
- research plan_- record a study plan for a project
- *life plan* - record and discuss their possible future life plans.

Make time at the beginning or end of a project for students to bring up questions they would like to pursue. The Community of Enquiry strategy is an excellent means for encouraging students to take control of the agenda for enquiry (Fisher 2003). What would they like to find out about? Create time slots for a child to nominate their favourite question for the rest of the class to discuss. Make a 'Wonder Wall' – of all the things they are wondering about. Ask children to research answers for homework. Discuss current research in the news and the elements the stages of research.

The following are some of the stages of research to consider in doing a research project (see also Tools for Thinking 21-25):

- *Design a research plan* to show stages and possible timetable for your research
- *Identify the key question(s)* that your research will try to answer
- *Decide on research methods* for collecting information (data) eg reading, Internet, observation, interview, recording
- *Systematically collect data* about your research topic
- *Analyse, summarise and present* your data
- *Critically discuss* your conclusions/ answers to research question
- *What further research* is needed?

Finally, consider how could you make part of your teaching a joint research project with your students.

The reflective professional: teachers as researchers

'If I expect my pupils to do their own research, then I should do my own research too. That is what being a lifelong learner is all about.'

Teacher

The Framework is predicated on fostering thinking children through encouraging teachers to become reflective professionals.

It is about enabling teachers to research their own practice in designing and evaluating lessons that make optimum use of AiFL methods to ensure that we are effective in teaching for thinking to as many learners as possible for as much of the time as possible.

Thinking is not best taught through `recipe' lessons (although there are good examples of these that can be used) but through teachers applying the strategies or tools for thinking to their own lesson plans and discussions with students and evaluating their success. A discussion with pupils about learning is a form of research in which evidence is collected, then interpreted and analysed so as to add to knowledge.

For examples of discussion plans relating to researching student views in English, maths, science and history see Appendix 1-4.

All teaching activity can be the focus for research, as can AiFL activities in any school or network of schools. Finding out what other teachers think is also a useful area for research. For example find out what they think are the priorities for improving learning:

A CPD research activity

Aim:	Researching current goals for improving learning
Materials	Sets of blank cards or sticky notes; poster paper/flipchart/ or computer/projector and white board
Organisation:	Organise people into pairs.

Each individual in the pair should make a list of current goals for improving the conditions for learning in the school/their class. Generate about a dozen. Write a brief description of each on a card /sticky note. Now rank them in different ways.

- Place them in order of importance. How much do you value attaining each one?
- Next order them according to their time-scale. Which ones are the very long-term projects that may never be completed? Which ones have a definite end-point?
- Next order them in terms of the ones that you are making progress with (whatever the time-scale), as opposed to the ones that are less developed.

Share these reflections with a partner.

Identify one goal each that you seem to be having trouble with. Discuss with your partner the barriers to achieving this goal and possible ways to encourage children to learn how to be more self-motivated and self-organising?

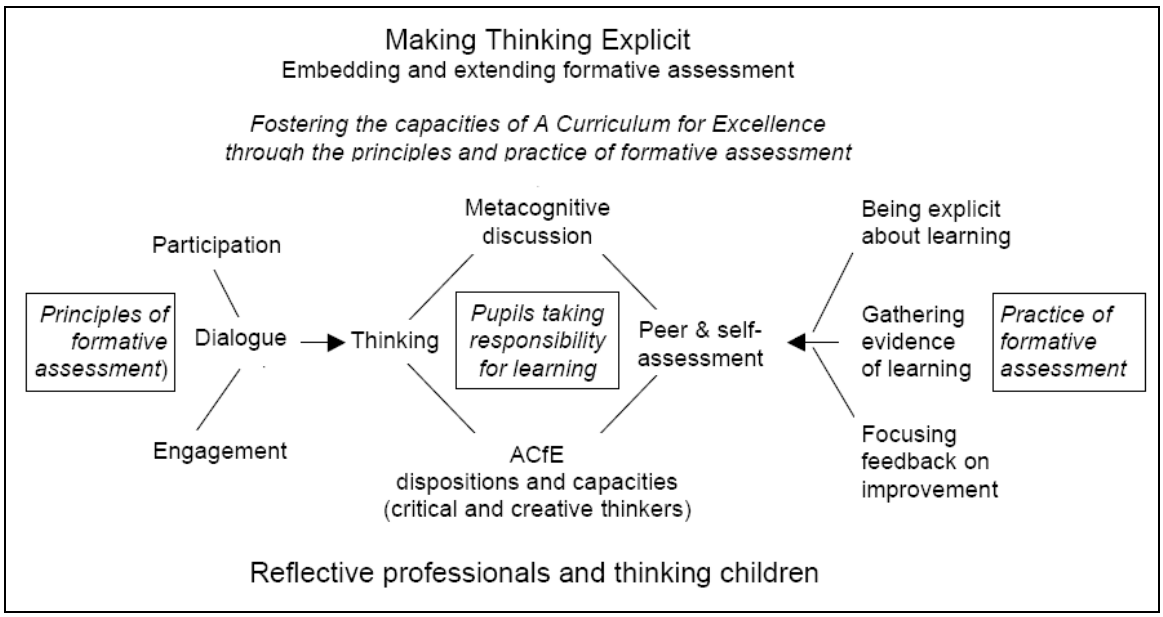
Other possible research activities include:

1. Asking children in your class what good learners do. Share these insights in a staff meeting.
2. Choosing one, two or three sections in 'Tools for Thinking' eg on target setting and success criteria. Apply these to your teaching. Collect evidence and reflect on the implications, if any, of these for future teaching and learning.
3. As a whole staff, examine the 'Tools for Thinking' and discuss how you might integrate some of these approaches into your curriculum.

In recognising that stimulating and sustaining purposeful thinking in the classroom is essential if the capacities identified as desirable in A Curriculum for Excellence are to be developed, the Highland Council Reflection Framework sets a context in which schools can explore the practical implications of seeking to develop broad dispositions and capacities through specific, subject related and inter-disciplinary learning opportunities. In doing so, they will be engaging in an approach that makes thinking explicit by supporting professional reflection designed to stimulate and sustain thinking children.

Summary

Formative assessment is teaching for thinking. There are many ways in which 'doing assessment for learning' but all depend on the participation, dialogue and engagement of the learner that aims to foster deep levels of learning through creative, critical and conceptual thinking and higher levels of thinking through metacognitive discussion leading to self awareness and self-directed learning. These principles are at the heart of the Highland model for Assessment is for Learning and of Curriculum for Excellence. They provide an ideal framework for continuing teacher research in school. Further development of the principles and practice will come through the continuing research of teachers and other reflective professionals in school.



The key messages of this paper reflect the following principles of effective teaching:

1. Make thinking explicit
2. Engage learners in dialogue about learning
3. Develop self awareness through metacognitive discussion
4 Involve learners in peer and self assessment
5 Engage learners in their own research

The Highland model shows how every lesson can be a lesson in assessment for thinking and learning. It supports the CfE aim of helping teachers take greater responsibility for their teaching and students greater responsibility for their own learning. It is a call to us all to be researchers into our own practice.

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APPENDICES

1. Auditing thinking about learning

The following are questions to aid reflection and discussion about the principles and practice of 'thinking to learn', which is the way we apply the principles and practices of formative assessment to develop successful and independent teachers and learners.

- How do we push for 'depth' in thinking 'to develop their full capacity for different types of thinking and learning'?
- How do we support independent learning (eg through for example self-directed reading, writing, questioning, problem solving etc)?
- How do we support co-operative learning (eg through activities such as paired learning, group work, community of enquiry etc)?
- In what ways do we use dialogue to support formative assessment?
- In what ways do we encourage critical and creative thinking?
- How do we develop pupils conceptual understanding of subject matter?
- What opportunities do we give for pupils' to pursue independent research?
- What is our policy and practice on giving feedback on learning?
- In what ways do we use questioning?
- What strategies do we use to develop dialogue between teacher and pupils and between pupils?
- What opportunities do we give for peer assessment?
- What opportunities do we give self assessment?
- How do we record achievements in learning?
- How do we help pupils become independent learners?
- How do we create communities of enquiry in our classrooms?
- What evidence is there that we are training our students in research skills?
- How might we pursue our own professional research into teaching and learning?

Note: *Tools for Thinking* offer more strategies to help develop thinking students and thinking classrooms.

English discussion plan

Some questions to help research what pupils think about talk and dialogue.

Discuss with a group of children the relationship between talking and thinking.
The following are examples of questions that can form the basis of a discussion plan.

1. When you talk do you always think first what you are going to say?
2. Can you talk to someone without thinking?
3. Do you ever talk without thinking?
4. Which comes first thinking or talking?
5. Is thinking just talking to yourself?
6. Can you think without words?
7. Can you talk without words?
8. Which can you do more quickly talking or thinking? Why?
9. Do you ever talk to yourself? Why?
10. Does talking with others help you think and learn? Sometimes? Always? Never? Why?

Mathematics discussion plan

Some questions to encourage reflection about the nature of mathematics:

- What is mathematics?
- Is mathematics useful? What does 'useful' mean? How is maths useful?
- Who uses mathematics? What is a mathematician? Are you a mathematician?
- What do you do to become good at maths?

- Can everyone succeed in maths? What does 'succeed' mean? Is success in maths the same for everyone?
- What makes maths a challenge (hard)? What is a 'challenge'? Is a challenge in maths the same as other challenges, such as in sports?
- Is maths invented or discovered? What does 'invent'/'discover' mean? What have you invented or discovered in maths?
- Does maths have a purpose? Does all maths have a purpose? What is the purpose (or usefulness)of what you have been doing in maths?
- How important is maths compared to other subjects?
- What questions do you have about maths?

Science discussion plan

Some questions to encourage assessment of pupils' thinking about science

- What is science?
- What is a scientific method of finding out? Can you give an example?
- What is a scientific hypothesis? Can you give an example?
- What is a fair experiment? Can you give an example?
- What is a scientific reason? What kind of reasons have you used?
- What is scientific knowledge?
- Do you/we know this or believe it? How do you/we know?
- What does this help us to explain or understand? What is there left to explain or understand?
- Is this knowledge/experiment etc. useful? How might this help us, or other people?
- Is there anything that is still strange, interesting or puzzling about this?

History discussion plan

Some questions to aid discussion about the concept of history

- What is history? Who says what history is? Do you have a history?
- What does/should a historian do? Are you, in any way, a historian?
- Is everything that happened part of history? What are the most important things to find out in history?
- Will you find everything that happened in history in history books? Why/ why not?
- Who decides what goes into history books? How do they decide what to put in and what to leave out?
- Is everything you read in history books true? Why? How do you know? Could history books be wrong? If so, in what ways? How could you find out if a history book was wrong?
- Do people have different points of view about what happened in history? Why is this? Can you give an example?
- Are there some things in history that we will never know? Why, or why not?
- Is the study of history useful/interesting/important? Why, or why not?
- When does history begin and end?

Note: These discussion plans have been adapted from Fisher (2003). For more plans from other curriulum areas see Fisher R. (2003) (2nd ed) *Teaching Thinking*, London: Continuum, Chapter 7

2 Curriculum for Excellence the purposes of the curriculum

To enable all young people to become:

SUCCESSFUL LEARNERS, with

- enthusiasm and motivation for learning
- determination to reach high standards of achievement
- openness to new thinking and ideas

and able to

- use literacy, communication and numeracy skills
- use technology for learning
- think creatively and independently
- learn independently and as part of a group
- make reasoned evaluations
- link and apply different kinds of learning in new situations

CONFIDENT INDIVIDUALS, with

- self respect
- a sense of physical, mental and emotional wellbeing
- secure values and beliefs
- ambition

and able to

- relate to others and manage themselves
- pursue a healthy and active lifestyle
- be self aware
- develop and communicate their own beliefs and view of the world
- live as independently as they can
- assess risk and take informed decisions
- achieve success in different areas of activity

RESPONSIBLE CITIZENS, with

- respect for others
- commitment to participate responsibility in political, economic, social and cultural life

and able to

- develop knowledge and understanding of the world and Scotland's place in it
- understand different beliefs and cultures
- make informed choices and decisions
- evaluate environmental, scientific and technological issues
- develop informed, ethical views of complex issues

EFFECTIVE CONTRIBUTORS, with

- an enterprising attitude
- resilience
- self-reliance

and able to

- communicate in different ways and in different settings
- work in partnership and in teams
- take the initiative and lead
- apply critical thinking in new contexts
- create and develop
- solve problems

3 Curriculum for Excellence principles of curriculum design

Challenges and enjoyment

Young people should find their learning challenging, engaging and motivating. The curriculum should encourage high aspirations and ambitions for all. At all stages, learners of all aptitudes and abilities should experience an appropriate level of challenge, to enable each individual to achieve his or her potential. They should be active in their learning and have opportunities to develop and demonstrate their creativity. There should be support to enable young people to sustain their effort.

Breadth

All young people should have opportunities for a broad, suitably-weighted range of experiences. The curriculum should be organised so that they will learn and develop through a variety of contexts within both the classroom and other aspects of school life.

Progression

Young people should experience continuous progression in their learning from 3 to 18 within a single curriculum framework. Each stage should build upon earlier knowledge and achievements. Young people should be able to progress at a rate which meets their needs and aptitudes, and keep options open so that routes are not closed off too early.

Depth

There should be opportunities for young people to develop their full capacity for different types of thinking and learning. As they progress, they should develop and apply increasing intellectual rigour, drawing different strands of learning together and exploring and achieving more advanced levels of understanding.

Depth is about how pupils can develop a capacity for thinking and learning that will allow them to grow in their understanding of the things that matter to them.

Personalisation and choice

The curriculum should respond to individual needs and support particular aptitudes and talents. It should give each young person increasing opportunities for exercising responsible personal choice as they move through their school career. Once they have achieved suitable levels of attainment across a wide range of areas of learning the choice should become as open as possible. There should be safeguards to ensure that choices are soundly based and lead to successful outcomes.

Coherence

Taken as a whole, children's learning activities should combine to form a coherent experience. There should be clear links between the different aspects of young people's learning, including opportunities for extended activities which draw different strands of learning together.

Coherence is about the extent to which teachers can ensure and learners understand that individual learning experiences combine to form a meaningful whole.

Relevance

Young people should understand the purposes of their activities. They should see the value of what they are learning and its relevance to their lives, present and future.

4 Curriculum for Excellence contexts for learning

THE ETHOS AND LIFE OF THE SCHOOL AS A COMMUNITY

Teachers know that positive relationships and the climate for learning in a school – its values, its ethos and its life as a community – are essential starting points for successful learning.

The wider life of the school – activities such as assemblies, community events and school projects – makes an important contribution to the development of the four capacities, helping to enable all young people to become successful learners, confident individuals, responsible citizens and effective contributors. Schools also offer pupils opportunities to learn through such activities as peer mentoring, membership of school councils, undertaking responsibilities and playing a part in decision making.

CURRICULUM AREAS AND SUBJECTS

Curriculum areas and subjects provide familiar and important vehicles for learning. We recognise their key role within the curriculum. With that in mind, curriculum areas and subjects will be refreshed and re-focused as part of the review process to take full account of the contributions they can make to developing the four capacities and preparing learners for the challenges of the future.

INTERDISCIPLINARY PROJECTS AND STUDIES

The curriculum needs to include space for learning beyond subject boundaries, so that learners can make connections between different areas of learning. Through interdisciplinary activities of this kind, young people can develop their organisational skills, creativity, teamwork and the ability to apply their learning in new and challenging contexts. To be successful, these activities need to be well planned with a clear purpose and outcomes in mind.

OPPORTUNITIES FOR WIDER ACHIEVEMENT

Opportunities for personal achievement, planned through the school, often enrich the life experience of learners. Taking part in activities such as performances, community or enterprise activities and trips plays an important part in widening a young person's horizons and developing confidence. Schools can also respond to the personal interests and aptitudes of learners through clubs, community, charitable and fund-raising activities. Many of these activities are voluntary for learners and have traditionally been organised as 'extra-curricular' opportunities. However, they play a major part in creating opportunities for individual growth, progress and achievement and we need to consider how they can be made available for all learners.