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# Information literacy and study skills

An overview of research for LT Scotland

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# Contents

<b>Introduction</b> .....	<b>1</b>
Education and learning: community, democracy and economy in the 21st century .....	1
A culture of excellence and improvement: raising achievement for all....	2
Implications and questions.....	4
<b>Study Skills</b> .....	<b>5</b>
Background .....	5
Constructivism .....	7
Gardner's theory of multiple intelligences.....	8
Metacognition: thinking about thinking.....	9
Deep and surface approaches to learning .....	10
Peer interaction and learning .....	11
Techniques to aid reading .....	13
Techniques to aid remembering .....	14
Techniques to aid understanding (for example, frames and mind maps) .	16
Critique of study skills .....	18
<b>Information Literacy</b> .....	<b>21</b>
Overview .....	21
Information literacy in context .....	22
Educational implications .....	25
Issues of concern (and specific problems).....	27
Strategic directions .....	28
Descriptions of major approaches .....	29
Partial responses in the curriculum and channels for development .....	31
<b>Conclusions</b> .....	<b>34</b>
Information literacy and study skills: similarities and differences .....	34
<b>Bibliography</b> .....	<b>36</b>

## Introduction

### Education and learning: community, democracy and economy in the 21st century

The educational terrain in Scotland is a somewhat contradictory complex of class, culture and community interests. The education system is subject to several sets of influences, in particular the actions of a relatively powerful teaching profession, government- and industry-inspired challenges to meet the needs of a failing industrial capitalism, and a relatively fragile entrepreneurial sector. At the same time, there is a backdrop of governmental renewal. The nature of economy, employment, enterprise and citizenship are therefore key influences on learning outcomes, content and teaching practice. In effect these influences create pressure to develop new areas of the curriculum.

Attempts to remedy social and economic inequality have been a key area of Scottish educational reform over the years. In recent years, the need to incorporate multiculturalism, to address the position of asylum seekers within society, and to redress population decline have also been recognised. These policy priorities are currently focused on issues such as:

- managing antisocial behaviour
- engendering employability and enterprise.

The Scottish Executive places the individual at the centre of its educational ethic and thinking, and has sought to ground this liberal democratic vision on increases in investment aimed at improving opportunity and attainment. The purpose of education is therefore firmly linked to improving life chances. The pervasive rhetoric in which these life-improvement notions are expressed is the language of systems thinking: pupils interact with learning environments, and schools are re-positioned as learning centres. Pupil interactions are to be managed progressively through a series of definable life stages. However, the future is acknowledged to be always uncertain, because of the volatility of the new economy.

Whilst the previous paragraphs essentially summarise the Scottish educational scene, we should not lose sight of the link between concepts of education and learning and the knowledge economy, information society and globalisation. Thus we should consider the possibility that discussing study skills and information literacy in a Scottish context might contribute to a set of economic development objectives which are common across the OECD nations. In this respect we might consider as international comparators Singapore, Australia and New Zealand, with the Nordic countries and the Baltic nations as dynamic near neighbours.

## **A culture of excellence and improvement: raising achievement for all**

In the Scottish Executive's idealistic vision of education, excellence is deemed to be universal, and improvement a constant. From the perspective of study skills and information literacy, the definitions of excellence and improvement in pupil attributes might incorporate:

- capacity to manage information
- ability to manage learning.

These notions relate to the research summaries presented below; in particular we will look at some of the different activities that these notions entail, and on what teaching and learning methods might be used to improve these capabilities in pupils.

At time of writing (2005) the Scottish Executive is embarking on an ambitious period of modernisation in the education service, to improve the learning experience and align the curriculum with the values of excellence and achievement of the fullest potential of all pupils. A major theme of the initiative is the *Curriculum for Excellence* (see [www.acurriculumforexcellencescotland.gov.uk/progress/index.asp](http://www.acurriculumforexcellencescotland.gov.uk/progress/index.asp)) which sets out to meet the kind of social and educational challenges set out above. The following section offers a contribution to the national debate, which provides a sense of context and relevance to the research summaries set out below.

### **A curriculum for excellence: personalised learning and successful intelligence for successful living**

Historically, Scottish education has grouped individuals into schools, year groups, classes and courses, with an in-built bias towards negative selectivity and academic elitism. The theme of personalised learning is particularly challenging in relation to that historical context. ICT and Internet-enabled teaching is often championed as *the* means by which learning can be personalised. Understandably, teachers experience contradictory feelings when presented with an approach that might improve learning, but at the cost of increased workload or some other negative outcome. Equally understandably, the educational management system tends to favour the promise of efficient, technology-based approaches as emblems of modernity and value for money. A particular attraction for educational managers is the fact that such technology can be straightforwardly indexed to easily quantifiable factors such as pupil/computer ratios, number of schools with Internet access, number of staff with e-mail, and so on. This provides readily calculable indices by which growth can be shown to be happening.

Perhaps a more fundamental challenge to traditional education approaches is presented by the possibility that personalised learning might be defined as a personal 'programme' which acknowledges the full spectrum of an

individual's capacities and potential, and is not merely a system of IT-enabled individual instruction. Such a programme could be regarded as 'intelligence-fair', to the extent that traditionally non-academic capacities would be prized alongside more mainstream abilities such as language, number and logic. This approach to personalised learning is given theoretical weight by the work of researchers such as Howard Gardner, Vygotsky and Sternberg, and again some of the key ideas from their work is briefly outlined in the research summaries provided below. More popular figures such as Buzan, De Bono, Covey and Jack Black are also relevant here: techniques such as mindmapping and the host of 'creativity' and 'critical thinking' models and heuristics are potentially relevant to both study skills and information literacy in that they provide the means by which individual pupils might enhance their skills in these areas.

It should be noted that the emphasis on personalised learning is compatible with recent enthusiasm for collaborative approaches to study. Ideas of social constructivism derived from Vygotsky, Piaget and Bruner provide a familiar theoretical basis for pedagogy. The message that emerges from research in this area (see section 2.1.5) is that collaborative activities can usefully act as a spur to individual reflection. What goes on within a group can therefore prompt positive change within each of the individuals comprising the group.

Crucially, the challenge of personalisation of learning might align to notions of *successful intelligence*. That is the kind of intelligence used to achieve goals and overcome barriers to enterprise and to economic and social self-improvement. This is perhaps the kind of intelligence required to exploit the potential of the information age. Barriers to the development of this kind of intelligence might include those presented by established educational practice.

## Implications and questions

It is arguable that to achieve an education fitted to modern conditions, it will be necessary to overcome the cultural legacies of Scotland's industrial past. Amongst those legacies are:

- a powerful cultural faith in technique, practicality and quantifiable results
- a history of subject-based education (particularly at secondary level) which narrows the scope of learning, underplays personalised learning and prizes elite knowledge outcomes over personal and community growth
- a curricular system which enshrines these values.

How can an emphasis on personalised learning and skills be reconciled with these forces? It is arguable that the teaching profession will place ICT and the Internet in the foreground of its thinking, and that curriculum development will be viewed through the technology-driven, e-learning lens. Thus, notions of technological renewal, connectivity, learning objects, interactivity, and crucially what is assessed, how and by whom, are likely to predominate. These notions are typically justified in terms of providing options for:

- self-learning
- collaborative learning
- alternative sources of information
- improved learning and performance
- congruence with various social and economic factors.

These options resonate with the modernisation agenda which is coming to dominate thinking and action in Scottish education.

The extent to which these perspectives are resolved in the national debate on excellence in the curriculum will go a long way to influencing the pedagogical character of the curriculum. That debate will also expose the potential for aligning the school curriculum to the needs of a competitive information society as opposed to a stagnating post-industrial one.

## Study Skills

### Background

The term 'study skills' refers to the conscious and deliberate use of the processes of learning to achieve effective study practices. The term 'learning how to learn' is used to denote a similar idea. There is a great deal of overlap between what one will find in an up-to-date textbook or web site on study skills and a similarly up-to-date textbook or web site on learning to learn. Both deal with the idea that pupils and students can and should be helped to develop conscious, deliberate control over the mechanisms of their own learning. The difference between study skills and learning to learn is therefore slightly hazy. However, the emphasis within learning to learn materials tends to be on slightly more abstract considerations such as awareness of the variety of learning strategies and styles that exist, and the importance of motivation and attitude to learning. A typical study skills resource, on the other hand, might be more likely to focus on the details of particular techniques that aid learning, such as how to draw 'mind maps' and how to write notes.

The set of skills implied is large. The most obvious are:

- reading
- writing
- note-taking
- time-management
- working with others
- engaging in critical and analytical thinking
- revising and remembering.

Another important skill is information-gathering: the enormous growth in the use of the Internet as a resource for learning in recent years highlights the importance of being able to seek information efficiently. Equally important is the ability to recognise the merit or otherwise of information found there. These skills overlap with those required for finding and using information more generally, such as using libraries to obtain the right books for study.

The need for an improvement in this area has long been acknowledged. For example, Selmes (1987) summarises reports of pupils having difficulties with:

- inertia
- concentration
- dependency on the teacher
- motivation
- how to perform study tasks.

Selmes noted that pupils themselves report difficulties in such areas as:

- making notes
- recalling what has been read
- assessing arguments
- relating evidence to arguments
- organising study
- meeting deadlines.

The need for improvement in this area is therefore quite clear. Understanding exactly how to effect an improvement, however, depends upon an understanding of the learning process itself. Research in recent years has provided a better understanding of learning processes and many useful insights into how improvement in learning might be achieved.

## Constructivism

The notion of constructivism follows on from Piaget's highly influential theory of cognitive development. Constructivism essentially denies the commonly-held transmission model of learning (i.e. the idea that teachers simply transmit knowledge to pupils). Instead it asserts that learners have to actively construct knowledge for themselves. The difficulty and degree of success of this construction process will be affected by such factors as the learner's prior knowledge of the subject matter. For example, in science learning it is now acknowledged that primary school children encountering physics do not do so as 'blank slates'. Instead, they come to the discipline with prior conceptions (derived from experience within the physical world) about fundamental physical matters such as force and motion. Such intuitive ideas are typically inaccurate, and can often be quite difficult to replace them with more adequate conceptualisations.

Teaching, according to the constructivist view, is less a matter of delivering knowledge to pupils and more a matter of facilitating the pupils' discovery of knowledge. As Alison King succinctly expresses it, the teacher is no longer a 'sage on the stage' but instead acts as a 'guide on the side'. In the case of science learning, for example, the teaching process might involve arranging a set of experiences via practical laboratory tasks or groupwork. The aim would be to expose pupils to an awareness of the inaccuracy of their intuitions and to alternatives that are demonstrably more adequate. Pupils would then have to absorb the wider significance of these new ideas. This may require time and effort after the lesson is over.

## Gardner's theory of multiple intelligences.

Gardner's starting point is the idea that the traditional view of intelligence is too narrow. Rather than conceiving of intelligence as a single, relatively fixed entity, this theory conceives of intelligence as comprising a number of relatively independent faculties. Initially, Gardner proposed seven such facets:

- musical
- bodily/kinaesthetic
- linguistic
- logical/mathematical
- spatial
- interpersonal (understanding others)
- intrapersonal (understanding oneself).

He has since argued for the existence of an eighth aspect of intelligence, namely naturalist intelligence (the ability to identify and classify patterns in nature). Gardner concedes that there may be other aspects yet to be fully delineated.

According to the theory of multiple intelligences, these independent aspects of intelligence are modifiable. This again contrasts with the traditional view of intelligence, which conceptualised it as relatively fixed.

The upshot of this view is that a particular student, A, might be particularly strong in linguistic intelligence, but more average in all other areas. Another individual, student B, might be particularly strong in spatial intelligence and more average in other areas. As a result, each will have different strengths that can be brought to bear on study tasks. Student A might best tackle study tasks using written lists, summaries and notes. In contrast, student B might be better to try using graphic organisers such as concept maps as a tool for thinking about and studying material. This is therefore a child-centred approach that recognises that there are many ways to learn. It also implies that the curriculum, the types of instruction and the types of assessment used should also be based on information about how the child learns.

Contemporary study skills advice (for example, Stella Cottrell's *The Study Skills Handbook*) suggests that students should give explicit attention to a variety of study skills techniques. The aim would be to identify those that suit them best as individuals, and to capitalise on those techniques that work particularly well for them. Such an approach requires a degree of conscious reflection by pupils on how well their own thought processes are working for them.

## Metacognition: thinking about thinking

Metacognition is the ability to reflect upon one's own knowledge and mental processes. This includes both the content of thought (metaknowledge), and of one's strategies for tackling problems (metastrategy). Capability in this area is somewhat patchy in younger children (e.g. primary age children) but as adolescence unfolds, improvements occur. For example, experiments demonstrate that older children could detect a blatant contradiction in a short piece of text. In contrast, younger pupils (including some children as old as 10 years) often did not. Failure to even detect such problems results in corrective strategies (e.g. re-reading, asking questions of peers or teacher) not being applied. The ability to attend to one's own thought processes and to detect potential problems requiring action is therefore clearly important to learning. It should be stressed, however, that research demonstrates that children's performance can be improved markedly by appropriate instruction.

For example, research by Christine Howe and her colleagues at Strathclyde University has shown that skills such as how to test a scientific hypothesis can be improved. The researchers used an instructional technique called 'scaffolding' or 'contingent prompting', first developed by David Wood at Nottingham University. It involves a careful use of prompting that depends upon what the child does in the following way:

- If the child performs part of a task successfully, the prompting by the adult is kept rather vague (for example, 'pick up the next piece').
- If the child makes a mistake, the prompting becomes more specific.
- If the child continues to make errors, the prompts become increasingly specific with each successive error until the adult is demonstrating the required action.
- Successful action by the child results in the prompting becoming less specific again.

The Strathclyde research involved the use of such scaffolding in the context of children learning to test hypotheses about the optics of shadows. Scaffolding was shown to be helpful to the (P5-P7) pupils' hypothesis testing skills, and the performance increase included generalisation to novel problems. Interestingly, computer-implemented scaffolding proved just as effective as human scaffolding in terms of the degree of improvement shown by the pupils.

Clearly, the conscious testing-out of study strategies by individuals presupposes a highly developed set of metacognitive skills. Likewise, the ability to reflect accurately upon the content of one's thinking and the success of one's strategies also requires a degree of metacognitive sophistication.

## Deep and surface approaches to learning

Much research now exists showing that a student's broad 'approach' (including intention and strategy) to learning material has a strong influence on the outcome of learning. For example, research by Marton and his colleagues showed that many students failed to grasp the basic point that a short written article was making. This happened *because they were not looking for the basic 'take-home' message*. Instead, they were concentrating on memorising elements of the text, a practice that inevitably resulted in fragmentary and incomplete knowledge. This led to the distinction between 'deep' and 'surface' approaches to learning. Deep learning has two aspects. The first is a holistic, global attempt to understand the underlying core meaning of the material; the second is a much more localised, close attention to the detailed logic of the argument. Surface approaches to learning, on the other hand, involve attempts to memorise information by rote.

Experiments on memory demonstrate that rote learning of substantial amounts of verbal material is an extremely difficult task. A great deal of forgetting of the material takes place even within 24 hours of attempting to learn. Broadly speaking, 'deep' approaches are much more successful in securing understanding and remembering. However, surface learning strategies are quite common among learners. It could be argued that surface approaches are encouraged by assessment practices. For example, the widespread use of 'closed-book' summative written examinations encourages the conceptualisation of the learning task in terms of memorisation.

A number of techniques have been developed for improving learning whose effectiveness can be explained in terms of deep and surface approaches to learning. A useful summary of some of these techniques is given in West, Farmer and Wolff's 1991 book, *Instructional Design: Implications from cognitive science*. All of these techniques are designed to increase the student's attempts to extract meaningful relationships within material (e.g. advance organisers, frames, and concept maps).

## Peer interaction and learning

A final strand of background theorising draws from the work of Piaget and Vygotsky and emphasises the importance of peer interaction for stimulating learning. Both foresaw the potential benefit to learning that could accrue from peer interaction, although each suggested different reasons why it might be helpful. Piaget's view emphasised the importance of conceptual conflict: being confronted with a conception different from one's own has the effect of challenging the adequacy of one's view. This challenge provokes reflection by the individual and also a process of 'equilibration' in which a new, more sophisticated view emerges. Ultimately each individual holds a better-quality conceptualisation than that which had been held before. Vygotsky, on the other hand, emphasised the importance of a more cooperative process involving coordination of knowledge.

The utility of peer interaction for learning has been extensively tested in real classroom settings over the last 15 to 20 years. Evidence has been found to support both Piaget's and Vygotsky's views. Research on primary science learning, for example, has demonstrated that having groups of children work jointly on generating hypotheses and testing tasks can result in substantial gains. However it should be noted that the gains are not always immediate, and a period of post-task individual consolidation may be required. Similarly, much research on computer-based learning has examined joint problem-solving around or in some cases via computers. Sometimes cases 'groupware' intended to support discussion processes among groups of peers has been developed.

The ESRC Teaching and Learning Research Programme project SPRinG (Social Pedagogic Research into Groupwork) has developed paper-based materials for teachers to help them enhance their (primary school) pupils' skills at working in a group. The materials cover exercises in communication skills such as good listening, speaking within a group (e.g. giving reasons, making suggestions), making decisions and being persuasive. At the time of writing these materials are being evaluated in a Scottish context (similar materials have already been shown to be successful in England and Wales).

Previous research has also shown that individual thinking skills can be improved as a function of peer interaction. A well-known example of this is Matthew Lipman's 'Philosophy for Children'. This involves children firstly reading specially-written novels that highlight particular philosophical issues (e.g. the nature of truth, whether robots could be said to have a mind). They then discuss these issues in a teacher-led class discussion, and there is evidence that this helps sharpen the children's critical thinking skills.

These five elements have all informed current views on learning and have directly and indirectly influenced study skills advice. For example, contemporary books on study skills such as Stella Cottrell's (2003) *Study Skills Handbook* includes discussion of the notion of multiple intelligences

and its implications. Conrad Lashley and Warwick Best's (2001) *Steps to Study Success* discusses learning styles in a similar vein. Both Cottrell's book and also Tom Burns and Sandra Sinfield's *Essential Study Skills* discuss the importance of groupwork skills, and so on. Whilst these books focus particularly on secondary school pupils making the transition to higher education, the same issues are pertinent for primary pupils. Likewise, the learning to learn literature and web sites also touch on these themes. For example, [learntolearn.org](http://learntolearn.org)'s CHAMPS system explicitly acknowledges such issues as active learning, multiple intelligences and metacognition. It is clear therefore that the research and theorising summarised briefly above has spawned practical applications in the study skills area.

## Techniques to aid reading

A number of schemes exist that purport to enhance learners' strategies for reading text. One such technique is SQ3R (there are other schemes of a broadly similar character but SQ3R is discussed here as an example). SQ3R stands for the processes involved in reading: survey, question, read, recall and review:

- The **survey** phase is the gaining of an overview of the text. This helps the reader decide whether the text is worth reading in detail. Specific hints are provided regarding how to survey the text, such as using title and contents pages, the preface, the index and sampling a chapter.
- The **question** phase alerts readers to the importance of focused reading - that is reading done to find an answer to a question. The question might be as broad as 'how does this fit with what I know already?' Alternatively it may be quite narrow, such as when the learner seeks an answer to a specific point arising in previous studies.
- The **read** part of the process is specified as having more aspects to it than a pupil might anticipate. For example, actively searching the text for specific information, making notes, and identifying key ideas are all aspects of the read phase. Reading is explicitly noted to be iterative, involving reading and re-reading.
- The **recall** phase involves the learner in trying to remember (for example) key points from the text. Memory failures should motivate further re-readings.
- **Review** involves comparing recall content with the original text and again should prompt further reading and reflection.

The good thing about such schemes is that they underline the constructivist nature of learning: reading does not simply amount to reading through a text once and then assuming that no more needs be done. Instead, reading is an active, often necessarily selective, effortful and iterative process. Techniques like SQ3R work partly because they encourage use of some of the memory strategies alluded to above. For example, generating a question or questions to focus reading makes an elaborative link between what is already known about and the new information. This helps to promote 'deep' learning. Likewise, the instruction to identify key points helps to make clear the main point that the author is trying to make and promotes deep learning. The downside of such schemes is that they are time-consuming for the learner, rendering them impractical at times. In addition, younger learners especially may not be adept at generating suitable questions with which to focus their reading.

## Techniques to aid remembering

A wide variety of study skills techniques that are intended to enhance remembering have been developed. We only have enough space to review some examples, focusing on two commonly cited sets of techniques: rehearsal strategies and mnemonics.

**Rehearsal** is a strategy that is known to enhance recall. As noted above, rote memorisation is to be discouraged. In the present context, by 'rehearsal' we mean a specific type of rehearsal, namely so-called 'elaborative rehearsal'. Elaborative rehearsal does not merely repeat content but actively *processes* it. For example, the various techniques aimed at improving reading skills, such as SQ3R and PQRS, involve the deliberate use of such elaborative rehearsal strategies. For instance, questioning during reading helps recall by inducing more active cognitive processing. In particular, questioning that requires information to be integrated across paragraphs before an answer can be generated induces a deep approach to learning.

Other elaborative rehearsal strategies include clarifying, predicting content that is about to follow within a text, reviewing and summarising. Evidence suggests that all of these activities promote retention, especially when they are generated by the students themselves. In all these cases, evidence also exists to suggest that the relevant strategies can be trained. This is true even if they are not well developed, which is often the case for younger learners. For example, Wong (1980) reviews research that shows that children and adolescents can be trained to generate appropriate questions about instructional materials. The training involved using modelling and reinforcement as teaching techniques. The learning of question generation strategies is helped by using training texts that are ambiguous and inconsistent. Likewise, summarising skills can be learnt. It is best to begin with example texts that are shorter and less relatively simple before moving on to lengthier and more complex materials. Feedback via teacher comment and group discussion is helpful. Summarisation (for example) is more effective as a learning technique when the student produces the summary than the teacher. This is because the generation of a summary by a student requires more active (and deep) processing on their part.

**Mnemonics** have been known to work well as memory aids since ancient times, but only recently have reasonable explanations for this phenomenon been suggested. There are several different mnemonic strategies, and they typically work by associating the to-be-remembered material with visual images. For example, the method of loci involves associating the learning material with particular places. Attempts to regenerate the visual imagery of the places helps cue the associated learning material.

For example, a student might try to associate a list of points with various locations on his or her university campus by imagining walking around the

campus and associating each item with a particular place. A heading might be imagined to be written on a particular building door, for instance. Retracing the imaginary walk during recall results in much more material being remembered. Experiments have clearly demonstrated this, by using lists of unassociated words and comparing a mnemonics-trained and a no-training control group. Such techniques can help a learner to capitalise on spatial intelligence and work by enriching and elaborating the memory representation of the learning material.

## Techniques to aid understanding (for example, frames and mind maps)

### Frames

Frames are useful as a means of presenting or summarising knowledge and involve presenting learners with a table or matrix of information. The information is displayed in a (usually) two-dimensional matrix with rows and columns labelled using the main ideas under discussion. For example, in geology the rows might be types of rock (igneous, sedimentary and metamorphic) and the columns might be 'formation', 'composition', 'use' and so on. Each cell in the frame thus represents a particular combination (igneous/formation, sedimentary/formation etc.). This can be used to summarise a complex body of knowledge from a previously presented text.

The frame can also be used as an exercise to help learning by presenting the students with a frame with some or all of its data cells left blank. Students then have to complete the frame using their own knowledge. Instructors should construct the frames (in terms of choice of row and column labels) carefully. Good choices of headings force the learners to pay attention to law-like principles in order that they may generate appropriate inferences about missing information. This encourages systematic logical comparison and contrast among elements of the learning material, and helps students to see 'the big picture'. Frames therefore fairly directly stimulate a conceptual level of thinking (or discussion if it is a group exercise). Again, this taps into deep rather than surface learning strategies by virtue of the emphasis on underlying conceptual issues.

### Concept maps/mind maps

Like frames, these are a spatial learning strategy using diagrams. Concepts are represented by labelled oval shapes and arranged spatially. They are linked to each other by labelled arrows which specify the types of relationships between concepts. Typically, concept mapping exercises involve pupils in extracting concepts and their relationships from some learning content. The learning content would typically be a text, but might possibly another type of content such as a picture or an ongoing dialogue. The concepts are then plotted either using pencil and paper or on a computer screen. The structure of the resulting maps can vary considerably: they can be hierarchical, chain-like or web-like (with links and concepts radiating from some central concept). Such maps are very good for displaying a number of interrelationships simultaneously, which can be difficult to do within linear text.

West, Farmer and Wolff (1991) review a number of experimental studies demonstrating that, given sufficient training, concept maps can be helpful for learning. They are especially useful when used during or after the study of content, and when knowledge of concepts and relationships is the primary goal of instruction.

There are other areas of study skills techniques that could be discussed here. Examples might include:

- techniques to aid writing (such as note-taking, or essay structuring such as 'the five paragraph essay')
- techniques to aid study management (such as to increase motivation, to manage study time more effectively, or to improve collaborative learning)
- techniques to aid the development of thinking skills (such as critical thinking).

However, those reviewed above constitute a sufficiently broad selection to allow us to identify several consistent themes in the literature. Firstly, the techniques relate to the literature on deep versus surface learning. The techniques discussed are all means to promote deep rather than surface learning. Secondly, they relate to the literature on multiple intelligences by providing a range of strategies. For example, frames and concept maps are spatial strategies, whilst techniques like SQ3R are verbal strategies. These different strategies could in principle tap into different sub-types of intelligence and allow pupils to capitalise better on their particular individual strengths. Thirdly, many of these techniques lend themselves to use in a peer interaction context. For example, completing the missing cells in a frame, drawing a concept map or generating a summary of a piece of text could all just as easily be group exercises as individual ones. By requiring active processing on the part of the pupils, all of these techniques are consonant with the constructivist view of learning.

## Critique of study skills

A number of critical observations could be made of study skills advice. For example:

- Some advice is overly general and inflexible.
- Some is unrealistic in requiring more time than pupils have at their disposal - for example, SQ3R requires multiple readings to be made of text when there may be insufficient time available to undertake such multiple readings.
- Sometimes advice given by one author flatly contradicts that of another.

In some cases, the advice given presupposes the existence of the very skills that are to be inculcated. For example, telling pupils to 'summarise what you read in the example' is reasonable advice. However, if the pupils have had little practice in summarising or have not developed much skill in summarising, then the advice is less than helpful. Likewise, 'think of questions to be answered as you read the text' is good advice to encourage deep learning. However, the very act of generating good questions might itself be problematic.

Another reasonable criticism would be to note that skilled activities (like riding a bicycle) develop through extensive practice and feedback. Let us assume that the various activities covered within study skills support resources (taking notes, drawing mind-maps and so on) are indeed skilled activities. This would imply that, in order to develop these skills, there should be a sequence of skill-learning activities, each with formative feedback. Only in that way can the learner gauge the extent to which he or she is improving in the development of the skill in question. However, study skills materials often provide one-off exercises that provide little feedback, so they amount to awareness-raising exercises only, and do not offer the possibility of properly honing the relevant skills.

This point also clearly implies that learning these techniques takes time (for both pupils and teachers). One experimental test of SQ3R, for example, involved teaching the technique to the experimental group for 160 minutes. This amount of prior learning resulted in significant learning gains when reading a test text compared to untrained controls. What should we make of this result? On the one hand, 160 minutes is a relatively short time to devote to a technique that promises to deliver significant degrees of benefit for learning. On the other, attempting to teach several such study skills techniques would take up a fair amount of time in an already full curriculum. Bear in mind that many authors of study skills materials suggest that students should try several techniques and choose those that suit them best.

As noted above for the various rehearsal techniques, research evidence shows that many of these study skills techniques can be taught. However, to do so properly requires carefully graded instructional materials, modelling by the teacher, and regular feedback. There is therefore likely to be

considerable teacher support required before these techniques can be fully mastered. Pupils trying out several techniques with a view to identifying those that best support their individual preferences and learning style seems sensible. However, it is possible that the degree of reflection and metacognition required for this would also require a non-trivial quantity of teacher support.

A point that should also be acknowledged is that it is essential to integrate study skills activities into the mainstream of classroom life. Analogously, Charles Crook has made exactly this point about computer-assisted learning. Computer-assisted learning is an activity that often takes place away from the classroom in a specialised lab. The danger with this is that the activities that take place around and with the computer will be isolated from other classroom experiences. The teacher then has to make special effort to ensure that experiences garnered using the computer are properly contextualised and explicitly related to other learning. A parallel case could be made for study skills activities: careful planning is required to integrate them into the rest of the pupil's learning activities.

The very notion of study skills *as skills* could be challenged. An alternative view is to see these as contextualised activities – that is, they are not inevitably displayed to the same extent in all situations but instead are brought out more strongly in some situations rather than others. An analogy might be helpful here. Research on critical thinking in adults often appears to show that participants typically perform at a disappointing level. For example, they are often apparently unable to furnish clear evidence in support of the arguments they make, or to challenge others' arguments. However, there is other research showing that in the context of a classroom discussion, primary-aged children can challenge each other's claims quite cogently. Thus, critical thinking skills don't appear to be well displayed by adults in interviews with researchers. On the other hand, such skills are displayed to a rather better extent during peer discussions among children. This might suggest that these different situations are cueing these skills to varying extents. The task for future research would therefore be to establish precisely which features of these contexts are proving effective in cueing the appropriate behaviours. By analogy, perhaps 'study skills' are similarly context-bound. Perhaps the deliberative use of study strategies is more likely in some contexts (for example, specific topic areas or particular teachers' classrooms) than others. In short, thinking of these activities as general skills that apply across contexts might be misleading.

Lastly, there are areas of debate that need to be acknowledged. One major debate concerns whether study skills advice should take the form of a separate course in its own right. Mounting it as a separate course should, especially if it is credit-bearing, encourage explicit attention to, and metacognition about, the relevant processes. The alternative teaching approach is to 'infuse' such skills teaching throughout the wider curriculum. The infusion approach might not be so good from the metacognition point of view, since the teaching of the skills is integrated with (or buried among?) the teaching of academic content. However, it might be better from the

point of view of generalisation of the skills to new and related situations. The 'separate course' versus 'infusion' debate applies not just to study skills but to thinking skills more generally and is at present unresolved.

# Information Literacy

## Overview

There is no dispute that study skills and information literacy are relevant and important to the school curriculum. However, information literacy is somewhat different from study skills as a phenomenon. It is a more recent field, albeit with deep roots in library and information science, particularly in the area of information-seeking behaviour, and is not so restricted to educational contexts as study skills. Therefore the following research summary needs to adopt a different structure from that for the study skills section of the report. Several divisions can be made within the information literacy research summary.

- The first is an outline of the context to establish the macro situation, clarify some of the current assumptions about information literacy, and identify some channels for aligning Information Literacy development with other topics of concern to educators.
- The second element describes the major approaches taken to information literacy around the world. These approaches offer a set of possible resources and infrastructures which can be harnessed to educational development of information literacy in schools, and in local/national school systems.
- A third element is a critique of some of partial responses in the curriculum, and a suggested framework for development.

Taken together these three interrelated elements constitute a source of objectives for information literacy which can:

- illuminate the production and use of teaching and learning resources
- suggest teaching and assessment procedures
- delineate teaching practices and relevant CPD
- identify further research
- underpin policy development.

The three elements provide a common language and guide for policymakers, teachers, librarians and resource providers in their efforts to implement information literacy.

## Information literacy in context

Information literacy is a growing field in its own right. It interfaces with education and a number of other areas of social and economic practice. It is a response to the notion of an 'information society' and provides potential frameworks and objectives for learning.

Some examples of work on information literacy around the world are presented here. Several of the web sites listed below provide school-related links, and as is the case with Internet resources, the chain of links opens up a huge array of information.

### International

The organisations listed below foster international cooperation in the development of information skills and their various applications application to citizenship, health, environment, work and education. The organisations focus on all aspects of information literacy and promote partnerships between teachers, librarians and policy makers. This high-level focus may appear remote from everyday school classroom concerns, however it is essential contextual and updating material.

- United Nations Educational, Scientific and Cultural Organisation (UNESCO - The Prague Declaration on Information Literacy) - [unesdoc.unesco.org/images/0013/001361/136151e.pdf](http://unesdoc.unesco.org/images/0013/001361/136151e.pdf). (See also [portal.unesco.org/ci/en/ev.php-URL\\_ID=15886&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/ci/en/ev.php-URL_ID=15886&URL_DO=DO_TOPIC&URL_SECTION=201.html).)
- International Federation of Library Associations (IFLA) - [www.ifla.org/VII/s42/](http://www.ifla.org/VII/s42/)
- International Association of School Libraries - [iasl-slo.org/sig\\_infoliteracy.html](http://iasl-slo.org/sig_infoliteracy.html).

### National

The following sites showcase the interest in information literacy around the world.

#### USA

The USA is a major player in developing information literacy standards for education, and the following sites offer a quick gateway to that activity.

- Association of College and Research Libraries - [www.ala.org/ala/acrl/acrlissues/acrlinfolit/informationliteracy.htm](http://www.ala.org/ala/acrl/acrlissues/acrlinfolit/informationliteracy.htm) and [www.ala.org/ala/acrl/acrlstandards/informationliteracycompetency.htm](http://www.ala.org/ala/acrl/acrlstandards/informationliteracycompetency.htm).
- Library Power - [www.ala.org/aasITemplate.cfm?Section=Resource\\_Guides&Template=/ContentManagement/ContentDisplay.cfm&ContentID=15749](http://www.ala.org/aasITemplate.cfm?Section=Resource_Guides&Template=/ContentManagement/ContentDisplay.cfm&ContentID=15749)
- Institute for Information Literacy - [www.ala.org/ala/acrl/acrlissues/acrlinfolit/professactivity/iil/welcome.htm](http://www.ala.org/ala/acrl/acrlissues/acrlinfolit/professactivity/iil/welcome.htm)

## Canada

Canadian public policy and practice in implementing online approaches to government and public services such as education is very highly rated. The following selection gives some entry points to Information Literacy-specific examples.

- Prince Edward Island Department of Education -  
[www.edu.pe.ca/bil/bil.asp?ch0.s1.gdtx](http://www.edu.pe.ca/bil/bil.asp?ch0.s1.gdtx)
- University of Winnipeg - [cybrary.uwinnipeg.ca/services/il/index.cfm](http://cybrary.uwinnipeg.ca/services/il/index.cfm)
- University of Montreal -  
[mapageweb.umontreal.ca/leroux/AAFD/AAFD\\_index\\_en.html](http://mapageweb.umontreal.ca/leroux/AAFD/AAFD_index_en.html)

## Australia and New Zealand

Both countries have active groups of librarians and teachers, and have adopted a similar approach to the USA in developing national standards for information literacy.

- Australian and New Zealand Institute for Information Literacy -  
[www.anziil.org/index.htm](http://www.anziil.org/index.htm)

The Australian academic Christine Bruce is one of the most prominent writers on Information literacy in the world. This is her home page -  
[sky.fit.qut.edu.au/~bruce/index.php](http://sky.fit.qut.edu.au/~bruce/index.php).

## Europe

The European approach is more varied than the USA/Australia/New Zealand, and the following sites are representative of that variety.

European network for School Libraries & Information Literacy -  
[http://www.en.eun.org/eun.org2/eun/en/vs-Library\\_vs/sub\\_area.cfm?sa=3937&row=1](http://www.en.eun.org/eun.org2/eun/en/vs-Library_vs/sub_area.cfm?sa=3937&row=1)

## France

- [formist.enssib.fr/](http://formist.enssib.fr/)

## Scandinavia

- [www.nordinfolit.org/default.asp?pid=9](http://www.nordinfolit.org/default.asp?pid=9)

## UK

The UK has lagged somewhat behind the USA/Australia, however there is a current upsurge of activity amongst professional bodies and researchers.

- Chartered Institute of Library and Information Professionals (CILIP) -  
[www.cilip.org.uk/default.cilip](http://www.cilip.org.uk/default.cilip)
- Standing Committee on National and University Libraries (SCONUL):  
Advisory Committee on Information Literacy -  
[www.sconul.ac.uk/activities/inf\\_lit/](http://www.sconul.ac.uk/activities/inf_lit/)
- The Information Literacy Place (academic web site) -  
[dis.shef.ac.uk/literacy/](http://dis.shef.ac.uk/literacy/)
- The Information Literacy Weblog (this is one of the most frequently-used current awareness services on information literacy in the world) -  
[ciquest.shef.ac.uk/infolit/](http://ciquest.shef.ac.uk/infolit/)

- The Information Literacy Gateway - [www.ilit.org](http://www.ilit.org)

### **Information literacy in the school curriculum**

The following sites include a site offering specimen lesson plans, and also references to material on e-learning environments.

- LTScotland on information skills - [www.ltscotland.org.uk/5to14/information\\_skills/index.asp](http://www.ltscotland.org.uk/5to14/information_skills/index.asp)
- Canadian school-focused site; provides an example of a process-driven model of Information Literacy - [www.pembinatrails.ca/infozone/](http://www.pembinatrails.ca/infozone/)
- USA research sites on pupils use of information in schools and relevant teacher issues - [www.oelma.org/studentlearning/default.asp](http://www.oelma.org/studentlearning/default.asp) and [cissl.scils.rutgers.edu/schoollibrary/](http://cissl.scils.rutgers.edu/schoollibrary/)
- Robert Gordon University research on information literacy (teachers' perceptions/information in schools etc) - [www.rgu.ac.uk/abs/research/page.cfm?pge=5843](http://www.rgu.ac.uk/abs/research/page.cfm?pge=5843)
- Specimen lesson plans for information literacy - [www.eduref.org/cgi-bin/lessons.cgi/Information\\_Literacy](http://www.eduref.org/cgi-bin/lessons.cgi/Information_Literacy)
- 'Webquest' approach to developing a learning environment for Information Literacy - [www.mla.mb.ca/infolit/WebQuest/index.cfm](http://www.mla.mb.ca/infolit/WebQuest/index.cfm)
- 'Noodletools' - [www.noodletools.com/debbie/literacies/information/1over/infolit1.html](http://www.noodletools.com/debbie/literacies/information/1over/infolit1.html)

### **Weblogs and blogging**

[www.weblogg-ed.com](http://www.weblogg-ed.com) is dedicated to discussions and reflections on the use of weblogs, wikis, RSS, and other Internet-related technologies in the school classroom.

## Educational implications

The above examples indicate a high profile or priority for information literacy and raise a number of issues which must be considered. Two key issues in education are:

- the nature of certain current assumptions about information literacy which will strongly influence educators' thinking
- the identification of issues of concern which can be aligned to information literacy as problems which require specific solutions and offer a focus for developing resources and learning objects, and for teachers and librarians taking initiative at school/classroom level.

## Assumptions

Common interrelated assumptions about information literacy are that it is:

- **Information Technology**, and that by developing access to and skills in using ICT and the Internet, information use will simply improve. Improvement is seen as a function of the storage, organisation, retrieval and communicative power of digitisation and networked access to information. Student/pupil age-group familiarity and facility with 'technology' are often cited as a conditioning factor. It is noticeable that many people, when they hear the term information literacy, ignore its 'information' and 'literacy' constituents, and re-construe it to mean information technology. However e-learning developments increasingly take account of information literacy in various ways, for example, highlighting information-handling skills as learning outcomes, and implicating information resources such as digital repositories in system design.
- **Library skills combined with ICT and the Internet** (often with a study skills focus). It is assumed that either a simple updating of some familiar skills for the new technologies, and/or a revision of practice to incorporate digital resources, will be sufficient. Consequently it is seen as part of an educational developmental agenda, which fits well with the use of contemporary communication technologies and the information technology perspective on design for learning. Libraries and librarians tend to remain located in their familiar roles, and may have no more influence on curriculum than at present. Librarians may bemoan the limitations of teachers/lecturers/technologists in relation to information literacy. Library skills and information skills are often combined with study skills in educational discourse, and indeed they may be presented as study skills. The ensuing practices can be discussed and critiqued in the same terms as the study skills material presented in the study skills section above. In this account it may be argued that attaining information literacy is a dimension of becoming a competent learner, pupil, student or lifelong learner.

- **Media literacy, tertiary literacy.** There is a vibrant debate around the use of the term literacy, and these two examples illustrate this. Both have been related to information literacy while remaining separate from each other. The first emphasises cultural analysis of communication technologies, particularly mass media, and tends to incorporate information literacy on that basis. Tertiary literacy is specific to HE and includes study skills, particularly writing. Tertiary literacy provides a more satisfactory account of study in terms of learning to learn, disciplinary acculturation, academic forms and conventions etc. Information literacy is coming onto the agenda for discussion amongst tertiary literacy researchers and student development specialists in universities.

Developers working with information literacy in the schools *must* anticipate variants of these assumptions to be made, and to influence thinking. This could influence practice, including the priority attached to the field, and also constrain acceptance and uptake of products. It is very important that developers, teachers and other change agents engage critically with these assumptions, in order to avoid misplaced initiatives, and wasted energy.

## Issues of concern (and specific problems)

There are a number of information-specific issues of concern which may constitute possible channels for aligning information literacy to perceived needs in education and thereby providing concrete sites for innovation by teachers and others:

- problems of information overload
- inappropriate use of Internet material
- failure to evaluate and synthesise information
- neglect of non-digital sources of information.

Such problems demand solutions, hence the interest in formal teaching and assessment of information literacy. Teachers may express concern about their capacity to take on this work. There may also be concerns about how the roles of librarians and information technologists can best be utilised. A common problem is underestimating the complexity of the phenomena and conceiving of the situation-problem-solution largely in terms of skill development and technological access or control.

Neither set of assumptions and issues adequately match the vision of Scottish education described, in particular the vision of education for an information society. However, they provide a practical approach to thinking about information literacy in terms of where schools and teachers may find themselves at present.

## Strategic directions

Current thinking in the field of information literacy suggests a need to proceed against a broader conceptualisation of information literacy. Indeed it may be that information literacy is best considered as a new subject discipline which is developing to meet the needs of an information society. A major premise of this broader thinking is that it is vital to shift attention *from the technologies to the actual information*, and to an understanding of *information process*, including evaluation of sources, as well as particular information behaviours. The notion of an 'information age' and a 'knowledge economy' is a useful characterisation of the focus of this broader perspective. This paradigm shift is advocated to achieve a more complete understanding and greater congruence with contemporary social and economic developments.

Typically, however, current practitioner attention focuses narrowly on techniques for finding and using information, and a variety of specific information-related skills are proposed as the content of teaching. Social, economic, ethical and other concerns are less frequently addressed, although they are presented as being key reasons to develop information literacy. In some respects this is akin to the fragmentary 'lists of study skills' and their attendant techniques, which abound in the literature and on the Internet.

## Descriptions of major approaches

Three main, interrelated, approaches to information literacy which relate to education can be identified:

- national standards
- process models
- phenomenographic accounts.

The Information Literacy Place web site (<http://dis.shef.ac.uk/literacy/>) provides an introduction to the wider field of approaches, and the Information Literacy Weblog ([ciquest.shef.ac.uk/infolit/](http://ciquest.shef.ac.uk/infolit/)) is a popular and accessible source of updating and commentary.

### National standards

Statements are typically very detailed and seek to provide full descriptions of information literacy together with some account of standards of proficiency to be obtained for each facet. These features of the standards offer a framework for teaching, learning and assessment. Main objections are the tendency to encourage a 'tick box' mentality, and to be somewhat off-putting to users who are not close to the origins of the facets amongst professional librarians. The UK has no comparable standard, although SCONUL has developed a framework, and some work has been carried out by specialist groups of CILIP. Relevant statements might be found in parts of the school national curriculum documentation and, for undergraduates, the subject benchmark documents dealing with relevant skills.

The main examples of national standards are:

- **USA** - [www.ala.org/ala/acrl/acrlstandards/informationliteracycompetency.htm](http://www.ala.org/ala/acrl/acrlstandards/informationliteracycompetency.htm)
- **Australia and New Zealand** - [www.caul.edu.au/info-literacy/InfoLiteracyFramework.pdf](http://www.caul.edu.au/info-literacy/InfoLiteracyFramework.pdf)
- **UK** - [www.sconul.ac.uk/activities/inf\\_lit/acil.html](http://www.sconul.ac.uk/activities/inf_lit/acil.html).

### Process models

Information literacy is described as a series of logical steps or stages in a process for acquiring and using information. The models are often proposed as underpinning subject learning and research activity. The models vary in complexity of their stages and the admission of iteration and holism. However, teaching and learning information literacy is proposed as a procedure of guided engagement with the process stages of a given model. The main objection to this approach is a tendency to oversimplification and regimentation.

Some examples include:

- **The Big 6** - [www.big6.com](http://www.big6.com) and [www.big6.com/kids/](http://www.big6.com/kids/)
- **Kuhlthau's Information Search Process** - [eduscapes.com/info/isp.html](http://eduscapes.com/info/isp.html) and [www.scils.rutgers.edu/~kuhlthau/Search%20Process.htm](http://www.scils.rutgers.edu/~kuhlthau/Search%20Process.htm)
- **Papas and Tepe's Pathways to Knowledge** - [eduscapes.com/info/pathways.html](http://eduscapes.com/info/pathways.html)
- **Pembia Trails School Division Info Zone** - [www.pembinatrails.ca/infozone/](http://www.pembinatrails.ca/infozone/).

More examples and commentary on process models can be found at [eduscapes.com/info/models.htm](http://eduscapes.com/info/models.htm).

### **Phenomenographic accounts**

Based in phenomenographic research, this approach describes information literacy in terms of information users' ways of experiencing information literacy. The results are suggestive of curricula and teaching practices which challenge the standards and frameworks devised by librarians and other professionals. They present models of information literacy derived from empirical research which are offered as frameworks for curriculum development and teaching practice. Typically the researchers advocate student-centred approaches to learning. The main objection is the relative complexity of the research-based accounts and perceived difficulty of implicating models in practice.

Key texts include:

Bruce, C. (1997). *The Seven Faces of Information Literacy*. Adelaide: Auslib Press.

Lupton, M. (2004). *The Learning Connection: Information Literacy and the student experience*. Adelaide: Auslib Press.

## Partial responses in the curriculum and channels for development

At present information literacy does not occupy a specific niche in the curriculum in the same way as traditional academic subjects of study. Consequently formal recognition via teaching and assessment is likely to be patchy. This is akin to study skills. However, there is a developed theory and practice of school librarianship, which may offer a more concrete organisational focus than is the case for study skills.

At least three systematic responses to the need for information literacy to feature in curricula can be described:

- **Library centred** - Focus on access to collections and the Internet; pupil-instruction; resource-based learning. An obvious development channel for the many contributions to the field being generated by the library and information science profession.
- **ICT and Internet centred** - Focus on technology, connectivity and communication. A less obvious development channel given the technological focus, but in itself it is an essential component of the changing information environment.
- **Study skill and task centred** - Focus on specific curricula and teaching/learning practices which may involve library/ICT and Internet activities. May also involve a wider spectrum of activity including interviewing people, observation and description of events. Another obvious development channel, it is complicated by the diversity of activity and sheer scale of the teacher/pupil populations.

Given the historical development of information and libraries in education, relevant examples may not be labelled information literacy as such. Specific objectives, activities, and tasks involving research or study skills and library or information behaviours may well signify information literacy in a particular curriculum/classroom. Projects requiring information, and quizzes and tests entailing specific approaches to finding and organising information, may well accompany other curriculum areas. Common higher level objectives of the three partial responses include: developing critical thinking; enhancing learning; and making better use of information resources. These higher level objectives would resonate with the five elements of theorising which are described above as informing current understanding of study skills.

The three responses are not absolutely distinct or mutually exclusive, and could be organised to combine elements of the three main approaches described in the preceding section. For example one can envisage a combination of:

- national standards
- Big 6 (process model/resource)
- school-specific deployment
- teacher and librarian collaboration
- online access to Internet resources/learning objects.

In this hypothetical scenario Big 6 operates as a process tool, available on the Internet, backed by teachers and parents, and linked to national standards or local school area requirements. This offers the scenario of a 'flexible curriculum for information literacy'.

Evidently the curricular 'map' for information literacy is complex and not entirely clear. However some possible paths can be identified by looking at the focal areas of concern identified above, namely:

- information overload
- inappropriate use of Internet material
- neglect of non-digital sources of information
- failure to evaluate and synthesise information.

These 'problems' offer a broad framework for a relevant information literacy development in curricula, and are explicitly *use and need-oriented* as opposed to the more familiar *taxonomy/behavioural objectives*-driven frameworks.

It is very important to note that these 'problems' relate to the substantial amount of publicly available material on the Internet etc. There is a vast array of electronic information 'about' subjects, people, places etc. which can be deployed in teaching. Information literacy must be developed by teachers and pupils in order to make best use of this wealth of material. This requirement will become more acute as Internet access becomes more general and directly controlled by users. Equally, as noted above, there is a growing set of sources which are 'about' information literacy on the Internet.

Educational strategies based in constructivist approaches such as PBL, inquiry learning, project work, and some e-learning developments all demand information literacy. Adopting constructivist approaches to teaching, learning and study skills will increase the importance and value of information literacy. Consequently we should aim to create learning resources and learning objects which are subordinated to an overall design for learning information literacy structured as a systematic whole to:

- contribute to solving the four information problem areas noted above
- offer a more complete curriculum response for information literacy

- incorporate the broader international and professional thinking about information literacy and exploit the growth of the field
- interact with study skills and reflect the current theoretical position of that area by contributing to pupils developing a process *awareness* as well as a specific skill set
- meet vocational and citizenship demands of the information society.

As the volume of available information and its centrality to learning increases, it is very unlikely that the current partial responses will cope with the demands created by the proliferation of sources and resources. As expertise in *information* becomes more obviously necessary for survival and success in an information society, it is likely that the three partial approaches to curriculum identified here will be exposed as inadequate. Clearly the current (2005) drive within Scottish education to modernise the curriculum should offer many opportunities to explore new pedagogical forms which will do justice to the academic coherence and social relevance of information literacy.

## Conclusions

### Information literacy and study skills: similarities and differences

We have stressed the similarities and differences between study skills and information literacy at various points above, and we draw these together so that readers may judge for themselves how the two domains might be combined in the curriculum, and in specific contexts.

#### Similarities

- Process models are common to both domains.
- Phenomenographic research is a common underpinning and concepts of surface/ deep learning are shared.
- Implementation in both areas tends to be task-focused and assessment-related.
- Both tend to be presented as personal attributes, although general skill/process and procedure accounts are also popular.
- Both domains are presented as highly relevant to formal study, susceptible to change through practical activity, yet somewhat underdeveloped in the curriculum, despite the fact that both have received serious discussion in terms of modern learning theory and research findings.
- Metacognition is relevant to both domains.
- Lifelong learning is relevant to both domains.
- Both are discussed in terms of the infusion versus standalone class debate.

#### Differences

- Information literacy has been the focus of national and international attention leading to the development of national standards and statements of good practice. This has not happened for study skills, although a wealth of resource material has been published in the UK, USA and Australia.
- Information literacy has substantial relevance outside formal education, particularly in the workplace and in terms of democracy and citizenship. It is not so restricted to educational settings as study skills have been.
- Information literacy is proposed as a key feature of lifelong learning. Whilst study skills is clearly relevant it has not had quite the attention applied to information literacy.

On balance it would seem that both study skills and information literacy are more complex, and potentially more rewarding, if they are approached as substantial contributions to learning and the curriculum, rather than diminished as mere supplementary skills, or in the worst case, abandoned for fear of 'cluttering' an already packed curriculum.

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### Some useful web sites:

- <http://creict.homerton.cam.ac.uk/spring/> - reports on the SPRinG project (Social Pedagogic Research into Grouping). It contains many useful notes and commentaries on groupwork by teachers who have used this method; these can be accessed via the search facility within the teachers' area of the site
- [www.dundee.ac.uk/psychology/ReadOn/](http://www.dundee.ac.uk/psychology/ReadOn/) - hosted by Dundee University, reports on the work of a very active group of researchers who focus upon peer tutoring, looking in detail at peer tutoring and in particular discussing the paired reading method
- [www.criticalskills.co.uk/](http://www.criticalskills.co.uk/) - the Critical Skills programme is a general approach to teaching and learning, and one that emphasises the importance of conversation, brainstorming and knowledge distillation
- [www.bdrum.com/group8web/gardnershelley.htm](http://www.bdrum.com/group8web/gardnershelley.htm) - contains a useful summary of the theory of multiple intelligences and some of the controversies surrounding it
- [www.newhorizons.org/strategies/mi/front\\_mi.htm](http://www.newhorizons.org/strategies/mi/front_mi.htm) - a useful set of bibliographic links related to the notion of multiple intelligences, including commentaries by educators who have tried to apply the theory in schools
- [www.support4learning.org.uk/education/learning\\_styles.cfm](http://www.support4learning.org.uk/education/learning_styles.cfm) - an extremely useful set of resources related to multiple intelligences, with links to materials on mind mapping, study skills and revision
- [www.gse.buffalo.edu/fas/shuell/cep564/Metacog.htm](http://www.gse.buffalo.edu/fas/shuell/cep564/Metacog.htm) - provides a summary of the notion of metacognition, and a bibliography

- [www.studygs.net/metacognition.htm](http://www.studygs.net/metacognition.htm) - provides question that link metacognition to the notion of 'learning to learn'
- [www.psyc.memphis.edu/trg/meta.htm](http://www.psyc.memphis.edu/trg/meta.htm) - provides a lengthy and detailed summary of research related to metacognition
- [carbon.cudenver.edu/~mryder/itc\\_data/constructivism.html](http://carbon.cudenver.edu/~mryder/itc_data/constructivism.html) - a comprehensive site containing a great deal of information about constructivism
- [www.emtech.net/construc.htm](http://www.emtech.net/construc.htm) - links to a number of critiques of constructivism.
- [www.teach-nology.com/currenttrends/constructivism/](http://www.teach-nology.com/currenttrends/constructivism/) - a very readable site on constructivism, and gives a teacher's perspective
- [www.dmu.ac.uk/~jamesa/learning/deepsurf.htm](http://www.dmu.ac.uk/~jamesa/learning/deepsurf.htm) - provides a clear summary of deep and surface approaches to learning
- [www.learning.ox.ac.uk/oli.php?page=175](http://www.learning.ox.ac.uk/oli.php?page=175) - presents a useful critical discussion of deep and surface approaches to learning.