Interdisciplinary Education and Co-operative Learning: Perfect Shipmates to Sail against the Rising Tide of 'Learnification'?

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Abstract

This article considers the current changes taking place within the Scottish educational system. It looks at the introduction of Curriculum for Excellence *and the resultant change which has occurred with respect to the rise in popularity of the term 'interdisciplinary learning' particularly within primary education.   It goes on to consider possible benefits and disadvantages of this and looks at co-operative learning as a possible pedagogical approach to facilitate interdisciplinary education.*

Keywords: *Primary education; interdisciplinary learning; Curriculum for Excellence; co-operative learning.*

Introduction

In this new millennium the changes which are taking place within the Scottish educational system could perhaps be considered a dim reflection of the myriad of changes taking place in the world itself. The collapse of communism for example and military regimes around the globe, international focus on the need for human rights, the growing threat of terrorism and global recession, are but a few of the issues facing humanity as we progress further into the 21st Century. Schools exist in this global context where new technologies are having a profound effect on the way people learn, think and live.   New ways of understanding

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ourselves through science and alternative epistemologies challenge previously held orthodoxies of thought.

Advances in neurology, psychology, philosophy, sociology and psychiatry, have provided us with new and exciting knowledge about how the brain works and the learning process. It is now known for example that the brain is not only the seat of the intellect as perhaps was once widely thought, but also of the emotions. Research is increasingly demonstrating (Goleman, 1995), that the ability to succeed at school, in work and in social life is determined by the relationship of our emotional intelligence to our intellectual functioning. In the context of this rapidly changing society, and our enlightenment about the learning process, schools are now required to make learning more active in order that pupils "… possess broad ranging knowledge, multi-faceted skills and a wealth of personal dispositions." (Deuchar, R. 2007, p3).

In order to meet these challenges the Scottish Government have introduced a new curriculum which attempts to address the problems of living in our modern society. 'A Curriculum for Excellence' (Scottish Executive 2004a) calls for schools to develop 'successful learners', 'confident individuals', 'effective contributors' and 'responsible citizens'. This document is an authoritative one; including a foreword by the Minister for Education and a Review Board of noteworthy academics. Additional authority is inferred through the use of research and international comparisons. Scottish schools are now looking for ways to adopt this new curriculum in a climate of fiscal depletion and drastic budget cuts.

Curriculum for Excellence calls for learning to become more active and for interdisciplinary work to become more frequent in schools. This article attempts to critically review the literature and research on interdisciplinary learning and consider some problems that may face schools in developing an interdisciplinary approach. It considers how this type of approach fits well with co-operative learning and looks at the development of this pedagogical methodology in Scotland. A number of questions arise from a critical review of the literature, including: What are the long term effects of co-operative learning on attainment? Is the use of co-operative learning affected by environment e.g. open plan

schools? Are teachers using co-operative methods to facilitate a more interdisciplinary approach?

Educational Change

A Teaching Profession for the 21st Century (SEED, 2001) was produced in an attempt to enhance the ability of Scottish schools and meet the challenges facing them in the 21st Century. After a consultation process which took account of 'the views expressed during the National Debate, current research and international comparisons' (Scottish Executive, 2004, p.7), 'A Curriculum for Excellence' followed. There now seems to be a plethora of documents published which suggest that schools must aim for nothing less than 'excellence' e.g. 'Ambitious Excellent Schools – our agenda for action' (2004). Drew (2006) questions the validity of the term 'excellence' with regard to school improvement and asks a number of pertinent questions: How is excellence defined? Should continual improvement be the goal of schools rather than the pursuit of 'excellence'? If excellence is deemed by HMIe to have been achieved, where does a school or a teacher go next? However, despite the elusive nature of the term, 'excellence' looks set to remain on the Scottish educational agenda for the foreseeable future leaving many working in education feeling that their best is just not quite good enough.

One of the stated goals of the new Scottish Curriculum for Excellence is to 'give teachers more freedom to teach in innovative and creative ways' (Scottish Executive, 2006, p.16). Briggs & Sommefeldt (2002, p.13) suggest that 'teaching a prescribed curriculum is associated with a lack of spontaneity and creativity' which leads to teaching becoming 'outcome focused'. While some teachers welcome the freedom this new curriculum is apparently offering, others do not relish the relative insecurity it brings in comparison to the prescriptive 5-14 guidelines. A further issue is that although teacher freedom and creativity are being promoted, such objectives can run contrary to a management structure driven by a top down set of directives (Reeves, 2006). Documents such as 'How Good is our School:

The Journey to Excellence' (2006), for example, prescribes 'best practice' and is still used by HIMe to measure and assess school performance.

A key change within A Curriculum for Excellence is the shifting focus from teaching to learning, from teacher to learner. Due in part to the bounteous technological advances in recent years (Briggs & Sommefeldt, 2002), teachers are no longer seen as the gatekeepers of knowledge but rather facilitators who actively encourage and engage pupils in learning. The main changes in the curriculum are evident in progression, learning and teaching approaches and the blurring of subject boundaries to incorporate interdisciplinary projects. Some argue that this shift from teaching to learning has happened to the detriment of education. Biest (2009) for example says that learning is a process term but is empty with regard to content and direction, and yet there seems to be an obsessive compulsion among policy makers and educationalists at present to focus on the language of learning rather than of education itself, a phenomenon Biest describes as 'learnification'. Have we gone too far in our consideration of learning styles at the expense of lesson content? Is there a danger that moving away from the teaching of discrete subjects towards a more interdisciplinary approach in schools, content will be compromised?

The Debate

Historically, the integration of subjects has been a controversial topic in Scotland. This can be construed as a battle of paradigms (Priestley, 2009). On the one hand, primary education has had a tradition of teaching thematically, with its roots in the 1965 *Primary Education in Scotland Memorandum* (SED 1965). On the other hand, secondary education is firmly rooted in the teaching of traditional subjects. The *Munn Report* (SED 1977) identified inherent problems in the isolation of traditional subjects within the curriculum, namely fragmentation and poor coverage of cross curricular issues. According to Kirk (1982) the report did not abandon the notion of interdisciplinarity, but gave strong tacit support to thematic teaching, and was strongly critical of traditional subject-based teaching. It therefore left the door open to future debate about interdisciplinary provision.

This debate re-emerged in the late 1980s and early 1990s when the 5-14 Curriculum was developed. Primary schools then began to move away from cross curricular, thematic planning, towards a more fragmented and discrete curriculum. Simultaneously in the secondary sector, schools came under pressure from HMIe to reduce the amount of contact that young people had with different teachers. While HMIE remained largely opposed to interdisciplinary teaching of the social subjects its continued identification of the problem of fragmentation, ensured that the idea of interdisciplinarity, did not disappear. Scotland's new Curriculum for Excellence has now re-ignited the old debate and schools are now grappling with how best to develop interdisciplinary work.

Interdisciplinary Work

So how is interdisciplinary work defined? Current literature and research presents interdisciplinary learning as a process which requires individuals to draw from two or more disciplines in order to advance their understanding of a subject or problem that is beyond the scope of a single discipline. Interdisciplinary learners integrate information from two or more disciplines to create artefacts, explain or solve problems (Boix Mansilla, 2004).

Priestley (2009), offers a typology which provides a continuum of practice in terms of organisation. First there is the teaching of separate subjects whereby discrete topics are taught in isolation. In secondary schools, this is usually done by different specialist teachers, but in primary education, the same teacher generally teaches most subjects to the one class. Under the 5-14 curriculum it is interesting to note that primary schools began to mimic secondary schools with a certain amount of time allocated to each subject area and teachers required to adhere to a timetable during the course of the day, moving from one subject to another to ensure each child received the correct amount of time for each subject. Students often find difficulty in making links between the subject areas in this model.

Secondly there is multi-disciplinary teaching. Here the constituent subjects are taught by a single teacher and may relate to a particular theme or topic, but subjects remain as separate entities. This is more likely to make inter-disciplinary links than in the first model

however it can still prove problematic for pupils. The third model is the interdisciplinary approach which is totally thematic. This approach differs from the multi-disciplinary model in that it attempts to blur the boundaries between the various subjects.

Benefits of an Interdisciplinary Approach

Interdisciplinary work has been linked with promoting higher order, critical and holistic thinking skills. This holistic thinking is the ability to understand how ideas and information from relevant disciplines, relate to each other and to the problem. Many argue that this is a powerful and engaging strategy that leads to sustained and transferable learning (Hiebert et al., 1996; Jones, Rasmussen & Moffitt, 1996). Bonnet (1995) warns however that the sanctity of content should not be ignored when trying to promote higher order thinking skills.

Research carried out by Hmelo-Silver et al. (2009) showed that students who participated in a problem based learning approach constructed a deeper understanding of the concept of transfer than did the students in comparison classes as demonstrated by their performances in a 'post test'. These students were also able to apply their understandings of the concept to generate recommendations for improvements of instructional methods. This was a small-scale quasi-experimental study conducted in the further education sector so its transferability to a school setting may not be direct. However this evidence helps provide credence to the results of Derry et al. (2006), which demonstrated similar results. Both reports give weight to the claims made that interdisciplinary learning, using a problem based approach, can promote deeper thinking and aid the making of links between disciplines.

There is a concern however that many teachers, primary teachers in particular, have a notion about what the term 'interdisciplinary' means but do not fully understand it. If this is the case, how can they develop and implement it successfully? If teachers are unsure or 'fuzzy' about what interdisciplinarity is, then how can the desired educational outcomes be recognised, planned for, achieved or assessed? Teachers therefore need to become more familiar with the literature and research surrounding this type of teaching and learning.

When 5-14 was introduced, many primary schools were slow to adapt their planning formats and continued to use 'topic webs' in their forward plans for Environmental Studies. These were similar to mind maps, with an idea or theme in the centre, then separate areas of the curriculum plotted around with lessons relating to the central theme under each subject heading. Many primary teachers who remember this type of planning model believe that they simply need to replicate it to facilitate interdisciplinary work within their classrooms. Simply linking discrete subjects to a theme however does not make for interdisciplinary work, rather multi-disciplinary as outlined above. In order for real, productive, interdisciplinary learning to take place, pupils need to be given some kind of meaningful problem to solve or question to answer which will allow them to draw on and develop their understanding of the discrete disciplines of which they already have knowledge.

As outlined above, the key to interdisciplinary working as opposed to multidisciplinary working is for students to be given a task or problem to solve, which requires them to draw on and use their existing knowledge of at least two disciplines. In doing so, they will not only be required to make vital connections between the disciplines but their understanding of the respective disciplines will also deepen and therefore their learning enhanced.

Implementation

When implementing a problem-based interdisciplinary approach, teachers need to be able to adopt facilitative roles, to manage student work without overly directing it, and to support students' efforts to become self-directed learners (Ertmer & Simons, 2006). One of the biggest challenges that teachers face as they begin using these methods is that of assuming a facilitative role (Brush & Saye, 2000; Dahlgren et al., 1998; Frykholm, 2004; Ward & Lee, 2002). In general, the teacher in a problem-based learning approach acts as a guide to help students collaborate to generate solutions to problems (Kolodner et al., 2003). The emphasis shifts from a focus on grades, competition, and public comparison with others to that of enquiry and understanding (Gallagher, 1997). It could be argued therefore that in this type of 'problem solving' scenario where students have the opportunity to work together in

order to discuss ideas and strategies, co-operative learning strategies provide an ideal vehicle of facilitation. Co-operative learning (as defined below), will now be considered as a scaffold for teachers who wish to adopt an interdisciplinary pedagogical approach.

Co-operative Learning

Co-operative learning is a teaching methodology which has been widely used in the United States and Canada over the past 20-30 years. In both countries, a great deal of research has taken place into this style of teaching. Some of the research literature dates from 1980s and 1990s but this is relevant to the UK because it approximates to the current participation and awareness levels in this country, which in many areas are in their infancy. Research into co-operative learning has been less extensive and limited in the United Kingdom but recent work outlined below illustrates how it relates to the learning process.

The Learning process

Researchers such as Desforges (1995) believe that students learn best when they can use their previous experiences, knowledge and skills across 'multiple social contexts' to test and apply their developing knowledge. Jerome Bruner, Howard Gardner and other leading developmental psychologists have demonstrated that some of the natural abilities that children are born with fall into disuse as the school curriculum increasingly narrow the range of skills they are required to use. Gardner's theory (1983) is that everyone has 'multiple intelligences', not one single attribute called 'intelligence' and that it is vitally important to nurture all of those intelligences through the experiences which are offered to children in the classroom and beyond. Eric Jensen (1995, p58) states that 'How smart are you?' is now an irrelevant question. A more powerful new question is, 'HOW are you smart?'

Lev Vygotsky has influenced the works of cognitivists such as Howard Gardner and Robert Sternberg. Vygotsky's theory on learning holds that language is a key and children

should be given opportunities to talk where they feel safe to share their emerging ideas and incomplete understandings. Social constructivists who built on this work believe that it is through discussing ideas and understandings that people are able to develop interpersonal skills. This enables them to express a range of emotions and feelings, to develop them and learn to use them effectively. Unlike Piaget's notion that children's development must necessarily precede their learning, Vygotsky argued that "learning is a necessary and universal aspect of the process of developing culturally organised, specifically human psychological functions." (1978, p.90). In other words he believed that social learning tends to precede development.

Vygotsky described a 'Zone of Proximal Development', known as 'ZPD', which refers to the transfer of knowledge and understanding which can take place within a group situation. His theory holds that everyone has a ZPD which can only be developed effectively through working with others. This view does not ignore the importance of personal reflection and thinking time for individuals which is also an important part of the learning process. It does hold however, that learners should have specific opportunities to work *co-operatively* as groups rather than simply sitting in groups and interaction is of paramount importance. Indeed more recent commentators such as Andrew Pollard agree, stating "The responsibility of teachers is to interact with children so that they actually learn not simply to expose then to subject matter and drill." (Pollard, 2002:138).

Co-operative learning is one way of allowing children to share their learning experiences with others with the aim of achieving optimal learning. As well as raising academic achievement, co-operative learning it is claimed, is effective in improving relationships and general behaviour within the classroom. Various reasons are given for this and these are considered below.

Co-operative learning is a highly structured approach to learning in order that a set product is produced. Five essential components of co-operation are identified by Johnson, Johnson and Holubec (1986) as:

1 - <u>*Positive interdependence*</u> - group members perceive that they are linked with each other in a way that one cannot succeed unless everyone succeeds. This should create a commitment to the success of group members as well as one's own.

2 - <u>*Face to face promotive interaction*</u> - real work is done together where students promote each others success by sharing resources and helping, supporting, encouraging and applauding each others efforts to achieve.

3 - <u>*Individual and group accountability*</u> - the group must be accountable for achieving its goals and each member must be accountable for contributing his or her share of the work.

4 - <u>*Interpersonal and small group skills*</u> - Social skills must be taught to students so that they build strengths in areas such as leadership, decision-making and trust building which will empower them to manage both teamwork and task work successfully.

5 - <u>*Group processing*</u> - group members discuss how well they are achieving their goals and maintaining effective working relationships.

This type of structured group formation and methodology provides an ideal scaffold for teachers wishing to develop problem-based interdisciplinary group work into their classroom. Not only this but some of the claimed advantages of co-operative learning are identical to those of the claimed advantages of interdisciplinary work itself e.g. promoting higher order thinking skills. The possible benefits of using co-operative learning are now considered.

Claimed Advantages

Allowing children to work together with their peers on co-operative tasks has been shown by research to have a considerable number of benefits. Some of the most significant findings and claims are that co-operative learning leads to –

1. *Improved self-esteem, motivation and engagement*. Everyone achieves. Pupils are encouraged to help each other work towards a common goal. This in turn raises the performance level of all group members as opposed to individual achievement. It helps to

build a supportive environment where everyone's contribution is valued. According to Johnson & Johnson (1991), co-operative learning has been shown to be particularly beneficial in raising self- esteem and achievement in low achieving students. They say that nothing motivates more than a sense of achieving a meaningful joint goal because this will make someone else's life better.

2. *Increased academic achievement.* Students working together are more actively engaged in learning rather than passively listening to the teacher. Interacting with other pupils helps to develop problem solving skills. They are also more likely to be motivated, remain on task and retain more information about what they are learning. It is argued that students, including the most gifted, make sense of and retain much more of the curriculum when they participate in co-operative learning. Researchers such as Slavin (1990) for example, argue that not only does co-operative learning benefit the lower achieving pupils but that 'gifted' pupils are likely to be the primary beneficiaries as they are the ones who will probably provide the most elaborated explanations within the group.

3. *Widened social relationships and better behaviour within the class.* Social skills and communication skills are taught and improved. Pupils develop the ability to reason and debate and learn to value other people's point of view. It promotes positive relations by helping pupils to understand their differences and resolve conflicts through discussion and mediation. Indeed one of the main elements of the co-operative strategy is that social skills play an integral part and all lessons have a social and academic element to them.

Gillies (2004) conducted a study which concluded that the behaviour of children in groups was better if the groups were structured (adhering to the five basic elements of co-operative learning as outlined above), as opposed to unstructured.

4. *Improved thinking and language skills.* Students are helped to formulate ideas. They ask and respond to questions, giving and receiving feedback. In addition to developing good listening skills, pupils working together must be able to present their ideas clearly and coherently. Cohen et al (1989) suggests that the nature of the task itself is of the utmost importance and pupils should be required to use their differing abilities to contribute to the

group. If tasks are challenging or uncertain this impels students to think for themselves and interact to produce a solution. A challenging interdisciplinary problem-based project fits this criterion perfectly.

Gillies (2004) also found that children in structured co-operative learning groups gave more unsolicited and solicited explanations than their peers which provided elaboration on issues and were more likely to facilitate understanding and learning. Children in structured groups in this study also attained a higher learning outcome score than their peers. Gillies and Boyle (2005) emphasise the importance of teachers modelling or scaffolding communication and thinking skills for pupils in ways which challenge understandings and enable a clearer focus on the problems to be solved or task to be completed.

5. *Self- management skills.* By encouraging pupils to take more responsibility for their own learning they need to ensure that they understand the task to which they will contribute. They also become adept at checking other group members have fulfilled their part of the task, completed homework assignments etc., so that all members can contribute and work as a team.

6. *Improved teacher/pupil interactions.* Ward and Craigan (1999), draw on the work of Kessler, Price & Wortman to point out that in a traditional classroom when a teacher calls upon a student, he/she becomes the focus of attention for the entire class. By contrast in a co-operative learning situation the focus of attention is diffused among the group. When an answer is presented to the class it represents the work of the entire group. This it is claimed, reduces the fear of answering out and reduces classroom anxiety, promoting an atmosphere of nurturing not criticism.

7. *The principles of democracy.* By participating in a co-operative environment where all children are given a role to play and are seen as equal, they learn the basis of how democracy actually works. Apple and Beane (1990) argue that this is a crucial part of the democratic way of life. Are co-operative groups truly democratic however? It could be argued that the fact the teacher structures the group and allocates roles and responsibilities, means that he/she is very much in control. The teacher in effect is also able to create a

hierarchical structure within the group before the pupils even begin their work. For example the role of the 'scribe' or 'writer' is always a very powerful one as this is the person who interprets the thoughts of the group as they see fit and commit them to print. The 'pen' is mightier than the sword as the saying goes! So whether true democracy is experienced by group members is debatable.

Inclusion. The issue of inclusion has been given a high priority by the Government in recent years. Mara Sapon-Shevin (1991) is among those who claim that co-operative learning allows children with different backgrounds and experiences to learn from and teach one another. She claims that teachers of students with learning and behavioural challenges have found that co-operative learning provides an ideal structure for integrating students into mainstream education. It could be argued however that bullying behaviour within a group could have the exact opposite effect.

Possible Disadvantages

Although there appear to be many benefits of co-operative learning, writers such as Pica and Szostek have been more critical. For example Szostek says "..co-operative learning is not a panacea. It cannot and should not be used to replace all other types of teaching and learning." (p259, 1994). Indeed research into how it is experienced by young people reveals that they do not always find it as rewarding or constructive as adults imply.

Cowie and Berdondini (2001), claim that children and young people do not always share a commitment with the adults who organise them towards the goal of a group. They also say that groups do not always work well together. Cowie et al (1994) provide evidence of the disruptive effect that domineering or bullying behaviour can have on small group work and they also document the difficulties experienced by many teachers when they try to create a co-operative working environment in certain groups, particularly where group members engage in bullying behaviour or sabotage activities designed to promote a climate of co-operation. It would seem that in order for groups to work successfully, the nature of how groups work and interact has to be considered carefully. Contrived group formation,

the teaching of social skills and perhaps counselling for disturbed pupils may all well play a part in overcoming these problems.

According to Slavin (1990), there is sometimes a fear among parents that co-operative learning leads to the more able child being exploited as 'junior teachers' within the groups. Slavin however dismisses this fear as unfounded claiming that in most co-operative group work, pupils will be exposed to the same curricular content as they would in more traditional classes and will actually retain more if they are given the opportunity to articulate their thoughts and ideas.

Method over Content?

Biest (2009) highlights an area of concern which he feels is currently prevalent in Scottish education and this is something he refers to as 'learnification'. Learnification is the idea that there is too much focus on *how* to teach and less focus on *what* to teach. Is there now an over emphasis on giving pupils skills as opposed to knowledge? Surely if co-operative learning is to be used successfully in developing thinking, creating knowledge and raising attainment there must be more concentration on the *types* of challenges given to pupils and the disciplinary understanding to be employed in solving them. The sanctity of content should not be ignored (Bonnet, 1995). The nature of the task itself is surely vitally important and should provide enough academic challenge to the pupils to impel them to think 'outside the box' making cross curricular links in a truly interdisciplinary fashion.

Barriers

Within the area of co-operative learning, there is a cornucopia of activities recommended as ice-breakers, social skill builders, energisers etc. None of these activities however have an academic focus and it is therefore possible for a teacher to falsely believe that he/she is using co-operative learning successfully. This relates to the problem of transferability and as Hargreaves (1999) points out, disseminating information can be difficult even on a very small scale. For example, teachers in the same school, sharing their ideas (internal dissemination),

may have problems with both the transferability and transposability of knowledge.

Transferability problems may occur if what is said by one teacher is not understood or understood in the wrong way by another. And transposability problems may occur if what works in one class may not work in another. This may be due to a variance in the number of children involved or different classroom layouts for example. Co-operative learning therefore can be understood and used very differently by teachers not only within the same school, but also the same department. How much greater must these differences be across an authority far less a country?

Teachers who begin to plan interdisciplinary co-operative lessons may find that there are limited commercial materials available for classroom use. Traditional textbooks and curriculum guides often do not contain adequate resources to support teachers. Teachers then have to find or create the materials themselves. This process can be difficult for teachers who feel they do not have free time to spare, especially when materials are readily available to support traditional lessons that cover the same content (Ward & Lee, 2002). In order to cope with problems such as these, teachers must therefore learn to work together more effectively. In order to enable the change in thinking needed by teachers to establish interdisciplinary, co-operative practices within schools there has to be the facilitation of generative dialogue (Boreham and Morgan 2004) between teachers – the formation of spaces where genuine exploration of cultural alternatives to existing practice may occur.

Way Forward

Most of the current major educational reforms today, call for extensive, meaningful teacher 'collaboration' and 'collegiality' within schools. This seems to be based on good evidence. For example, researchers such as Little (1990), and Friend and Cook (1992), have found that more effective schools can be differentiated from less effective schools by the degree of teacher collegiality, or collaboration they practice. Hargreaves (1999) states that collegiality is quickly becoming one of the 'new orthodoxies' of school improvement and change within education. He suggests that collegiality has become the key to change among many

reformers and administrators. But what is meant by collaboration and collegiality? There seems to be much confusion over exactly what these terms mean.

Friend and Cook (1992) provide a very general definition of collaboration. They say: "interpersonal collaboration is a style of direct interaction between at least two co-equal parties voluntarily engaged in shared decision making as they work toward a common goal" (p. 5). This however could cover a multitude of activities teachers engage in regularly, eg. liaison with stage partners, staff meetings, working parties and curriculum development meetings.

Hargreaves (1994) has adopted a micro-political perspective to analyse collegiality. He discusses the idea that collegiality and collaboration can be imposed on teachers as an exercise in organisational power. This he calls 'contrived collegiality'. He distinguishes this from 'collaborative cultures' which he says "emerge primarily from the teachers themselves" (Hargreaves, 1994, p.192). According to Hargreaves, collaborative cultures are characterised by being spontaneous, voluntary, development oriented, pervasive and unpredictable in outcome as opposed to administratively regulated, compulsory, implementation oriented and predictable in outcome. A collaborative culture, as defined by Hargreaves, could potentially enable and may even be a prerequisite of, the development of a truly interdisciplinary approach to teaching and learning within a school.

Conclusion

Within Scotland there is a growing interest in the area of interdisciplinary working as a means to achieve the aims and objectives of Curriculum for Excellence. There are concerns however that the true nature and potential of interdisciplinary work may be misunderstood by some teachers and this is a missed opportunity for enabling students to reach their full learning potential within schools.

As illustrated above co-operative learning can provide a structured scaffold for teachers wishing to facilitate a problem-based, interdisciplinary teaching approach where

students work together in groups, but that as yet there is little evidence in the Scottish context that co-operative learning in itself raises attainment.

The potential problem that discipline knowledge and lesson content may be sacrificed for methodology has also been highlighted above. As teachers grapple with adapting their teaching styles to accommodate the demands of the new curriculum it may be that schools where a co-operative approach is being promoted will have to concern themselves more with the *nature* of the tasks that co-operative learning is being used for to see if there is a skills based or knowledge based focus for learning and to see if real interdisciplinary working is being achieved through it.

If interdisciplinary learning is better understood through professional dialogue and teacher collaboration, and employed rigorously using a co-operative approach, there is the potential to enhance the learning experience of all Scottish pupils while also stemming the tide of 'learnification' within our education system.

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