

# **A virtual learning environment in primary education**

Miles Berry

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“A fully integrated VLE [may] not be appropriate for a primary school at this stage in VLE development” (Becta 2003)

## **Introduction**

Virtual learning environments (VLEs) are claimed to offer schools a number of benefits, such as anytime, anywhere access, improved motivation, access to higher or novel learning styles, opportunities for independent learning, better integration of information and communication technology (ICT) tools, and increased parental engagement (Becta 2004). Indeed, Europe wide, there is a perception that VLEs can be

“Facilitators of changes in education and pedagogy towards more learner centred approaches, enhancing interactivity in learning [and] helping constructional knowledge building” (EUN 2003, p21).

There is, in what is still a relatively young field, some confusion over the use of terms in describing this technology. In UK further and higher education (FE, HE), the Joint Information Systems Committee’s (JISC’s) definition seems the most widely accepted:

“A VLE is an electronic system that can provide online interactions of various kinds that can take place between learners and tutors, including online learning” (JISC 2003),

although it is interesting to note that more recent documentation for schools refers to ‘Learning Platforms’ (Becta 2005), with perhaps a greater emphasis on the presentation of content rather than the provision of tools for communication and collaboration.

Although it is possible to trace the history of VLE style tools back to the earliest days of educational computing (Inglis et al 2002, p13-14), widespread

availability of the technology is quite recent and, it could be argued, much of its present use may be motivated by technological advances rather than educational needs (Esiensadt & Vincent 2000). VLE usage at present is concentrated in the FE & HE communities, where it has been taken up with some enthusiasm (Inglis et al 2002), however, “the school sector VLE market is still very immature” (Gill & Shaw 2004, qv BECTA 2003 p16), and, although there is a growing interest in the use of VLEs within secondary education, there is little evidence of more than isolated use within primary education (BECTA 2003). Consequently, the studies that have been undertaken of the use of this technology are restricted to FE & HE, or occasionally secondary education, and in this latter case are frequently developer funded and thus may be accused of lacking objectivity. Therefore, the author has undertaken a small scale pilot study of VLE implementation in his own teaching, in the hope of assessing the effectiveness of this technology, particularly in regard to pupils’ attitudes and approaches, and measurable learning gains.

## **Context**

The author is deputy head of St Ives School, Haslemere, an independent day preparatory school for girls aged 3-11. St Ives has about 150 pupils on roll, and is essentially non-selective. It prides itself on a broad curriculum, but also provides specialist, subject based teaching for year 5 and 6 pupils, and to a lesser extent for younger pupils. Class sizes are generally small, and the level of IT provision is relatively good, despite this being funded entirely through fees income, in which IT costs need to be balanced against other calls on limited financial resources, such as books and teachers. Situated in the affluent southeast, parents are supportive of their daughters’ school work, and almost all have home computers connected to the Internet.

The author is responsible for the Year 5 and 6 mathematics curriculum, and it is in these classes that VLE use has been piloted. Whilst the national numeracy strategy is followed up to year 4, the two senior forms follow an accelerated

programme, focussed on preparation for high stakes entrance exams in the January of Year 6, using the University of Plymouth's Mathematics Enhancement Programme resources, many of which are available online (CIMT, 2005). The approach used in these lessons aspires to social constructivist ideals, in which the class is seen as a learning community in which shared understanding is co-created, thus there is a commitment to interactive whole class teaching rather than a preponderance of individual or group work. Furthermore, in addition to the now common place daily mathematics lessons, a daily maths homework is set for these classes, and it was in this latter context that the VLE was to be primarily used.

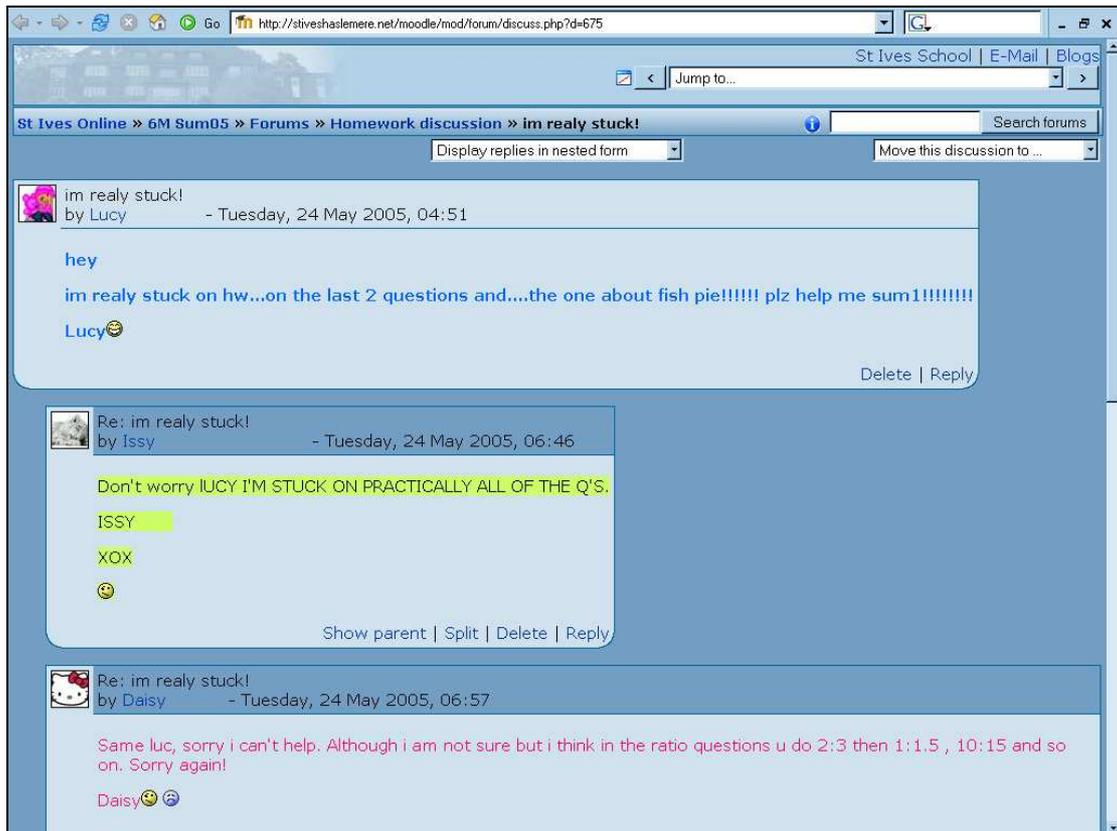
### **Pilot study**

The open source virtual learning environment, Moodle (see <http://moodle.org>), was selected for the pilot study, as it:

- Was free, and would run on the school's existing web server;
- Was grounded within a social constructionist pedagogy, close to that prevalent in these classes' lessons;
- Provided all aspects of core VLE functionality, such as calendars, homepages, chat, forums, resources, shared workspace (wiki), content creation, online assessment; and
- Was open source software and thus was adaptable within an action research framework, and itself exemplified the social constructivist approach described above.

The model adopted for the pilot study was to take the best aspects of the social constructivist classroom approach and use the VLE technology to make them available to pupils at home via the Internet.

Therefore, online tools were provided to facilitate synchronous and asynchronous one to many and one to one communication, focussed on mathematical discussion, thus making it possible for pupils to get help from one another or from their teacher when challenged, and providing a place in which they could explain their mathematical thinking to others.



Just as in class, pupils were used to receiving immediate feedback on their progress and attempts at questions, so the automatic marking of homework provided a similar feature at home, with the opportunity to re-attempt questions. This allowed pupils to learn from mistakes and make homework an opportunity for fresh learning rather than mere reinforcement:

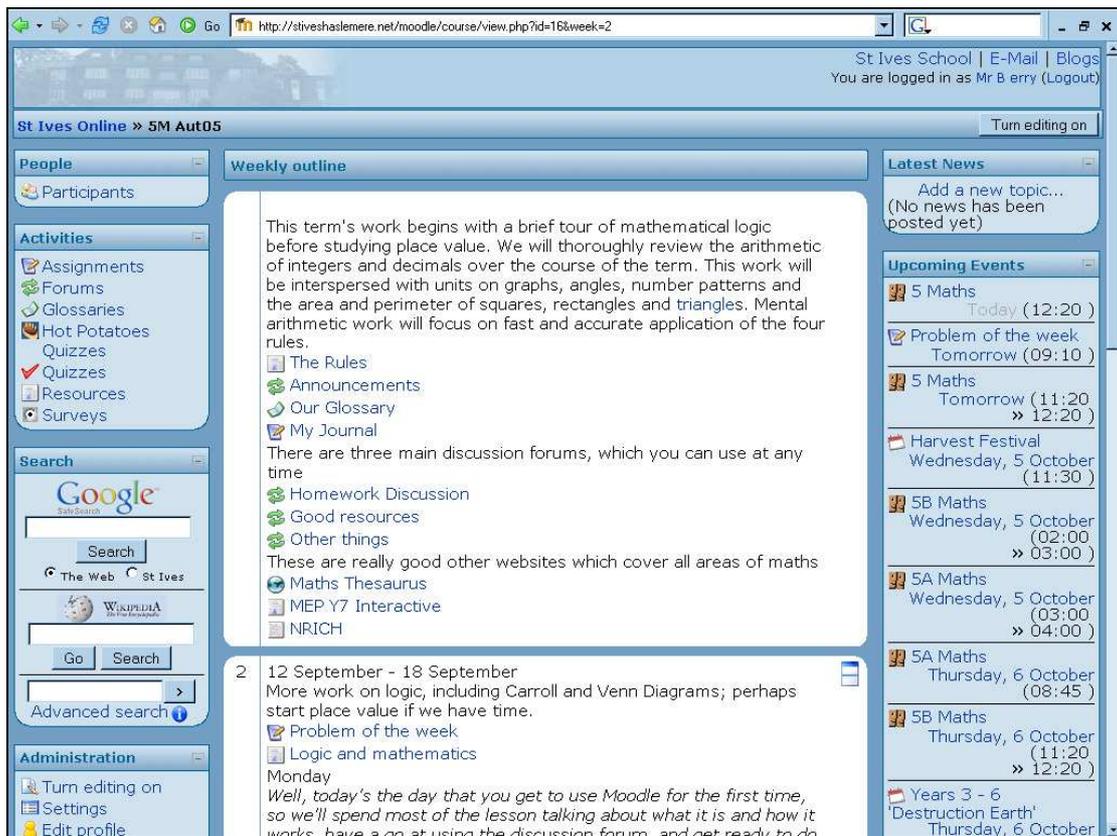
The screenshot shows a Moodle quiz review page with the following content:

**1 (780)**  
 Marks: 8 Calculate:  
 $3 \times 6 + 5 \times 7 = 53$   
 $7 - 4 + 8 \times 3 = 27$   
 $3 \times (2 + 9) - 3 \times 7 =$    
 $6 \times 4 + 8 - 2 = 30$   
 $6 \times (3 - 1) - 4 \times 7 =$    
 $8 \times 9 - 33 \div 3 = 61$   
 $7 \times 4 + 4 \times 3 \div 2 =$    
 $(4 - -7) \times 12 \div 3 =$    
 Partially correct  
 Marks for this submission: 5/8.

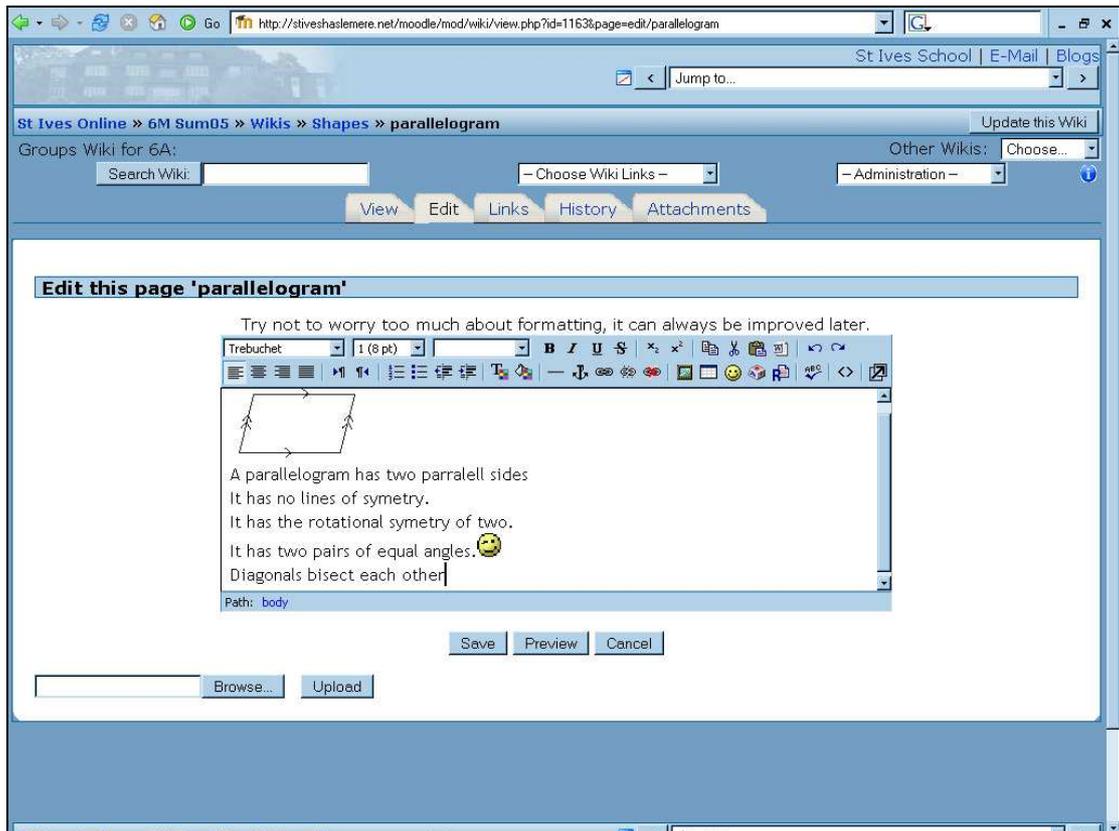
**2 (782)**  
 Marks: 4 Fill in the missing numbers:  
 $5 + 7 \times 4 = 33$   
 $(6 - 4) \times 4 = 8$   
 $(5 + 10) \div (4 - 1) = 5$   
 $(6 + 9) \times (8 - 6) = 30$   
 Correct  
 Marks for this submission: 4/4.

**3 (781)**  
 Marks: 4 Put brackets into each expression to make it correct:  
 $3 \times 4 + 7 = 33$   $3 \times (4 + 7) = 33$   
 $15 - 7 \times 2 = 16$   $15 - 7 \times 2 + 16$   
 $6 - 4 / 2 + 3 = 0.4$   $(6 - 4) / (2 + 3) = 0.4$   
 $3 + 7 \times 8 - 5 = 30$   $3 + 7 \times 8 - 5 = 30$   
 Partially correct  
 Marks for this submission: 2/4.

As in any good primary classroom, a range of resources are made available to the children, who thus have the opportunity for more independent work, as well as reinforcement or extension where appropriate, so the Moodle installation provided links to a range of general Internet resources, such as a filtered Google search, Wikipedia, an interactive version of the textbook, a maths dictionary and the NRICH website, as well as specific reinforcement or extension resources linked to each lesson's objectives.



Again, the opportunity to work together on a shared task, readily available in the classroom, was provided via the Internet using discussion groups, collaborative glossaries, and most importantly wiki activities, in which all users could contribute to and subsequently edit a mini website; this proved particularly effective for vocabulary or research type homework.



Furthermore, Moodle made it possible for pupils to review class work after the event, either before tackling homework questions, or as an aid to revision later. Initially, pdf copies of interactive whiteboard work were made available this way, but more recently the board work and audio of the introductory phase of the lesson has been recorded as flash movies.

The screenshot shows a Moodle resource page titled "Friday's lesson (past paper review)". The main content is a geometry problem: "10. (i) Draw, as accurately as you can, a triangle ABC where AB is 6.5 cm, AC is 7.2 cm and angle BAC is 90°." The solution shows a hand-drawn right-angled triangle ABC with AB = 6.5 cm, AC = 7.2 cm, and angle BAC = 90°. A protractor is used to draw the 90-degree angle, and a ruler is used to measure the sides. The length of the hypotenuse BC is measured as approximately 9.8 cm. The page also includes a toolbar with various drawing tools like a ruler, protractor, and triangle.

10. (i) Draw, as accurately as you can, a triangle ABC where AB is 6.5 cm, AC is 7.2 cm and angle BAC is 90°.

6.5 cm  
A 90° C  
7.2 cm

(ii) Measure the length of BC.

Answer: BC = 9.8 cm (1)

(iii) What is the perimeter of the triangle?

Answer: 23.5 cm (2)

## Perceived benefits

The instant feedback provided by online assessment has been greatly valued by pupils, who have used this to take greater responsibility for their own learning, and have been thus motivated to correct their work and thus learn from their mistakes. Furthermore, ready access to assessment data before the following day's lessons has allowed the teacher to address collective or individual misconceptions immediately.

As pupils can readily get help when challenged by work, either from their peers or their teacher, this has provided further opportunity for homework to encompass fresh learning, instead of being limited to the reinforcement of already assimilated ideas. Similarly, provision of the discussion forums has, it appears, made pupils more confident in discussing their mathematics, with a consequent improvement in technical vocabulary, both within the online forums and in class:

"I think I've worked out the age one by using algebra. So lets say their names are Meridith, Grandma and Sally to make it easier to cope other wise you have to different s's. So  $M + S + G = 119$  ( you have to scroll down to see all of it)

$$2s = G, M = s/2$$

$$s/2 + S + 2s = 119 \text{ therefore}$$

$$3 \frac{1}{2} s = 119$$

$$\text{so } s = 119 / 3.5 = 34$$

$$\text{so.... } S = 34$$

$$G = 68$$

$$\text{and } M = 17$$

Is this right Mr Berry and is there an easier way? also could I do this with the money one?" (Christy, Y6)

It was particularly encouraging that those pupils seen as relatively shy in class exhibited no such reticence in contributing to discussions within the VLE.

Analysis of the log files, and anecdotal evidence, suggested that pupils have valued the opportunity to look back over work, particularly in preparation for entrance exams and Key Stage 2 assessments. Similarly the sense of community engendered by the VLE has been appreciated, especially by those who have been absent from school, or whilst revising over the Christmas holiday. Indeed, long-term absences from school no longer result in missed work or the need to catch up, as individuals are able easily to keep up with lesson content and homework.

Use of the VLE has resulted in an improvement in pupils' computing and typing skills, alongside their mathematical development. Furthermore, as Moodle is open source software, the pupils have gained some awareness of the processes involved in software development, and were delighted when their ideas for new features, or their occasional bug reports, made it into a new release.

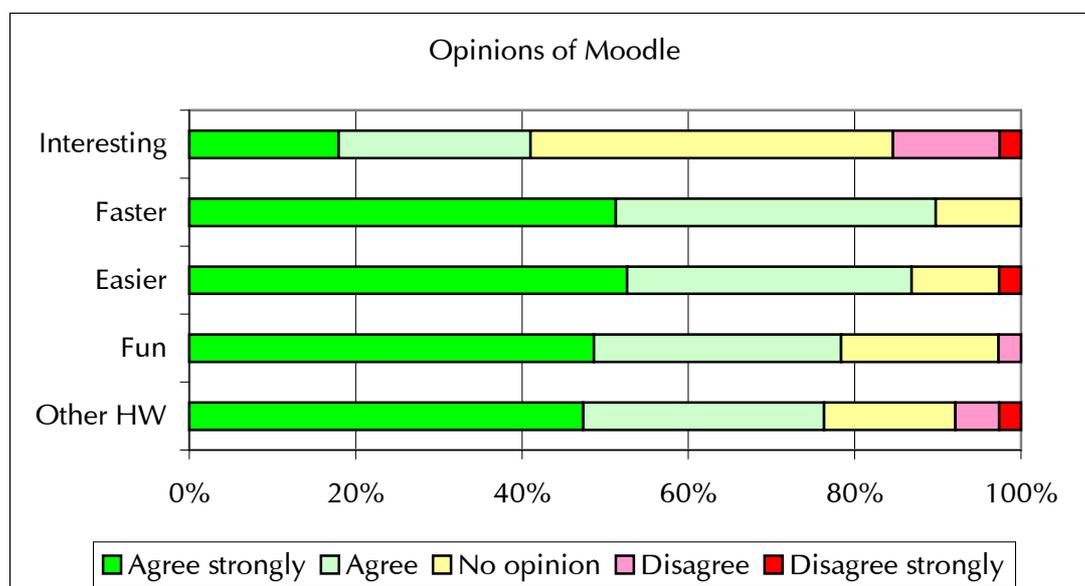
Although Moodle presents an unashamedly social pedagogy, its use at St Ives has done much to promote learner independence and autonomy, as on the occasions when differentiated homework has been set, the pupils themselves have had the opportunity to select from the range of activities available, and lesson introductions recorded for one set have been made available to all. Similarly, whilst the homework 'quizzes' have been mandatory, other resources and activities have been left for learners to select for themselves, further promoting their sense of responsibility for their learning.

From a management perspective, access to lesson plans, resources and assessment data provides a valuable tool for institutional knowledge management, the opportunity to share content and courses across institutional boundaries would facilitate a collaborative approach to the construction of learning materials and curricula, and access to the VLE's log files permits highly sophisticated multivariate data analysis, using data mining techniques.

## Pupils' evaluations

During the second term of the study, the year 6 pupils undertook independent statistical investigations. One pupil chose to survey the opinions of the year 5 and 6 pupils on the use of the VLE, using five questions, each measured on a 5 point Likert scale:

- "Moodle makes homework more interesting"
- "Homework is faster using Moodle"
- "Homework is easier using Moodle"
- "Homework is more fun using Moodle"
- "I'd like other homework to be done through Moodle"



(Source: Francesca, Year 6)

Further analysis indicated significant differences on speed (y6 found it faster than y5), interest (y5 found HW more interesting than y6), and use for other homework (set B were more in favour than set A).

As part of the evaluation of the pilot, pupils were asked for brief comments on their overall impression of Moodle over the course of the year. These were almost entirely positive, and the following give some flavour of the views expressed:

"This has been a great year for maths. I loved moodle." (6A)

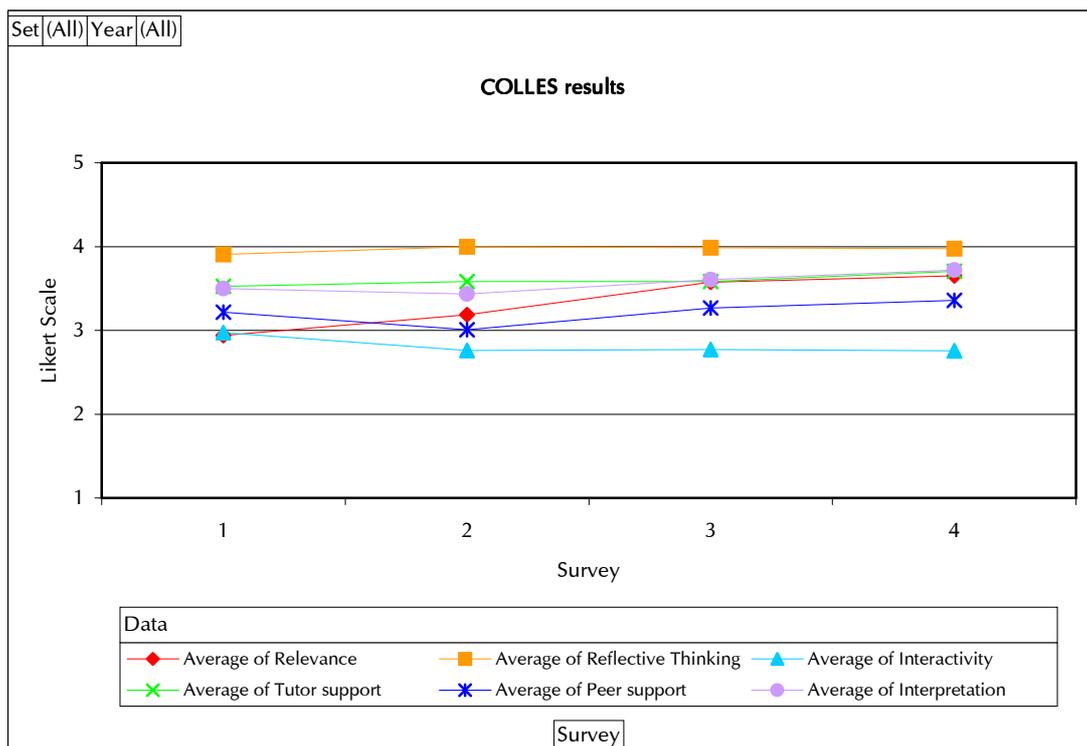
“Its a great way of doing home work and its fun!!!” (6B)

“I really like to use moodle because I find homework disscusion really helpful” (5A)

“I like the idea of homework on the computer and homework disscusen when your stuck.” (5B)

### Analysis of impact on pupils’ attitudes and approaches

A modified, simplified language, version of the Constructivist On-Line Learning Environment Survey (Taylor & Maor 2000) was used to measure the impact of Moodle usage on pupils’ attitudes and approaches to their studies. The on-line survey instrument consisted of 24 statements measured using 5-point Likert scales. The statements are grouped into 6 clusters, to provide an overall indication of the perceived level of relevance, reflective thinking, interactivity, tutor support, peer support and interpretation. It was administered at the beginning of the pilot study and subsequently at the end of each of the three terms. Pupils were assured of anonymity. Regrettably, no control group data was available, and so it could be argued that such changes as were measured may not be a direct result of the introduction of the VLE.



A paired sample t-test between the initial and final survey indicated a significant overall improvement in the degree to which pupils perceived these qualities ( $p=0.03\%$ ). Scores on several of the individual statements showed a significant improvement over the course of the pilot study:

- “I have found the work interesting”
- “When we start a topic, we talk about things in the real world”
- “The things I learn help me to understand the world better”
- “I learn how the things I’m taught will be useful for me when I leave school”
- “The teacher makes me think”
- “The other pupils encourage me to join in”
- “Other pupils make good sense of what I say”

Only one of the statements actually showed a significant decrease over the course of the year, and this may be worthy of further investigation.

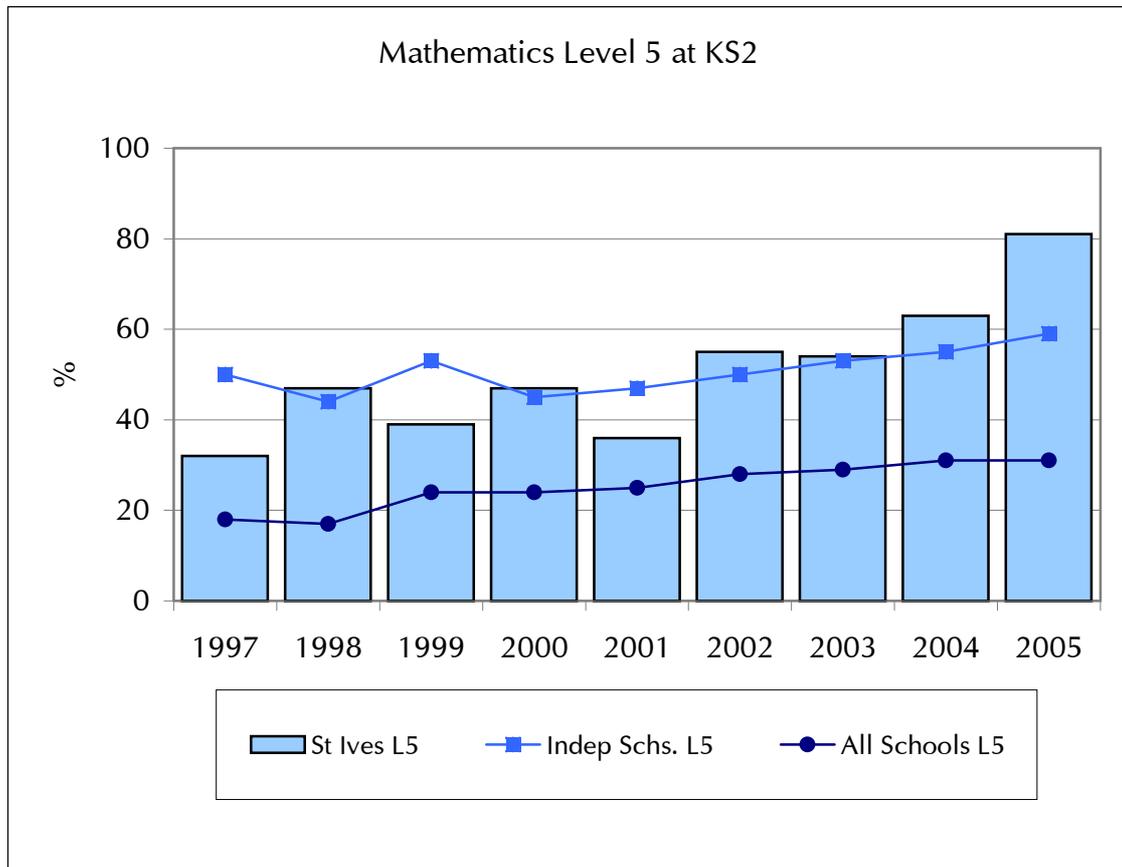
- “I ask other pupils to explain their idea”

### **Impact on test scores**

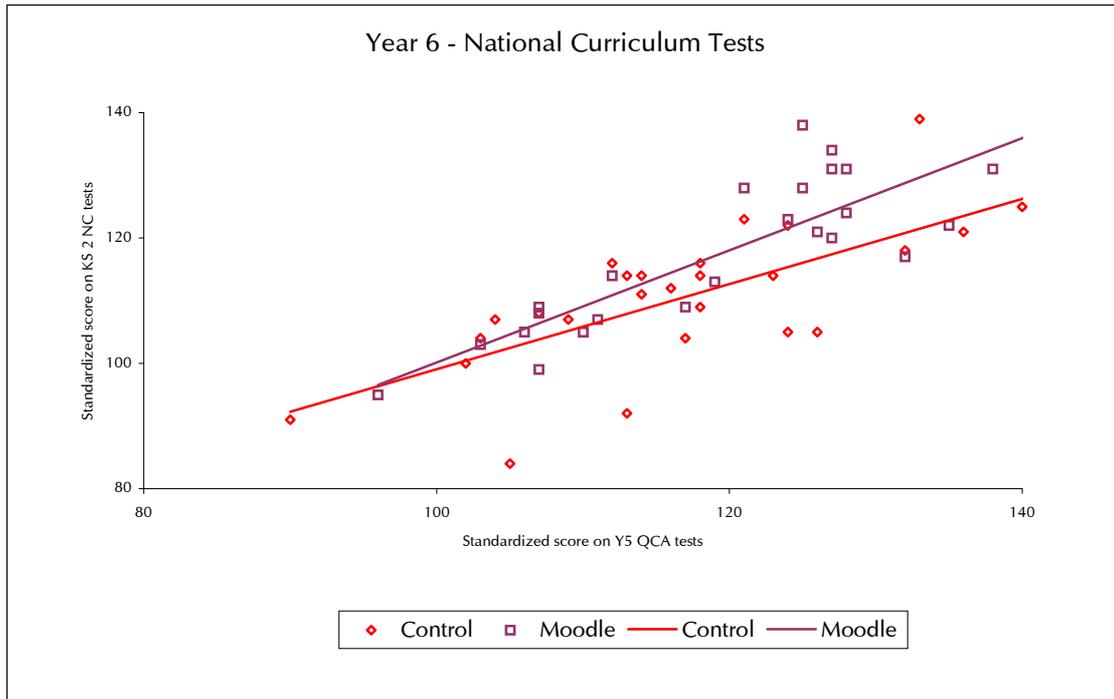
Russell (2001) reports that the vast majority of studies of technological interventions in education make “no significant difference” to assessment results, perhaps because use of a VLE brings wider benefits, as discussed above, than those which can be measured through relatively narrow spectrum paper based testing. Indeed Becta (2003) state that “It is unhelpful to compare VLEs with traditional ways of learning as that misses the point”, and it is possible that present assessment methodologies, in so far as they may reinforce “old style pedagogies and cultures”, actually limit the scope for social, collaborative learning which a VLE like Moodle can promote (EUN 2003).

As St Ives is an independent school, it does not formally participate in the National Curriculum Tests (SATs), and these papers are marked internally, although rigorous procedures are observed to ensure that tests results remain comparable to those of other schools. The year 6 cohort that took part in the

pilot study obtained the school's best ever SATs results in mathematics, with 81% achieving level 5 or above, and 11% being objectively assessed at level 6.



However, this cohort was regarded as a particularly bright one, and so in order to identify Moodle's contribution to these results, a quasi-experimental approach was adopted, in which, wherever possible, all aspects of the curriculum and pedagogy remained unchanged, apart from the introduction and use of the VLE. The previous cohort's test results thus provided control data for the trial group.



Analysis using a more sophisticated, multivariate model, combining both QCA and NFER pre-test assessments, suggested that whilst Moodle may have had a small positive effect on test outcomes, these results were not statistically significant, and amounted to only a 3 point improvement in standardized scores for the Year 5 cohort, and 2 points for Year 6, in addition to the progress which the school would normally expect to see over the course of these years.

However, analysis of the individual residuals above or below the cohorts' respective trend lines against use of Moodle as recorded in the log files, suggested that those who had adopted a more strategic approach to the use of the VLE, viewing the full range of resources and earlier quiz attempts rather than merely focussing on the present homework activity or discussion, were those for whom Moodle had been most beneficial. Such analysis has subsequently informed the way in which the VLE is presented to classes.

## Conclusion

The pilot suggests that VLEs can offer much to primary aged schools, perhaps particularly when used as part of a blended approach, combining interactive, whole class teaching, with independent online work, which nevertheless maintains a social dimension to learning. The VLE was perceived as providing a wide range of benefits, and evidence indicated that it had had a significant effect in moving pupils' attitudes and approaches closer to a social constructivist model of learning, as well as having some positive, although not significant, effect on test scores, particularly for those pupils who had adopted a more holistic view of their studies. By making use of pupils' home computers, the VLE has made individual access to computing for the curriculum a reality, without additional hardware or support costs to the school, and has done much to strengthen the home-school learning partnership.

The open source development of Moodle perhaps makes it particularly good at promoting a more social, collaborative model of learning within the VLE, going beyond the mere presentation of resources or online assessment. However, for a VLE to have any real impact on institutional knowledge management, robust mechanisms for reusing content, and for linkage to a school's management information system are needed.

St Ives has learnt much from the pilot implementation, and is now building on this work to expand its use of Moodle. The year 5 and 6 humanities curriculum is now supported through Moodle, and 'courses' have been set up to provide for staff administration, a forum for Old Girls to keep in touch, production of the content for the school magazine, and an intranet home page. The school is actively exploring ways of making some of its curriculum available online to other children, including those educated at home or overseas, and would welcome opportunities for collaborative work with other institutions.

Other primary schools wishing to embark on implementing a VLE are welcome to contact me directly via e-mail at [mberry@st-ives.surrey.sch.uk](mailto:mberry@st-ives.surrey.sch.uk). I would recommend that a school starts small, and builds up its own on-site expertise, whilst nevertheless seeking to future-proof such pilot work. An experimental approach has worked well for us, in which we were willing to tweak the VLE as we gained experience in its use, but crucially there needs to be a willingness to work at it, and I'd recommend that schools be prepared to use the tools creatively and build up their own content, ideally in collaboration with others. Furthermore, in order to get the most benefit from using the VLE, it's important that it be embedded into the curriculum, rather than simply bolted on – this of course raises issues of a 'digital divide' and some form of alternative provision for those who don't have access to the Internet at home will need to be made available – in our case, the school's ICT facilities were available for those attending our homework club, but other models are possible.

Finally, for schools using Moodle, I'd strongly advocate joining the online support community at [moodle.org](http://moodle.org), which brings together teachers, educationalists and technologists from all phases of education and from throughout the world. I believe that my own teaching, as well as our use of Moodle, has been immeasurably enriched by participation in this community. To whom, and in particular to Moodle's lead developer, Martin Dougiamas, I owe many thanks for making this study possible.

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