VISUAL INFORMATION IS A FUNDAMENTAL ELEMENT IN LEARNING

GOLDFARB, 2002

ENGAGING PUPILS IN LEARNING:
USING INTERACTIVE VIDEO, QUIZZES, AND GAMES

MirandNet Action Research Report, October 2015

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VISUAL LEARNING, DIGITAL LITERACY AND INDEPENDENT LEARNING ARE HIGH ON THE AGENDA OF OAKDALE JUNIOR SCHOOL IN EAST LONDON.

As a professional development exercise, staff at Oakdale Junior School in East London have been reviewing these teaching and learning strategies with Professor Christina Preston who founded the MirandaNet Fellowship, a professional organisation of thought leaders in education innovation.

Their professional programme, Sprint, is designed to give teachers space to reflect on the ways in which they are currently using digital learning tools and to contribute ideas for improving their teaching and learning strategies. Pupils are also included in the reflection process and all the participants, as co-researchers, receive a MirandaNet award for their contribution to improving achievement in teaching and learning.

The staff decided to investigate whether their growing use of video, gaming and quizzes was enriching their pupils learning and what they could do to improve their practice further. The value of visual learning has also been an element of this exercise.

To develop this professional agenda the staff chose focus on their use of BrainPOP because it has been in use for many years and remains popular.

In her Sprint reflection on how digital technologies are used in the school, Jenny Berriman, the head, talked of her belief that all children have the ability to gain a wealth of varied knowledge and skills.

Digital technologies provide an important opportunity for all children to achieve their full potential. In Jenny's view combining different resources has been a better approach than embracing a 'one-size-fits-all' product solution.

BrainPOP is integral to this strategy particularly as Jenny sees gaming as one means of ensuring that the school motto, 'Learning for Life', is supported, developed and embedded through experiences for the pupils.

OAKDALE JUNIOR SCHOOL

Oakdale Junior school in the borough of Redbridge, East London is a mixed community school of 344 children aged 7-11.

The school performs above national average in the percentage of pupils achieving Level 4 or above in reading, writing and maths.

In 2013-14 they spent £78 per pupil (2% of budget) on ICT learning resources.

2013-14 PER PUPIL SPEND ON ICT RESOURCES

£78

38%

PUPILS WHO DON'T HAVE ENGLISH AS THEIR FIRST LANGUAGE

BrainPOP provides a suite of interactive learning opportunities that are varied and engaging.

In a school that embraces education innovation, Oakdale Junior School in East London, have subscribed to BrainPOP, an education portal that offers cross curriculum games, videos, apps and quizzes.

The videos can be used for exposition to a whole class or chosen by independent learners at home and at school to fit in with a curriculum topic.

BrainPOP resources have been used consistently by the Oakdale staff because the variety of resources and the coverage of the curriculum.

THEORIES OF LEARNING ENGAGEMENT

In the first place MirandaNet Fellows looked at the background to digital learning resources like BrainPOP that offer innovations in learning that expand learning opportunities for pupils.

In particular digital products that offer videos and games provide new routes to explore 'visual literacy'.

VISUAL LEARNING & DIGITAL LITERACY

Visual literacy is an essential 'literacy' for teachers, and one they should be actively exploring and encouraging and helping their learners develop.

Digital platforms, tools and environments have become ubiquitous and it can be argued that visual literacy is very closely linked to digital literacy. These inextricable links between the digital and the visual, affect education as much as any other aspect of our lives (Kuechel 2013).

Visual Literacy is a cross disciplinary competence, and pays an important role in all subjects, and is just as important in the STEM subjects as the Arts and Humanities. Research literature during the past 60 years evidences the benefits of using visual media to support learning. Each later development in technology has contributed new affordances (Kuechel 2013).

But visual literacy is a contested term because the implied analogy with spoken or written language can be misleading and some resources may focus on helping learners to understand visual communication but ignore the need for them to learn to communicate effectively themselves in words.

However, the presence of an established name for this aspect of visual learning does simplify the search for useful resources (Brighton, 2014).

Beaudry (2014) explains how such digital products can enhance a learner's ability to:

- view, understand, analyze and evaluate;
- design and create;
- use visuals and visual representations for acquisition, consolidation and communication and transfer of knowledge

"Visual literacy involves both intra-personal and meta-cognitive as well as inter-personal collaboration.

Visual literacy combines the use of a variety of visual products (lists, tables, graphics, graphic organizers, concept maps, mind maps, argument maps, timelines, systems maps, videos, movies and art) with teaching, learning and assessing processes, and creates interconnections of visual, oral, written, visual representation, numeracy and technological and digital literacy."
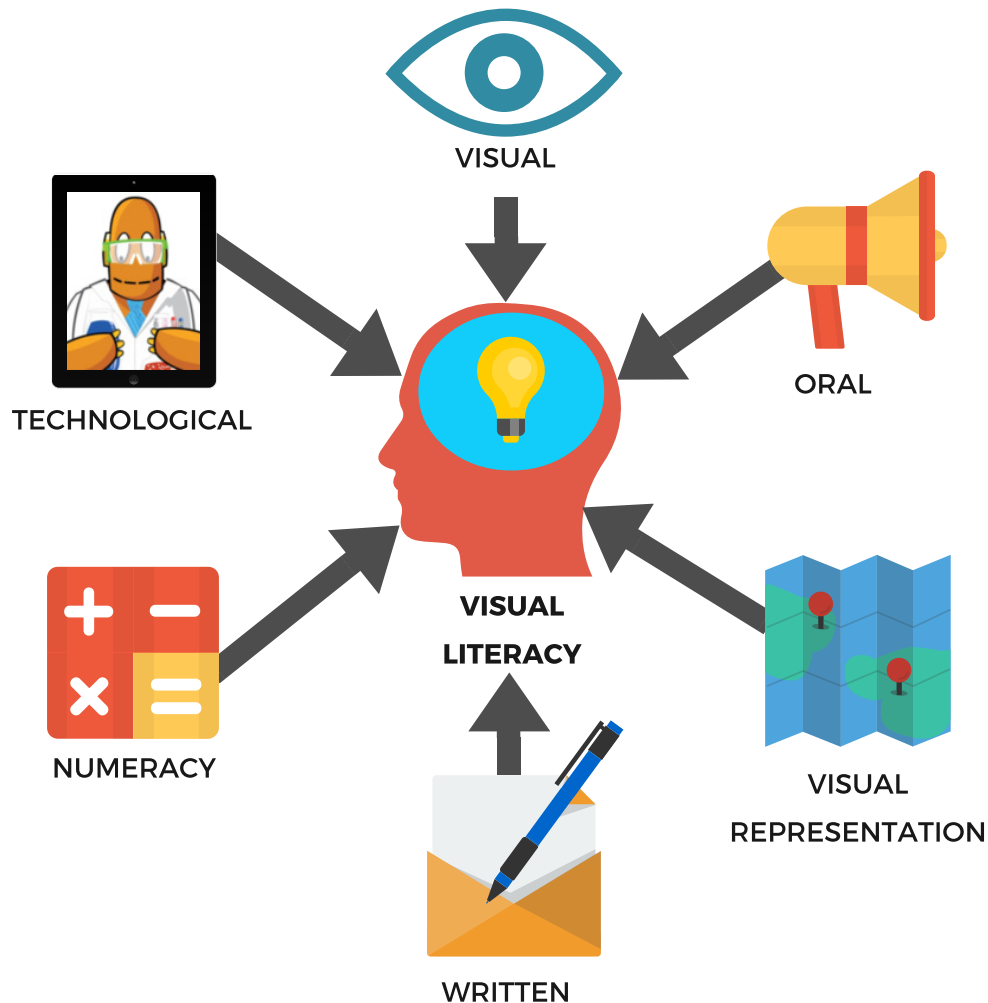

Figure 1: Elements of Visual Literacy (Beaudry, 2014 as adapted from Sinatra, 1986)
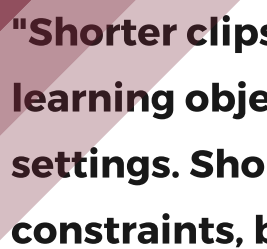
Visual learning helps children present complex information in a way that is accessible and view visual images to promote engagement with the subject. With the support of handheld devices for games, kinaesthetic, visual and auditory learners can benefit as different learning styles can be catered for. Visual learning is known to be effective in teaching and learning. Although digital games are not physical, Douch et al. state that the '...players become skilled at understanding visual images, making mental maps and manipulating 2D images in their mind' (2010:20). Digital game based learning in schools has proven to be an effective tool in order to engage young learners.

Visual information is a fundamental element in learning. It applies to all visual communication media formats including video and games. It offers clear evidence that visual media is effective in supporting and enhancing learning. The pedagogical use of visual media correlate to currently available technologies: images, film strips, slides, movie screenings and, more recently, video, animation and games (Goldfarb 2002).

Computer based Digital Video (DV) has extended the understanding and interpretation of a topic by enabling non linear (non sequential) viewing of video content. Along with the development of DV has come the concept of the clip, - a short self explanatory sequence of video, ideal for illustrating a concept or a process. This is the basis for much educational content - including internet based resources (Kuechel 2013). The new formats allow users to stop, start and replay sequences of video in order to analyse parts of the video, or to illustrate topics selectively by choosing the sections of relevant content.

A recent international survey of 472 educators, conducted by the University of Hull (Burden & Kuechel, 2010) found that the preference of a majority of educators (77%) was for short clips of between 3 and 10 minutes. Most teachers who used video agreed that it is easier to convey concepts and processes using clips rather than software programs.

Clips also allow teachers to make better use of lesson time, a fact also noted by Mardis (2009):

"Shorter clips afford educators the ability to use highly focused learning objects across disciplines and in a variety of learning settings. Shorter clips also address the issue of educators' time constraints, both in preparation and in the classroom."

Internet hosted video emerged during the late 1990s, enabling computers to access video content on the web in as streaming or downloadable data.

The launch of YouTube in 2005 allied faster broadband connections in school signalled a recognition of the growing importance of online video, and advisory bodies such as Naace and Becta (British Educational Communications and Technology Agency) referenced video sites and content in their reports and communications.

By 2006 the quantity of online videos, on YouTube and elsewhere had grown exponentially. In the UK, school network managers reported 1 in 20 web requests were for YouTube videos (Becta 2006). Video clips are now commonly included in interactive media and are included in 'games or quiz type environments'.

Video clips are commonly mapped to curriculum subjects and themes to help teachers incorporate them into their lessons. Denning(?) states a video by itself is unlikely to be more effective for teaching information than a book or programmed learning device on the topic but when used in combination with other instructional strategies, ideas can allow learners to make their own input into learning experiences and to realize the personal importance of learning itself.

Teachers can also provide new contexts and applications. Denning, for example, is aware of the potential for learner interaction with video and argues that in order to move from a passive use to an interactive model teachers must be instrumental in using video and games alongside other pedagogical strategies

It is up to the teacher to develop processes and circumstances to get the most 'interactive learning' value from video and to help bring the video experience into the classroom

The scope of visual literacy in education now extends beyond illustrated content, symbols, diagrams and charts to encompass drawing and painting, moving images, animations and other multimodal formats including games and interactive video.

Visually literate teachers recognise different types of visual content and understand how it can be used to enhance and augment to educational resources and activities. They will be able to present and communicate information and concepts using a range of visual methods (Kuechel 2015). Additionally, Buckingham (2007) suggests that in order to benefit from new technologies, teachers and students need to develop a new critical 'media literacy' that involves writing as well as reading visual and multimodal media.

GAMES BASED LEARNING

Some digital resources exploit the learning potential of games. The success of games in learning is usually attributed to the evidence of high levels of students' engagement. Rather than relying on the mere transfer of knowledge, games provide opportunities for an interactive learning experience in which visual learning is promoted, high-level thinking is stimulated and problem-solving skills can be exercised.

The most well known exponent of games in learning, Gee, proposes that games and gaming strategies can teach us a lot about learning itself (2008). An overview of recent research on games finds that;

- games can hold a student's undivided attention for long periods time.
- the 'goal orientated' of games can increase motivation
- the interactive elements of games may stimulate learning
- the 'levels' in games enable individual progressions
- video games encourage strategic thinking
- video games and simulations enable players to take risks or 'engage' in extraordinary or dangerous activities without encountering real consequence

The fruits of these cumulative developments are now readily available in schools through a range of educational services and content delivered in visual and interactive format including large global platforms such as Khan Academy, Google, and Discovery or companies serving national and local markets such as BrainPOP.

Digital game-based learning has proved to be a positive tool for engaging young learners in other ways as well (Younie and Leask 2013; Cheema 2014; Johnsen et al 2011; Sandford 2006). Digital games are now a part of home life for most young learners with access to different devices (Ofcom 2014).

Yet most games used at home are considered commercial and not designed for educational purposes (Younie and Leask, 2013). However, it is the engagement and attention seeking elements which young learners are attracted to and the same elements can be transformed into educational games. Younie and Leask (2013) refer to the use of fantasy games, puzzle, role play and augmented reality games which can be considered as themes to link to curriculum content.

One of the key aims of introducing digital games in a classroom is to ensure the content is related to curriculum and, therefore, provides an engaging yet educational experience.

This can be achieved through selecting game themes tailored to different learners using varied difficulty levels and accessibility. These approaches are particularly valuable in the areas of English as an Additional Language and Special Educational Needs (Cheema 2014; Douch et al 2010).

As the number of children playing games at home rises, it is also just as important that teachers are correspondingly engaged with the game based learning concept. A study of 1,634 teachers in the UK found that 42% of them never play computer games (Williamson, 2009).

The survey by Sandford et al. (2006) of 924 teachers found that 72% did not play any games for leisure whereas 82% of the children did play games outside the school (2006).

The high percentage of teachers who do not play games will not be aware of the levels of engagement and motivation that games can bring to a child's learning nor how to effectively implement game based learning within classrooms.

This was proved in a recent study of 694 teachers across the Unites States: 23% of teachers agreed that they lacked knowledge about integrating games into instruction; 45% stated insufficient time as a barrier to using games. The study recommended pre-service training because teachers without formal training are not being exposed to the broader range of instructional strategies that can enhance and facilitate digital game integration (Joan Ganz Cooney Centre, 2014).

The suggestion about teacher training in games was made because digital games are known to promote engagement in learning particularly with pupils who are not easy to engage.

Factors that support learning include:

- cognitive development;
- problem solving;
- team work when playing multiple player games;
- variety and fun when learning content associated with different genres.

The element of control over their own learning can prove to be beneficial for most children as the traditional teaching and learning styles do not allow such control.

'As players are given power and control over the flow of events and learning content, learners' engagement and ownership promotes an enhanced learning experience' (Younie and Leask, 2013).

Furthermore, games provide instant feedback which some children see as an instant reward, giving them the encouragement and satisfaction of completing a level while playing the game.

Teachers are advised to consider their strategies before implementing gaming within classrooms. Younie and Leask advise that games should impose a challenge but not a difficult one as learners need to experience success and game satisfaction in order to proceed without doubting their abilities leading to disengagement (2013).

The content should also be appropriate and familiar as children can use the classroom taught knowledge to further develop upon and build existing knowledge knowing the basics of the chosen theme or subject.

Facer (2003) also lists a number of factors that need to be considered before developing games in classrooms:

- pre-set scenarios
- accuracy of content
- saving and restarting
- information to the teacher
- sound; progress
- interface
- challenge and collaboration
- real-world expertise
- time

Despite the challenges of implementing digital game based learning in classrooms, the positive outcomes outlined by most studies show improvements in behaviour, engagement and increased levels of motivation by young learners.

In addition, young learners are now playing and using digital games as a leisure activity at home.

With the appropriate concept and engaging visual and audio elements, digital games can prove to be an effective tool to support teachers with engaging young learners in a number of subjects and different curriculum areas.

OAKDALE'S LEARNING STRATEGY

With her commitment to active and inclusive learning, Jenny is opposed to centralised technology solutions and is agnostic as far as brands go. As a result she has worked with her staff on a variety of digital solutions that fulfil the needs of pupils as they progress through the school.

Her aim has been to facilitate solutions that are integrated and embedded rather than a series of add-ons. In Jenny's view combining different resources has been a better approach than embracing an overall product solution.

BrainPOP is important to this strategy particularly as Jenny sees gaming as one means of ensuring that the school motto, 'Learning for Life', is supported, developed and embedded through experiences for the pupils.

BrainPOP is particularly popular with staff and pupils so Jenny valued the Sprint opportunity to reflect on how to gain the most from the package.

STAFF CONFIDENCE

In the last couple of years Jenny has noticed a tipping point in teachers' understanding about what computers can do. This change can be attributed to the exponential growth of ownership of tablets and smart phones. Now that teachers use these devices competently every day for personal efficiency and fun, they can envisage what education innovation might mean for learners and adapt their lesson plans. They also now have devices in the classrooms for the children to use which stimulated the debate about the new ways to exploit BrainPOP.

Jenny works closely with her deputy, Dawn Hallybone, who is the lead in Computing in the school and also an international expert in gaming in school. Because of her expert interest she bought BrainPOP for the school almost as soon as it appeared on the market. She still feels this was a wise decision as other products were too expensive and too all encompassing to fit in with the digital strategy to promote variety. The cost of BrainPOP at about £1 per pupil per year is affordable.

The value is even greater because BrainPOP is available to parents for home learning. Parents told the teachers that they liked the safe environment as they are concerned about unsupervised use of Youtube. The school also recommends the program to parents asking for ways of supporting their pupils learning.

USING VIDEO IN TEACHING

The Oakdale staff agreed that they use BrainPOP videos as a teaching resource in all key stages in two different ways:

- as a tool for use in planning and delivery lessons
- as a learning tool to provide engaging visuals for various topics

All the teachers used BrainPOP videos as an extra curriculum resource for Science and History: some also used the videos in PSHE, computing, English and Geography.

One outstanding feature in the teachers' discussion was the pleasure their pupils took in BrainPOP humour. Even the top classes who are more sophisticated enjoyed the playfulness and related well to the characters Tim and Moby. In particular Oakdale pupils enjoy the interaction between the two characters which keeps the narrative at the child's level and brings them in.

The blend of video and gaming engages the pupils well in all the subjects but Dawn had found the unit on sex education particularly valuable. The humour between Tim and Moby dispelled some of the tension that teachers and pupils feel in tackling this topic.
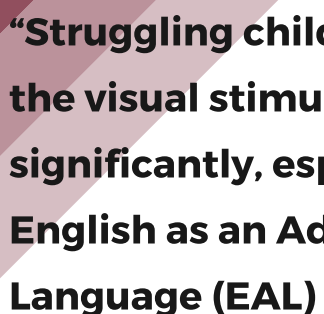
Teachers often use the videos to introduce difficult concepts and agreed that as soon as they announce a BrainPOP video, the children are immediately engaged and excited which is important in motivation to learn.

Patterns of use in teaching varied according to the individual teachers' learning aims and the needs of the pupils they were teaching but overall the teachers agreed that their pupils look forward to, and understand, the routine of watching the video clip and answering the quiz. Because the animated content is funny and engaging, behaviour is good.

Oakdale teachers explained that the format of the video, tool and questions at the end help drive collaboration through class discussion. In addition where a topic is complex, less able children are often pulled up to the next level because they can share ideas with others. One teacher commented:

"Struggling children really find the visual stimulus helps significantly, especially with English as an Additional Language (EAL) students".

EVIDENCE OF LEARNING

Overall the teachers said that evidence of learning is mainly demonstrated by engagement: the fact that the pupils enjoy the videos shows effective learning.

The most important aspect of using BrainPOP was the evidence that pupils were getting to grips with some quite complex concepts.

Often children will come back to discuss the learning - even the weaker pupils.

One teacher was able to provide evidence of learning from the grammar video.

The explanation was quite complex but the children did recall the information on request. Their recall was noticeably better than traditional methods, like a written piece.

Pupils commented that after using the Volcanoes video they could recall the detail on Magma and Lava, evaporation and water cycle quite easily. They also commented that researching the 'Rocks', 'Soils' and 'Black holes' topics on BrainPOP helped them answer questions in class. Another pupil reported helping his father with information he needed for a speech about Shakespeare from knowledge derived from the BrainPOP video on the topic.

PUPIL ENGAGEMENT

Pupils agreed with the teachers that they are quickly immersed in BrainPOP:

"We did not want to stop the session and so we just carried on!!"

Teachers were pleased at the high level of correlation between their views about the most successful lessons and those of the pupils.

For example teachers and children agreed that learning about binary was difficult and that at first the topic seemed incomprehensible. One of the teachers explained,

"In this lesson the children used BrainPOP worksheets to practise the use of binary as an extension to our computing lessons or cryptography recently. After watching the video, children were all able to complete in pairs – with no prior knowledge of binary code."

A pupil described the same lesson from the learner's point of view:

"Binary was really confusing to start with and we did not think we could make sense of it. But re-watching the video really helped explain what it was all about. I had no idea before hand but the video did really help me think about it."

Pupils also agreed that the length of the videos is generally good, and the teacher helps their understanding by pausing and recapping on key points.

The teachers and pupils were enthusiastic about the videos that they used often. Examples of effectiveness were lively introductions to disparate topics like RE and Magnets.

The Magnets video showed usages that really help real life context and extending knowledge.

General comments included:

- help with Science subjects like Space and the Solar System
- understanding flower growth
- sentence structure for English
- descriptions of different religions
- Computing help
- learning about the difference between a dictionary and a thesaurus

Pupils also found the quizzes were particularly valuable for consolidation and to set a benchmark in learning:

"The quizzes are great because they make you think back to what was in the video."

Individual research of the BrainPOP resources at home and at school was also popular with pupils to find resources for project work. Not only did the pupils like learning independently but they found learning was effective in partnerships and discussion in groups:

"The discussion afterwards helps us remember the information and explain in more detail. Discussion after reading books does not work so well as people are at different stages in their reading. Visuals are easier to understand."

The pupils endorsed the humour too commenting:

- "Moby with his humour, really helps to make learning fun"
- "Textbooks can be very boring. The animation in BrainPOP makes learning fun."
- "The characters are amusing and make it easier to learn. Textbooks cannot explain it as well as a video."
- "Moby and Tim help you remember more because they are cartoons and then the quizzes help to trigger your memory."

RE-THINKING PRACTICE

The Sprint programme provided Dawn and her staff with an opportunity to share some thoughts about the practical classroom management of BrainPOP and review their practice in order to increase achievement.

Teachers were already used the service for their own research for lessons but they observed that they were also becoming more inclined to let the children access the content themselves in pursuit of independent learning because the children now have devices available.

One teacher explained how she might structure a lesson using BrainPOP,

"Often I begin with a video to introduce a topic, then clarify my pupils' understanding with a discussion and questions before they embark on an independent task. I often use quizzes to recap and to assess their understanding."

Teachers also praised the flexibility as they used BrainPOP both as an element of a detailed lesson and also to go to at the last minute when the pupils need further examples.

Another teacher also said that being involved in this Sprint research prompted her to think more about how to use fully all the aspects of the product in teaching. She described one example of effective use - the video on animation that was shown to introduce the concept before pupils started on Scratch, the computing language.

The length of video is important: longer than three minutes and the pupils lose interest. One teacher explained,

"It is better to break up the video to allow more recap and conversation with the kids. They are then keen to move on to the next clip."

In this context, videos aimed at older children can be too long and overwhelming. One technique this teacher used was to stop the video in a group viewing but she needed to keep an eye on the length of the video in independent learning – although she commented that the more advanced pupils enjoy the challenge.

LESSONS FROM THE PUPILS

Although the teachers and the pupils agreed on most of the aspects of BrainPOP that produced effective learning there was one significant difference in responses to the games. The teachers did not often mention the games whereas the children played them as much as they watched the videos.

The teachers observing the pupils realised that playing the games on devices is a more absorbing and quieter activity than playing the videos. As a result of observing the pupils playing games the staff decided to revise their classroom balance between games and video in favour of games.

Teachers mentioned that the BrainPOP badge competition worked really well as all children like winning recognition. This competition prompted the pupils to think about the content of the video in detail and explain to others what it was about. BrainPOP rewards for learning were popular and motivating: the badges, certificates and especially the chance to meet Moby.

The introduction of personal devices in the classroom and home access has been effective in promoting independent and self-paced learning. But when all the pupils are running videos on their devices there is too much competing noise. Headphones have been used in the past but they break easily or get lost. As a result the teachers realised that they had reverted to showing BrainPOP videos on the electronic board mainly for introducing a subject in an entertaining way and for revision. They wanted to revisit this aspect of their practice and look for a better combination of independent and whole class learning.

In the future Dawn and Jenny thought they should promote access more so work at home and work sharing could be consolidated more often. They planned to put the home password in the newsletter every month because parents and pupils wanted to be reminded. Currently the school does not have access to their school's BrainPOP usage statistics. In this context a dashboard would be really valuable in helping to build a learning strategy for BrainPOP use across home and school. In addition, Dawn would be able to create incentives for learners who use it at home.

One teacher said, "If we could log the whole class in individually, we could monitor the use, link the video and the quiz to help extended learning. Parents would benefit as much as the students." These statistics would also be valuable for reporting to the Senior Management Team, governors and in evidence for Pupil Premium and OFSTED. One imaginative pupil had an idea to use the statistics for product development:

"If BrainPOP knew how many young people were answering the questions maybe they could change the video if everyone got the same question wrong."

During the discussions staff decided to make better use of planning tool with links to strands of curriculum. A key topic of conversation was whether an alternative strategy might be topic driven.

Some subjects have been topic based in the past and this approach is becoming more important than the prescriptive curriculum strands.

Appropriate metatagging for the videos is there to help teachers whatever the subject and the recommended age range is also included in the lesson plans.

Finally the teachers said they would like more sessions to reflect on their use of BrainPOP and decided to select some pupil champions to be expert in the resources.

CONCLUSIONS

This Sprint study has only been conducted in one school but it provides information that other teachers may find useful in planning how to use digital learning tools.

Sharing professional strategies can be valuable and teachers are becoming more sophisticated in how they use the tools. In the last couple of years, Jenny has noticed a tipping point in teachers' understanding about what computers can do.

This change can be attributed to the exponential growth of ownership of tablets and smart phones. Now that teachers use these devices competently every day for personal efficiency and fun, they can envisage what education innovation might mean for learners and adapt their lesson plans.

They also now have devices in the classrooms for the children to use which stimulated the debate about the new ways to exploit BrainPOP.

The head and the staff agreed that they had learnt from the Sprint process, especially from the children, would like to give more time to ensuring value for money from digital purchases through professional development, particularly an innovation audit and a workshop sharing practice.

Thank you to the staff and pupils at Oakdale Junior school for sharing their insight and feedback

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