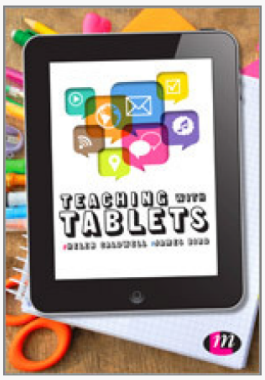
ICT in Practice

Transforming education through sharing knowledge and practice
Created by educators from around the world

ISSUE 11 / SPRING EDITION APR 2015

Can you teach mathematics through digital games, apps and websites?

Teaching with Tablets



Helen Caldwell — *University of Northampton, UK*
James Bird — *Oxford Brookes University, Oxford, UK*

Paperback	03-27-2015	ISBN: 9781473906792	$43.00
Hardcover	03-27-2015	ISBN: 9781473906785	$100.00
Electronic Version	03-27-2015	ISBN: 9781473918726	

LEAD AUTHORS

Helen Caldwell
James Bird

CONTRIBUTING AUTHORS

Clare Fenwick
Christopher Dyer
David Andrews
Sway Grantham
Yasemin Allsop

The presence of handheld technologies in the classroom isn't enough - you need to know how to use them to enhance teaching and transform learning.

As more and more primary schools acquire devices such as iPads and tablets, it is becoming clear that adding them as a classroom resource is not enough. Teachers and trainees need strategies to integrate these into existing learning contexts in a meaningful way. Without this, these fantastic resources lose their value.

This book helps teachers to make the most of these devices in the primary classroom. It offers guidance on:

•how to use tablets to devise meaningful learning activities
•embed them in genuine curriculum contexts, drawing upon case studies from existing practice

It is written for non-specialists and explains technical terms in an accessible, practical way. Each chapter begins with a case study contributed by a teacher using tablets in schools. Real life examples and comments like this give the text a truly practical focus.

CONTENTS

EDITORIAL TEAM

FROM THE EDITOR

Welcome to the 11th Issue of **ICT in Practice.**
In this issue we bring you activity ideas, pedagogical arguments and examples of the use of technology direct from the classroom. It is great to see that teachers are using a wide range of technologies to engage learners with their learning and there are more events than ever organised and run directly by teachers to share good practice.

I believe that having a strong educational technology community is the key to the successful implementation of technology into education and we are so fortunate to have an amazing community to support this in the UK. The recent changes in the Computing Curriculum, was definitely an outcome of the collaborative work of this amazing community. Surely, we cannot dismiss the exceptional work of Computing at School (CAS) in order to prepare schools and teachers to deliver the new Computing Curriculum. I know that the CAS movement has not only had an impact on the UK community but also in other countries around the world using their work as an example to make changes in their community and curriculum.

We are all a part of this community and all have a piece of knowledge to share. It doesn't matter if it was the findings of a well designed action, research or just a personal reflection, each piece of information is valuable for us. So, it is very good that you read about others ideas and use shared resources, but don't just stop there. Be an active participant. Do not worry about what others will think, or if your article is worthy to be published, or if English is not your first language. We are in the same boat. We welcome you our ICT in Practice community.

Remember, the more we share, the more we learn!

Yasemin Allsop, editor ICT in Practice
@yallsop

Eight steps to promote problem solving and resilience and combat

By Phill Bagge
Computing Inspector/Advisor HIAS
CAS Regional Coordinator
CAS Primary Computing Master Teacher
CAS Primary Group facilitator http://code-it.co.uk/resources/phil2.jpg
Computing Planning @
http://code-it.co.uk/
http://www.pythoncode.co.uk/
http://www.ictvideohelp.co.uk/

In my experience learnt helplessness is particularly prevalent in Computing/ ICT. In the last three years I have taught nothing but computer science in six primary schools, over 1200 hours and have seen learnt helplessness in varying degrees in all of my schools.

In this article I will look at what learnt helplessness is and how it will manifests in computing lessons. I will also suggest reasons as to why pupils have learnt this strategy and offer ways to promote independence, resilience and problem solving. I will also look at how learnt helplessness can also manifest in teachers and teaching support staff and suggest ways to help them move on.

Learnt helplessness is a strategy for getting other people to solve problems for you. In the classroom, for pupils, these others may be the teacher, LSA, classroom assistant or other pupils.

In computing/ICT learnt helplessness can be seen in various ways. Sweet helplessness often manifests to the teacher as a pupil putting on a sweet helpless voice and declaring they are stuck. Aggressive helplessness manifests with a cross tone and the implication that they think the work is 'stupid' or they don't get it. Being stuck is never a problem but if you ask what they are stuck on and the pupil cannot tell you or describe the problem or they give vague indications that they are stuck on everything then there is a good chance they are using learnt helplessness to get you to solve their problem. Similar strategies will often be used with their peers, tailored to make the problem solver feel valued, superior or pressured into helping.

4. Alongside this I also promote the idea that it is not my job to fix their algorithms or debug their code. It is my job to promote useful strategies that they can use to fix things themselves. So when they come to me they know they are looking for strategies to find and fix things themselves.

5. For those pupils transitioning from learnt helplessness to useful problem solving they need to see what they are doing. I have asked pupils; 'are you trying to get me to fix your code?' 'Are you trying to get me to solve the problem for you?' In the same way that we couldn't move on until we recognised the issue, some pupils won't either. Of course good teachers do this tactfully and with regards to pupils known issues but an element of challenge is inevitable to identify the issue.

6. Encourage the class to join you in this by putting a ban on doing things for other people. They can describe what to do but are not allowed to do it for them or give them a full solution to programming solutions. As you model this they will reflect this attitude to their peers. Having a ban on touching anyone else's mouse, keyboard or touchscreen is a good start. I often compare this to writing in someone else's maths or literacy exercise book.

7. Move pupils away from language that personifies digital machines. "My computer hates me," is typical. Miles Berry describes computers as deterministic which means that if all the inputs are the same you will always get the same output. Personification encourages pupils to think that an answer might not be available due to the capriciousness of the machine, an attitude that is anti problem solving and frankly incorrect.

8. Don't neglect the other adults in the class, all your good work could be being undone by your LSA or classroom assistant. Train them to help using good strategies and hints rather than solutions. If you are providing training on the new curriculum don't neglect your class room assistants, they are important.

Finally you may notice learnt helplessness in teachers and learning support assistants. Is it worth the hassle to challenge this? As a parent I know that my children don't do what I say but what I do. I lead mostly by example or lack of it as my wife will testify. This is just as true in the classroom or computer suite. Of course we need to be tactful and recognise the good practice of teachers and the excellent problem solving strategies in other curriculum areas, but if we don't identify the problem, nothing will change. I have found that talking about my own struggle to change has enabled others to do likewise.

The New Media Consortium (NMC) Horizon Report for Asian International Schools

Michael Boll is an Apple Distinguished Educator, Entrepreneur, Podcaster and Technology Coach at Concordia International School Shanghai . Michael enjoys helping educators, parents and students harness the transformative powers of technology.

For more information about Michael, check out his personal website www.michaelboll.me

In the Beginning

It all Started with a phone conversation.

“Mr. Boll.”

“Yes?”

“This is Tanya, Dr. Koerschan’s secretary.”

“Yes?” Oh gosh, am I in trouble again?

“He would like to meet with you to discuss the most recent Horizon Report and how it relates

to technology at Concordia. As one of the Middle School Tech Coaches, he assumes you have already read the report and have some thoughts. Can you meet right away?

‘Yes, of course.” I fibbed.

“Mr. Boll, one more thing.”

“Yes Tanya, what is it?”

“Dr. K is the head of school.”

“Yes, Tanya, I think I already knew that.”

After that conversation, I ran off to figure out what this whole Horizon Report was all about. It was very new to me and I wanted to sound like I knew what I was talking about.

THE HORIZON REPORT

In sum, the report finds twelve emerging technologies recognized across three adoption horizons over the next one to five years, as well as key trends and challenges expected to continue over the same period, giving international school leaders and practitioners a valuable guide for strategic technology planning.
The international school version is found here:
http://www.nmc.org/publications/2014nmctechnologyoutlookisa

The Horizon Report teams consists of 40 or so subject matter experts from the various schools and organizations who contribute to the report. We are led through a contribution process via a group wiki (http://isasia.wiki.nmc.org/Horizon+Topics) where we review, add ideas and comment on the current trends put up by the Horizon Report editorial team. This is the heart of the process and by far the most interesting. We all waded into the world of digital strategies, enabling technologies, consumer technologies and their relationship to education.

Bringing the Horizon Report To Asian International Schools

After preparing for the meeting and discussing the report, I started exploring the idea of becoming a subject matter expert. Turned out one of our Concordia colleagues, Michael Lambert, was already a member of many years. At his suggestion, I decided to see if I could bring a Horizon report specific to Asian International Schools. The “I” quickly became a “we” when NIST International School in Bangkok, Thailand jumped on board. Ivan Beeckmans, the digital literacy coach there, took the lead for his school.
Thanks to our combined efforts, we managed to pull in a total of eight international schools and four organizations to be part of the process and contribute the brains needed to make it all happen.

The process concluded in the summer and a set of forecasts and predictions was set forth.

The table below highlights the specific predictions and compares them to the predictions of other Horizon Reports from other areas.

NMC Horizon Report 2014 K-12 Edition	2014 Technology Outlook for International Schools in Asia	NMC Horizon Report Europe 2014 Schools Edition
Time-to-Adoption Horizon: One Year or Less		
Bring Your Own Device Cloud Computing Mobile Apps Tablet Computing	Cloud Computing Games and Gamification Makerspaces Mobile Apps	Cloud Computing Flipped Classroom Mobile Apps Tablet Computing
Time-to-Adoption Horizon: Two to Three Years		
3D Printing Games and Gamification Learning Analytics Makerspaces	3D Printing Learning Analytics Massive Open Online Courses Personal Learning Environments	Games and Gamification Learning Analytics Massive Open Online Courses Mobile Learning
Time-to-Adoption Horizon: Four to Five Years		
Flexible Displays The Internet of Things Virtual and Remote Laboratories Wearable Technology	The Internet of Things Virtual and Remote Laboratories Virtual Reality Wearable Technology	Personal Learning Environments Virtual Assistants Virtual and Remote Laboratories Visual Data Analysis

Time to Adoption: One Year or Less (Cloud Computing, Gamification, Makerspaces, Mobile Apps)

In China we find cloud computing to be challenging. While there is access to local cloud servers in China, many of the cloud storage systems, such as Google, are blocked. This puts us a bit behind other international schools in the rest of Asia.

Gamification is starting to emerge more in the classroom. Website, ipads and other connected devices frequently offer gaming as part of the learning process. Students greatly value the instant feedback these games provide them.

Makerspaces are becoming more and more common and schools are discussing redesigns to their existing structures to accommodate learning and design centers. Ironically this type of hands on learning was common place in the past with auto shop, woodshop and other similar programs. It fell out of fashion, but is now returning with the emphasis on how tinkering and hands on work contributes to great design.

Mobile apps are very common already and will likely continue to be so.There is a proliferation of mobile apps and at this point, many of us find the choices overwhelming. In time, winners will emerge and the selection may narrow. However, the barrier to entry to create a mobile app is so low, innovative ideas will continue to bubble up.

Time to Adoption: Two to Three Years (3D Printing, Learning Analytics, MOOC, Personal Learning Environment)

Many schools have 3D printers, but they are often rudimentary in their uses. Simple designs such as characters and symbols are the norm. Software support is fantastic, but the more sophisticated printers are still expensive. This will surely change as prices come down and we find ourselves going from printing cute toys to printing more sophisticated items with moving parts inside.

Learning analytics and personal learning environments are exciting and promising opportunities. Teachers are limited in our ability to truly understand how well each of our students is doing in more than the broadest sense. A handful of services, such as Khan Academy, provide our students with an adaptive learning experience based on learning analytics. Other apps, such as Exit Ticket allow us to capture student impressions and thoughts and display them on a dashboard interface where, over time, we can spot trends and patterns with how students engage with assignments and more.

Do you MOOC much? Many of us have heard of a MOOC (Massive Open Online Course); at the outset it seemed as if they would take over education. That reality has not happened (yet?), and the MOOC narrative now talks of very low completion rates. However, with classes sizes in the hundreds of thousands, MOOC's do fill a niche and even at an 8% average completion rate, that is still a very large number.

Time to Adoption: Four to Five Years (The Internet of Things, Virtual and Remote Labs, Virtual Reality, Wearable Technology)

Many people, not surprisingly, are not sure what the Internet of things really means. It refers to items such as a thermostats, coffee makers, etc., that will have a connection to the Internet. From a remote location you can tell your heater to turn on, your coffee pot to start, or your child to be less grumpy. Ok, I am kidding about the last one. While I agree this will be a reality, I struggle with how it will be used in the classroom. I am confident, though, people Far smarter than I will find wonderful uses in the way these devices connect.

A remote laboratory would be fantastic. Being able to join a doctor during a surgery or an archaeologist during a dig would bring unforeseen benefits to our students and how they relate to the material they are studying.

We have all likely heard of and thought of virtual reality. Star Trek fans think fondly of the Holodeck that allowed characters to visit any type of location and environment. Taking our students on virtual field trips and viewing reenactments of historical events as if they were there is too exciting to imagine!

Wearable technology is already here and getting better. Smart watches are becoming more popular and the data we can pull from it is awe inspiring. Already we can see uses for it in physical education where they gather data about student heart rates. With wearable devices, instructors will access a dashboard in front of them loaded with data about students. Imagine the potential to adjust lessons to fit individual needs. So there you have it, a rundown of the Horizon Report targeted at international schools in Asia. We learned so much from the experience and I now feel confident talking to my current head of school should he call me into his office and ask what this Horizon Report thing is all about.

Interested in becoming part of the next version? Contact Michael Boll (Michael.Boll@concordiashanghai.org) to express your interest.

The Concordia EdTech Podcast is a collaboration of Concordia's Elementary, Middle and High School Tech Coaches. Each week we discuss the latest headlines in Ed Tech, interview an innovative individual or company and toss in a few free tech tips.
http://podcast.concordiashanghai.org

Global Partners Junior programme

by Lisa Whittaker, teacher at the WOW Zone

Since September 2014, KS2 students and staff from the WOW Zone out of school learning centre in Wythenshawe have participated in the Global Partners Junior programme. The programme, run in association with the New York mayors office sees students from over 30 global cities meet weekly to collaborate on a shared curriculum that encourages learners to use technology in a creative way. Students from the WOW Zone have completed over 50 hours of learning based around this years central topic of sustainability. They have researched, discussed, designed and created action plans around this theme to directly impact upon their local and global communities in a positive way.

As part of the project, students have designed sustainable homes using the Home Design 3D App, explored and built worlds using Minecraft Edu, assessed their own impact on the environment using Commit2Act and pledged to make changes to improve their impact score. Students have been lucky enough to communicate and collaborate with peers from around the globe including those from Toronto and Sydney via web chat, FaceTime, Skype and letter. All of the work created has been shared using a password protected website meaning that students have not only learnt more about their own city but have been able to draw comparisons with others too.

One of their biggest successes to date saw students presenting their ideas about how to make the building that houses the WOW Zone more environmentally friendly. They created Keynote slides showcasing their research, suggestions and plans to the manager of the centre regarding recycling and measures they would like to see implemented. As a result the centre manager has pledged to purchase recycling bins and encourage all staff to ensure that they contribute positively to the centre's sustainability.

Along their journey, students they have used Apple Macs and iPads to creatively record and transform their ideas. This technology has enabled them to adapt the curriculum and really be creative! Their multimedia presentations and other examples of their work can be found on the WOW Zone YouTube channel.

Students are currently researching urban gardens and are looking forward to visiting a local Geo-dome before the programme comes to an end in May 2015.

Can you teach mathematics through digital games, apps and websites?

Courtney Pere is a Supervisor of Curriculum and Instruction in Hudson County New Jersey. This is her 8th year in education. She is absolutely passionate about the relationship between education, technology, and leadership as we prepare students to be independent, life-long learners, in the 21st century digital world. She has worked in two different states and in both places she was fortunate enough to work in schools that have one to one environments. She is currently a Doctoral Candidate in a Global Leadership Program with ADE's from all over the world.

Jean Piaget once said that "play is the answer to how anything new comes about."

As educators and developers in the digital age, it is important that we embrace the power of play in our classrooms. One of the ways that we can redefine our practice is by using game education in our schools.

Game education is a powerful way to engage 21st century learners in a variety of cognitively complex tasks that lead to deeper levels of understanding.

Educational games help students to learn about certain subjects, expand their thinking on specific concepts, and reinforce skill development while they play at the same time increasing engagement, empathy and excellence in the classroom.

Here is what Courtney Pepe a Supervisor of Curriculum and Instruction in Hudson County New Jersey, has to say :

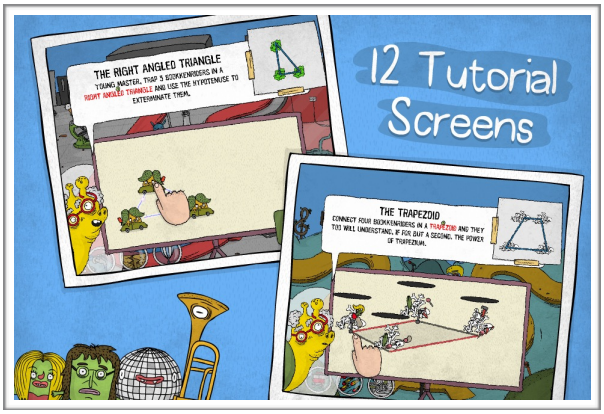
As a Supervisor of Curriculum, when I look at tech tools that can be used in a school setting I like to opt for games that can be used with students who are small and students who are tall. Also, as someone who taught all types of students on the educational continuum ranging from special education students to general education students to gifted and talented students, I like apps that are adaptable to students with different learning styles.

The Land of Venn - Geometric Defense is a game that meets all of the above criteria.

When making the choice – what apps should go on the iPads in my school – the decision maker needs to consider many different factors. One thing to consider, is this something that the teachers will implement? One big factor in classrooms today is whether the app or ICT product is aligned to the Common Core State Standards. Teachers will be more comfortable trying a new technology if they see that the technology can be integrated with their course of study and curriculum. As someone who has authored math curriculum, I leave a spot next to the standards for different apps/21st century tools that work to teach to that standard or skill. One thing I love about Land of Venn - Geometric Defense is that the game encompasses broad range skills which are connected to Geometry Common Core State Standards for Grades One, Two, Three, and Four. This means that any decision maker about apps on iPads in an elementary school can put this app on the iPads and feel confident that it will be used by ALL of the math teachers in the building.

The beauty of The Land of Venn - Geometric Defense is that it also can be used with middle and high school students. The game has 30 levels so students who are super competitive love to be divided into teams and see which team will be able to pass through the different levels the fastest. In one of my last assignments as a teacher, I used the game with gifted and talented eighth grade students. They loved the game so much that they all crowded around the iPad and shouted out tips about which spells to buy to defeat the evil Wizard.

At the high school level, a game like The Land of Venn - Geometric Defense can be used as a motivational tool. Our current population of students, Generation Z has grown up playing games and they are tech innate. High school students will spend 45 minutes working on sine, cosine, and tangent if they know that at the end of the class they will be able to have 5-7 minutes to play Land of Venn. You could use this game as a trigonometry or geometry teacher as a way to make sure you have your students' attention from bell to bell while sneakily using it to review important math vocabulary words that students need to know at all levels.



So if you are the person making considerations about what games should be placed on student iPads, no matter what the age and stage, The Land of Venn - Geometric Defense is a win win for students and teachers alike.

iMagine Machine™ is an educational gaming company that develops STEAM (Science, Technology, Engineering, Art, Math) related games, with an emphasis first and foremost on a rich gaming experience, weaving in the pedagogy transparently.

Introducing Binary in Key Stage 2

Working towards understanding computer networks

by Su Adams

You can download the resources using the links below:

Double sided binary cards
Double sided binary counting cards
Binary calculator template

Since the introduction of the new computing curriculum, much of the focus has been on programming. Now that we have begun to get our teeth into this, it's worth turning our attention towards helping our pupils to understand computer networks.

This begins with understanding binary; how computers store and transfer information. But what is binary, how should we teach it at key stage 2 and why?

Binary falls within the Medium Term Plans at our school for Year 3, and provides the foundation for our pupils' learning about networks. This base 2 number system crops up repetitively throughout computing and so has great relevance. Binary dictates memory threshold sizes, IP address thresholds, screen resolution sizes, processing speeds, the list is endless.

Just like anything, to teach binary successfully it needs to be practised, to embed the learning. In order to avoid further saturating the already full curriculum, we have chosen include this skill when learning about networks, programming and other areas of the pupils' learning.

When introducing binary, it is useful to break down the introduction into sections.

- What does a binary number look like?
- Review of place value and denary
- From denary to binary
- Counting in binary
- Assessment

So what does a binary number look like?

To teach this section you will need:

Double-sided Binary Cards (enough for every child in the class)

Binary is a number system made up of ones (1) and zeros (0). A one and a zero could be used to represent all sorts of information; on/off, true/false, black/white etc… Ask the children what those pairs have in common. At this point it is useful to involve 5 pupils providing each with one of a double-sided binary cards. On handing out the cards I usually give them the zero side stating 'you are a zero' (this often sparks up some amusement, as one of them may comment that they're not nothing!). Pupils usually automatically line up with the numbers and hold them in front of them, if not encourage this. Ask the pupils to all turn over their cards (to display the number 1) and say "on", ask the children to turn them back to zero and say "off" involve other members of the class encouraging them to use alternatives such as true or false etc…

Next ask pupils to turn over cards to represent the following 01101 then challenge other pupils to read out the number. Pupils will most likely ignore the 0 on the left, then read the number as one thousand, one hundred and one, as they will assume it to be a denary number. Highlight to them that this is a binary number, ask them to remind you what a binary number can include (only a 0 or a 1).

Next getting the class into groups of 5s hand out the remaining double-sided number cards. In the very likely situation where there are surplus pupils, rather than making a smaller group, these pupils can become 'Binary Callers' ensuring that numbers are made up correctly. Call out a 5 digit binary number to check that pupils represent these correctly. Then the 'Binary Callers' can call out variations of 5 bit binary representations such as on, off, on, on, off or true, false, false, false true. After repeating this a few times, switch over your 'Binary Callers' and then challenge children to organise themselves correctly without communicating (you may well find that 1 or 2 pupils in each group take the lead at telling others to display a zero or 1 as appropriate). Then for the next binary number challenge the children to make sure they know which location they are in (i.e. first binary number, middle or last etc…) then they close their eyes and try to represent the number correctly. This usually creates a little amusement, as you might imagine.

Tell the pupils that each zero or one represents a 'bit', you could also introduce that 8 bits is known collectively as a byte (and if you want to take it a little further, that 4 bits is a 'nibble', a fact that pupils usually find amusing).

Advise pupils that all digital information is stored or transmitted in binary and ask them to consider all the different forms that this could take i.e. text, music, photographs, videos, requests for information. This is whether the information is on their computer or the internet, on a digital camera or a smartphone.

At this point, it is useful for pupils to consider why there are only two options. Using a physical switch (such as a light switch) is a constructive, visual way of demonstrating that digital information is stored on lots and lots of tiny switches within digital devices. A switch has two states; it can be on or off. As modern number systems start at 0, off is represented by 0, whilst on is represented by 1. You may choose to ask pupils why they think we don't use Roman Numerals as a number system; Zero cannot be represented in Roman Numerals.

Review of place value and denary

To teach this section you will need:

A whiteboard – preferably interactive

Having introduced what a binary number looks like, it's time to look at number systems, how they work and how binary can be used to represent numbers. The number system that we use is called denary. Remind pupils that the binary number system is base 2.

Questions:

Binary is base 2. What clues are there in its name tell us this? Often it will help to ask pupils to name other words that begin in the same way and question what these have in common e.g. bicycle, biplane etc…

- Can we work out what the base number is for denary?
- Why do we think that the number system that we now use is base 10? Perhaps because we have 10 fingers (or digits)?
- If base 2 has 2 states, how many states does denary have? Use fingers to show each of the ten states, starting at zero. Remind them how important zero.

Next create a place value table on the board
Above write Denary – Base 10
Write in the place value titles then add in the power value for each column explaining that this refers to how many times you multiply a number by itself. Ie 103 = 10 x 10 x 10
Ask pupils to remember that denary has 10 states, then ask what is the smallest number that can exist in units, when you receive the correct minimum enter 0 beneath units. Then ask pupils what is the largest number that can exist in units, again when the correct answer is given write 9.
Do the same for the Tens column, ensuring that pupils realise that the minimum and maximums will be the same for each column.

10^4	10^3	10^2	10^1	10^0
Ten Thousands	Thousands	Hundreds	Tens	Units

From denary to binary

To teach this section you will need:
A Whiteboard – preferably interactive

Start a new place value table
Above it write Binary – Base 2
Write in the first 3 place value titles of 1, 2 and 4 then ask the pupils to help fill in the power value for each column reminding them that this refers to how many times you multiply a number by itself. i.e. 23 = 2 x 2 x 2
Ask pupils to try and calculate what values should be written in the empty columns.
Ask pupils to remember that binary has 2 states, then ask what is the smallest number that can exist in units, when you receive the correct minimum enter 0 beneath units. Then ask pupils what is the largest number that can exist in units, again when the correct answer is given write 1.
Do the same for the 2 column and so on, ensuring that pupils realise that the minimum and maximum will be the same for each column.

16^4	8^3	4^2	2^1	1^0
				0 – 1

Counting in binary

To teach this section you will need:

- **A Whiteboard – preferably interactive**
- **Double-sided Binary Counting Cards**
- **Binary Calculator Templates (pages 2 & 3) – printed on card**

Hold up a random Binary Counting Card showing them the 'on' side. Using the binary table that you have created, ask pupils where you should place the card. They should use the quantity of dots to help them place it correctly. Do this for the remaining 5 columns demonstrating the value of each column. Draw attention to the 1 at the bottom of the Counting Card, ask what this means in binary.
Next turn one of the Counting Cards over stating that it is now off. You now longer have those dots and the binary value of 0 is now shown.
Use the Binary Counting Cards to display 01000 state that this means that 1 is off, 2 is off, 4 is off, 8 is on and 16 is off. The denary conversion for this binary representation is 8.

Questions:

- Is it possible to make 4? Once the explored display the binary representation for 4 (00100).
- Is it possible to make 3? Once the explored display the binary representation for 3 (00011).
- Using the binary place value table, we can see that we have 2 and we have 1 by adding those numbers together, we get 3
- Is it possible to count using binary representations?
-

Assessment

To teach this section you will need:

- **Mini Binary Counting Cards where needed for support**
- **Binary Calculator Templates (pages 2 & 3) – printed on card**
- **A Challenge Sheet to test calculators**

Give pupils instructions for making their Binary Calculators. They will need to fill in the denary values for each column, in the correct place. They will also need to apply some computational thinking around sliding in the strips so that the correct information displays.
Finally, in order to test their calculator, you will need to create a challenge sheet, this could be made up of some of the questions below as well as asking them to supply binary representations for denary numbers or vice versa, and asking them to create their own challenges for their peers.

Questions:

- What is the highest number we could count to with 5 bits?
- With Binary Counting Cards in all 5 columns set to 1 (on), we can add all of those numbers to total 31 i.e. 16 + 8 + 4 + 2 + 1 = 31 Can we count higher in binary?
- How high could we count if we weren't restricted by the number of bits?
- Could we use our fingers to count in binary?
- Can we quickly tell if a binary number represents an odd or even number without calculating the answer? If yes, how?

What is the highest number we could count to using both hands?

This lesson can be undertaken either over 2 one hour sessions (including a review of prior learning), or as a 90 minute session. Two sessions work best for better understanding.

We have found that pupils have greatly enjoyed learning about this, and choose to return to their binary calculators to challenge themselves in independent learning time and reward time.

We have also found that different pupils will grasp the concept at different points in the lesson. In particular, some pupils struggle a little with the switch from denary to binary section of the lesson. It is important to encourage them to stick with it as there is usually a light bulb moment for them quite quickly. The making of the binary calculator provides a great opportunity for spending more time with any pupils who may need further support to understanding.

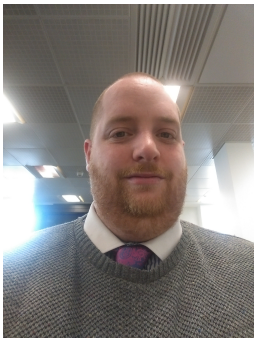
As an extension task or homework, we encourage our pupils to make a game checking their peers knowledge. Our pupils use Purple Mash 2 DIY games for this, however other software could easily be used or they could create their own question and answer challenge cards on paper.

This really can be a fun lesson to teach, pupils greatly enjoy it and many have gone on to choose to spend time outside of school creating codes , practising and even teaching adults!

Credits:

Lesson created following CAS Binary training by Kevin Young, CAS Master Teacher Counting Cards are adaptations of the CSUnplugged resources

Interactive White Boards in schools: BENEFITS AND ISSUES



Michael Ward is from Huddersfield in West Yorkshire and is currently studying primary education at MMMU and will graduate this year. He is a computing specialist and really enjoy working with the new national curriculum to provide exciting, interactive and engaging lessons for his pupils. His interest in interactive whiteboard technology was sparked during a placement where the technology was seemingly used for every conceivable application, without much thought as to whether there was a pedagogical benefit its use. He hopes that his article that was borne out of this interest addresses some of these concerns.

The classrooms in our schools are more congested with technology than ever before. When I was at primary school there was a BBC Micro Model B in the corner of the classroom and a couple of Acorn computers in the library. Today almost every teaching space is equipped with a computer and Interactive White Board (IWB) and schools have computer suites with enough computers for whole classes of pupils at the same time. Many lessons are delivered, at least partially, through the use of PowerPoint or Prezi presentations and watching video content no longer requires uprooting a whole class to a separate room to sit in front of an antiquated VCR and TV combo. Many people consider the proliferation of these technologies throughout schools to be an entirely positive development however I feel it is important to take a balanced view. This essay will attempt to critically analyse the research into the effects of technology in the classroom. It will also ask whether we are using the technology that is available to us in the most effective way, paying particular attention to the use of IWBs in classroom teaching.

As a digital native I have always been very keen to embrace all and any technology that is available to me however it has become clear that these technologies do not always make for better student outcomes, the success of the learning environments that contain these technologies is dependent on the pedagogies utilised by the practitioners within them. I have seen both good and bad practice in my school experience. In many cases teachers seem to be using IWBs as a direct replacement for the black and whiteboards that have been in schools for years. There are some very limited benefits with this kind of use of IWBs. The teacher is able to keep eye contact with the class for a greater proportion of the time because putting new information on the board only requires a tap of a pen on the board, rather than the lengthy erasing/writing process required on a normal black or white board. (Beauchamp, 2004) This small benefit of the modernisation of classrooms from the analogue to the digital is not in itself enough to justify the costs involved in upgrading. It is only when a new, interactive pedagogy is adopted that the costs involved in these upgrades become worthwhile. This area has been extensively written about and the conclusion above is one echoed across lots of different pieces of academic research (Abbeduto & Simons, 2010; Schuck & Kearney, 2007; Miller, Glover, & Averis, 2004). Even when teachers are using new pedagogies, such as PowerPoint presentations, all is not immediately and automatically well. In the hands of a teacher who is proficient in and enthusiastic about using PowerPoint presentations and similar presentation technologies they can be extremely beneficial to the class, however teachers who centre their lessons around longwinded slides, or even worse, read directly from them, could actually be doing more harm than good (Lightfoot, L, 2011).

So what actually constitutes best practice? How can teachers create lessons that best utilise the equipment they have available to them? Do IWBs help to create motivational learning environments? And, how can we equip teachers with the required skills to make the most out of this technology?

One of the most important factors in ensuring that the right training regimes are put into place. It is of the utmost importance that the training provided to teachers is of high quality and ongoing. It is easy for schools that have installed the IWB technology to hold a one off technical training day in order to improve teachers understanding of the technology however this approach is very unlikely to yield the best results for students. Training needs to cover the technical aspects of using IWB technology but must also, and perhaps more importantly, help teachers integrate this technology into their pedagogy and conversely mould their pedagogy around it. Clearly this cannot be achieved with a one off technical training session. Some staff, those who are keen and interested in the technology, will take it upon themselves to improve their skills and to make the most of the equipment available to them. However those who are less keen or perhaps even intimidated by the technology will find it easier to stick with the basics and will not begin to exploit the full potential of these devices. (Digregorio & Sobel-Lojeski, 2010) With this in mind it is important to implement a long term, whole school approach to training, allocating long term support and guidance to all the practitioners within a school but also providing the opportunity for teachers to feedback to each other and share good practice.

A school culture that reflects a wide "buy-in" from teachers to the IWB concept will allow administrators and faculty to observe, coach, and give constructive feedback to each other. …By giving teachers the proper ongoing technical and pedagogic IWB training, they are likely to be better equipped to transform their teaching as compared to their relatively inexperienced counterparts (Digregorio & Sobel-Lojeski, 2010).

With the correct training it is obvious that IWBs offer an opportunity to make classroom teaching more centred on the pupil when compared to the more didactic methods of the past. Children are no longer expected to sit quietly at the back of the class listening to an endless stream of information. The teacher is no longer considered to be the infallible source of all knowledge. It is expected that pupils and teachers should work together, interacting with the technology available to them in order to learn. It is important to distinguish the difference between the interactivity that any given piece of equipment can facilitate and whether these interactivities can contribute towards an educational dialogue. It is clear that the IWB provides many opportunities for pupils and teachers to interact with it. It is possible to highlight, erase and annotate text, you can animate objects and it can automatically recognise handwriting. It is even possible to set the IWB to provide feedback such as sounds and animations when a correct answer is selected.

Clearly all of these features are "interactions" but the question still remains as to whether they are beneficial to the educational dialogue within a classroom. Implementing a dialogic approach to teaching involves encouraging learners and teachers to share ideas and build upon each other's knowledge in order to reach shared conclusions. (Alexander, 2004) It is by adopting this attitude to teaching and embracing this way of working that teachers are able to make the most out of the technology available to them. IWBs and other advanced technology should not to be seen as the driver of pedagogical change but merely a tool which can help a teacher to implement new pedagogies they are already fully committed to.

It seems that a tool such as the IWB can present new possibilities for a teacher, but it is as the servant of pedagogy and not its master. … Those teachers with dialogic intentions strive to employ a variety of IWB functions to enhance the quality of pupils' learning experience. Thus the effective use of the IWB as an educational tool is not inherent in the hardware, software or even the materials it displays. It is predicated upon the teacher's practical understanding of how to engage students and to help them learn (Mercer, Hennessey & Warwick, 2010).

There is a great deal of agreement regarding the effects on motivation that the introduction of IWB technology has on students, initially at least there seems to be a short term positive impact on the motivation of pupils. (Armstrong et. al., 2005; Shenton & Pagett, 2007; Wood & Ashfield, 2008) In a 2002 survey conducted in two Sheffield schools, a high proportion of children, (57 – 68%) when surveyed described lessons using the IWB as more fun and interesting. (Torff & Tirotta, 2009) Whilst this is a positive result it does suggest that the added motivational value of being taught using an IWB is not as large as it could be. It is therefore very important that these pieces of equipment are used in the best possible way, in order to maximise their impact.

Another consideration to think about is whether just because the technology is available to you, it should be used at all times without any consideration for the pedagogical benefits. There are several ways to look at this but perhaps the most interesting and useful is the SAMR model. SAMR stands for Substitution, Augmentation, Modification and Redefinition and at its simplest form allows you as a practitioner to see what benefits your use of technology has. At the substitution level all that is really being achieved is replacing an analogue technology with a digital one.

This could be as simple as showing your class a map of their town on Google maps rather than in a road atlas. In this case you are not really adding to the learning and some would argue that you are actually taking away from the learning by not teaching map reading skills. In the second level of the SAMR model you might use Google maps to plan a walking route through a town with your class, in this case the technology has augmented the learning by giving precise distance data for the route you have planned. In the third level learning is actually modified and the technology gives you opportunities that may not be possible without the technology, an example of this might be using Google street view to see the types of housing in cities and towns around the world. And the fourth level is redefinition, this is where technology can be used to create new ways of displaying and presenting work. Children are able to present their work in the form of video blogs or YouTube clips and are no longer restricted by what is possible with a pen and a piece of paper. Teachers can create interactive quizzes and are able to collaborate with teachers from around the world as well as with their own pupils and colleagues all with the aim of improving learning and teaching for everyone. It is with these final two stages of the SAMR model that the best use of technology can be found, when it used to create new and exciting ways of both learning new things and presenting what has been previously learnt. (Edinburgh city council, 2012)

The question of whether IWB technology is beneficial to the children in our schools is a difficult one to answer. When used properly it can certainly contribute to a more engaging and motivational learning environment, however this is not always the case. Whether through lack of training or a lack of desire to embrace the digital age there are cases where the technology that schools have spent so much on is not utilised to its full potential. Because of the massive investment schools have made, this technology is now firmly embedded within our classrooms it is therefore essential that teachers are properly trained, not just on the technical aspects of how to use IWBs but also in the pedagogical benefits of them. It is also very important that we recognise when it is beneficial to use these technologies, for too often they are used for trivial tasks which are not in any way enhanced by their use. We have, in our schools, an exceptionally powerful tool, with the potential to enrich and inspire millions of children but like all powerful tools, it is of very little benefit in the wrong hands.

LINK FOR THE REFERENCES

References

Click here to download this activity in PDF

SIMPLE PYTHON ACTIVITIES FOR KIDS

To create a new program ALWAYS:

- Open the Python app and tap idle.
- Then select File > New Window. This will open an empty shell window for you to write your new program.
- After you have entered your code, choose File > Save. Ensure that your file name has 'py' extension at the end.
- For example; you could save the first task as helloworld.py . Then choose Run > run module.

1-My first program: Hello, World!

Remember you can use the hash (#) to put comments in your code.

Task: Write a program that prints out 'Hello, World!'

CHALLENGE
Look at the following example, test it and identify the error.

```
Print ("hello')
```

2- In Python we could store the words or numbers in variables.

```
firstname='Yasemin'
lastname='Allsop'
print (firstname, lastname)
```

```
Yasemin Allsop
```

Task: Can you store words in variables to print your favourite book author?

> **CHALLENGE**
> Write a program to give information about yourself e.g.; name, surname, age, birth, city, etc.

3- Question time!

In Python you can write programs to get information from the user by asking questions. Run the following script:

```
age= input ("How old are you?")
print ( age)
```

Task: Write programs that ask the user their name, favourite colour and favourite food.

4. Python mathematics: In Python we can do basic calculations.

operator	Operation
+	Addition
-	Subtraction
*	Multiplication
/	Division
**	To the power of
%	Percentage

Test the code below:

```
>>> print (4*3)
```

Task: Write a program to solve the problems below.

Problem	Answer
28+34	
68-31	
2**3	
10%100	
125/5	

CHALLENGE

Challenge: run the program below. Why is the answer is 17 not 30?

```
>>> print (2+5*3)
17
```

5- Writing a program to find the area of a rectangle:

Test the program below:

```
print("Let's calculate the area of a rectangle")
length = float(input("Length: "))
width = float(input("Width: "))
print("Area:", length * width)
```

Task: **Can you write a program to calculate the perimeter of a rectangle?**

> **CHALLENGE**
> **What about writing a program to find the area and the perimeter of a triangle?**

6- Conditionals- If statement

Look at the example below:

```
answer = input("Do you like coding? [Yes/No]")
if answer == "yes":
    print("I love coding too")
else:
    print("Maybe we could try together")
```

Task: **Come up with an if statement and write a program in Python to print it.**

Published by
ictinpractice.com
London, UK