



DEVELOPING AN ELECTRONIC TEACHING RESOURCE: Using an Interactive white board

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With considerable
assistance from
Synapsys
and
Ako Aotearoa

Guidelines



AOTEAROA
NATIONAL CENTRE FOR
TERTIARY TEACHING
EXCELLENCE

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1 Preface

Interactive White Boards are becoming more commonly available. The intention of this guide is to show tutors and teachers that sharing their ideas about teaching and learning can be fun, surprisingly effective and cheap. By making sets of video clips that are well designed and easy to access, good practice may be shared with other teachers of the same topics or with their students as revision. Being camera shy is no issue; no camera need be involved. The video you capture is of what you present on the board in just the way you already present a lesson.

I have put these guidelines together with the idea that they are readable and straight forward. The rationale and theory underpinning this work is included at the end of the guide.

2 Acknowledgements

This project would certainly never have happened without the various love, wisdom, generosity, and professionalism of some great people who have helped.

Thank you to my partner Tara for her intelligence and support even late at night; Phil Garing from Synapsys for his friendship and wisdom in helping me to crystalize the concept in the beginning and his generosity in providing me with the expert staff; Steve Gallagher from Synapsys for his ability to make sense of the stuff I did not know I knew and his expertise in learning design.

Having worked out what I was trying to achieve I would have been lost without the guidance and encouragement of Selena Chan who has been a fine mentor, thank you. CPIT's Mark Kyle is brutally honest, and endlessly generous with his ideas and passion for teaching our trade - a huge help. Thank you Cathy Gillespie, Synapsys, for the sentences and structure where I simply did not know where to start to write this guide. And finally thank you to Bridget O'Regan from Ako Aotearoa. Without your support and focus this would never have been finished.

3 Introduction

The inspiration for this work came from connecting three observations I have made as a carpentry trade tutor. Firstly as tutors/teachers isolated in our classroom, it is easy to be oblivious to colleagues' masterful teaching of things we do only adequately. Secondly digital technology and blended learning has the potential to hugely improve students' learning by allowing virtually free repetition of delivery and the possibility of providing for a greater range of learning styles. Finally, the digital white board that I have had the privilege of using to deliver lessons has revolutionised the way I am able to teach; what's more I can seamlessly capture those lessons.

These guidelines are the product of my action research project, and are based on what I learned from developing an electronic resource about stair construction calculations. I received regular help from an education design expert and used a SmartBoard™ (A brand of electronic white board) to develop simple avi files (assets) which are then bundled into a single electronic resource (or RTO – reusable teaching object). These may be shared with other teachers or used by students for revision. To look at, the RTO is a simple web page or pdf with icons linking to short avi file video clips. *Figure 1*

			
Stairs			
TOPIC	SUB-TOPIC	CLICK TO VIEW ASSET	OTHER RESOURCES
Tutor information	1 Key points for using this resource		Sample link Sample link 2
Parts Terminology	2 Stair technical terms		
Optional project	3 Introduction to the 3D model		
Calculations Terminology	4 Rise definition		
	5 Tread, going and run definition		
	6 Pitchline or margin		
Design	7 Clearances		
	8 Stair proportions		
Calculations	9 Individual rise		
	10 Pitchline angle		
	11 Individual going		
	12 Diagonal length		
	13 Find the best rise and going		
	14 Site measure		
	15 Marking up the string		

Figure 1

These video clips are in an order that logically supports the development of the ideas in a sequence. But the user may pick and choose any clip(s) as they each stand-alone. For a screen shoot of one of the avi files see *Figure 2* and if you are viewing as an active word document you are be able to double *Figure 3* click the to play asset 9 from the case study

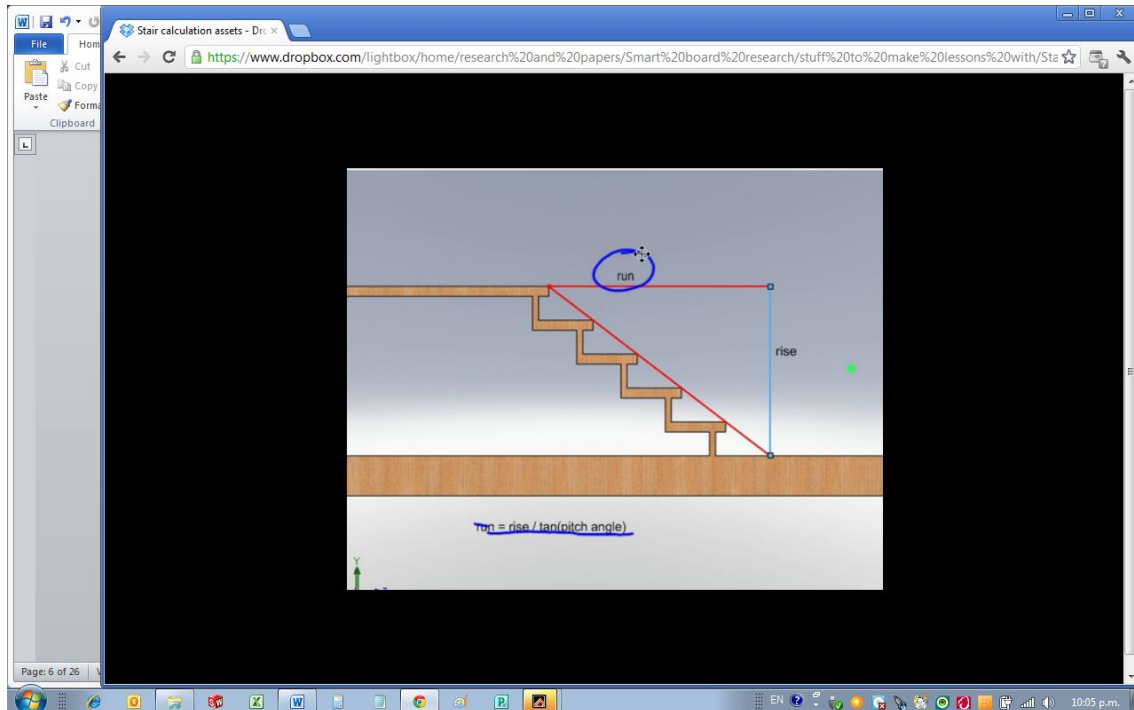


Figure 2



Figure 3

In these guidelines, you will be shown, step-by-step, how to create a set of logically sequenced assets. It is assumed you already have a good understanding of your subject area and are experienced in teaching. However, you may not yet have any experience in using technology to record, capture and re-use your lessons.

It is not the intention of these guidelines to teach you how to design learning material. Rather it is assumed that you are good at that and wish to capture the images and content that you already deliver so that it may be shared and reviewed.

The emphasis in these guidelines is on 'rapid' development - quick, easy and without dependence on technical experts. The roles of instructional designer, content expert and developer are all played by one person - and that is you.

As well as offering you a method of rapid development, you are encouraged to remember that what you are producing is a basic "fit for purpose" product. The teaching activities which you produce are intended to support sound teaching

and instruction. In my experience, they do not have to be highly complex, nor do you have to spend ages perfecting each one for it to be of value.

While these guidelines show you how to prepare avi files using a Smartboard™, you can develop similar resources using other technology, e.g., Promethean, Camtasia.

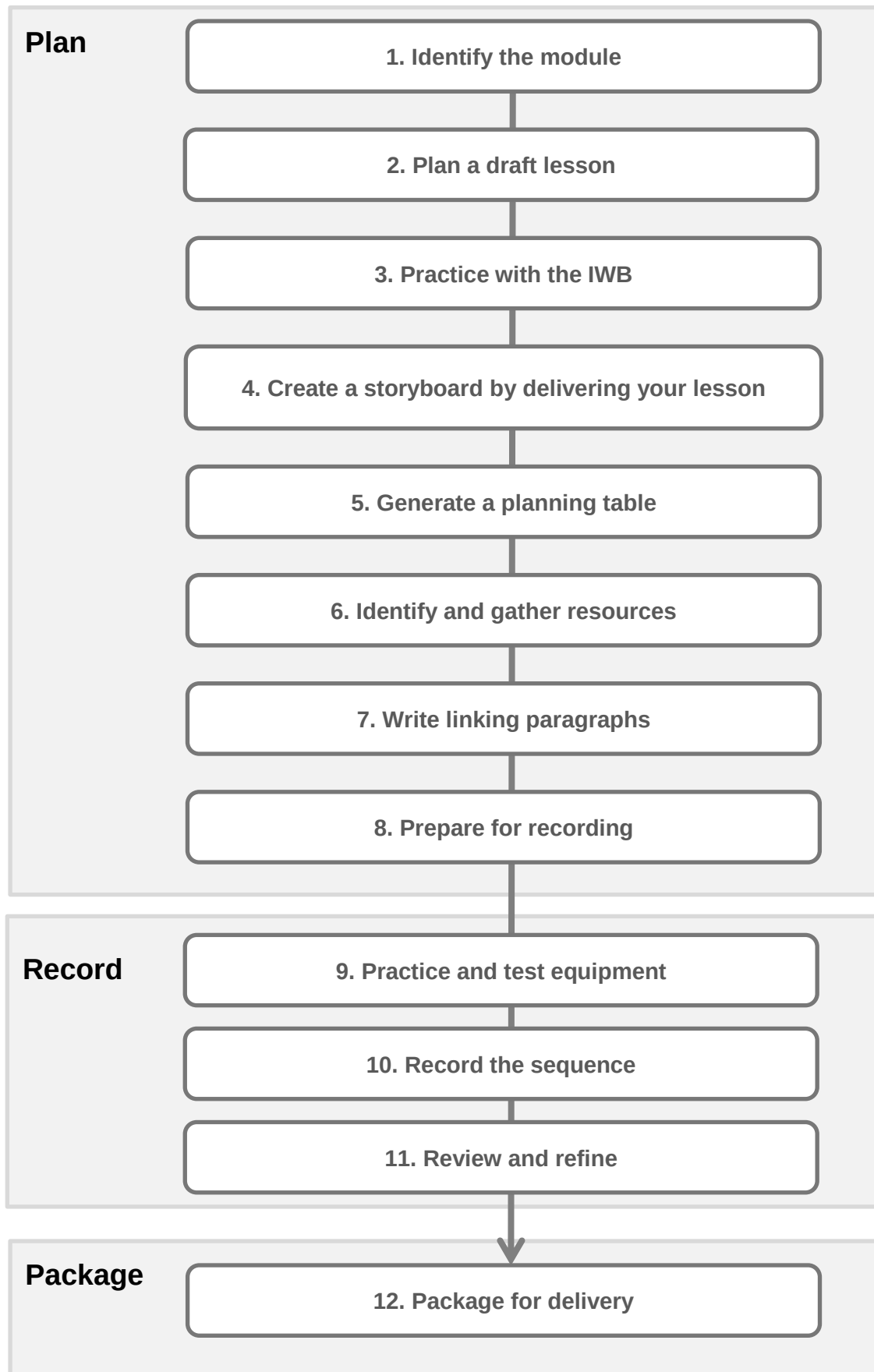
A glossary of terms used is included at the end of the guide.

4 Equipment and supplies

These guidelines are prepared using a Smartboard™. While the same concepts will apply to other interactive whiteboards, you may need to refer to the specific user guides for detailed information on how to achieve the tasks described.

APPLICATIONS MINIMUM REQUIREMENTS
◆ IWB software ◆ Access to the Internet ◆ MS Word or MS Excel or similar
EQUIPMENT
◆ Interactive White Board (IWB) such as Smartboard or Promethean ◆ Wireless microphone ◆ Computer (dual screen is optional but can be helpful)

5 Summary of the process



6 Plan the module

6.1 Scope of the module

The first decision to make is which module to tackle, and what breadth of information should be covered in it.

If this is your first attempt at creating an RTO keep it simple! When selecting the module, consider the following:

- ◆ The module should break down easily into smaller chunks (topics and sub-topics) which can be recorded as separate files.
- ◆ Each sub-topic should last around about 2-3 minutes. This is based on feedback from a small group of students and my own experience in watching educational podcasts.

CASE STUDY: STAIR CALCULATIONS

I chose **Stair Calculations** for the following reasons:

- ◆ I was experienced in teaching the topic.
- ◆ It could be broken down into a number of clear chunks.
- ◆ There were a number of 3D models, plans and other resources already prepared and which were already being used in the classroom.
- ◆ Although considered, the decision was made to exclude the following key points as out of scope:
 - Use of scientific calculators
 - Trigonometry
 - Head room calculations
 - Dogleg stairs

The reason for omitting these was to keep the project manageable.

An electronic teaching resource is prepared in much the same way as you would any other resource, such as an interactive package, a piece of equipment or tool for giving a live demonstration. It is important that you remember that this is a tool to *support* teaching and is not meant to *replace* student interaction. Good course design will use a mixture of methods to get a point across, and this includes reinforcing the use of the electronic files with either classroom discussion, lecturing or online activities.

6.2 Plan a draft lesson that will create a storyboard

You already know how to teach your subject! You are likely to have some notes on the subject either prepared by yourself, or provided by the teaching establishment. However, you probably also have a significant amount of tacit knowledge - this is the stuff you know so well that you don't even know that you know it. (Sennett, 2008) The idea is to present all electronic material via Notebook – the Smartboard™ software and capture these currently 'unwritten' aspects of the lesson delivery.

Remember that the purpose of these guidelines is not to change what is good, and what works.

For any course you will need to document the following information:

- ◆ The audience.
- ◆ Any essential prior knowledge.
- ◆ Objectives.
- ◆ Competencies.
- ◆ Clarity around what is not covered, or is covered elsewhere in a course on the same pathway.
- ◆ The scope and any limitations of what can be taught.

EXAMPLE: STAIR CALCULATIONS MODULE

For **Stair Calculations**, the following information was identified:

- ◆ The audience. Students studying carpentry or joinery often with no more knowledge of stairs than the general public, but with a basic knowledge of carpentry tools and materials and proficient in basic arithmetic.
- ◆ Objectives. By the end of the course the student would know all of the terminology associated with stairs and their construction; how to apply mathematics to set out a straight flight of stairs; how to find and interpret relevant building code requirements for stair construction.
- ◆ Competencies. The student should be able to site measure a straight flight of stairs and set out the string to create a code compliant set of stairs.
- ◆ The following topics would be identified as pre-requisites and students directed to additional resources if they didn't feel confident in this area:
 - Use of scientific calculators
 - Trigonometry.
- ◆ Headroom calculations and dogleg stairs would be taught in a separate module.

6.3 Practice using the IWB

Practice is the key to recording a fluent teaching resource

If you are not familiar with an IWB, an hour or two spent getting to grips with the software is time well spent.

You need to test out the technical abilities of what can be captured using the Smartboard and practice recording a variety of resources, e.g. video and YouTube links, to make sure that they replay properly.

You also need to test voice recording and playback to ensure that your microphone is working correctly.



KEY POINT

KEY POINT

For some applications where fine control is required, you may find that you cannot record the event smoothly using your finger on the Smartboard™; you may need to use the mouse and cursor to execute these fine moves accurately.

6.4 Create your storyboard by delivering your lesson



KEY POINT

KEY POINT

Remember that you may have written the perfect lesson plan. However, the purpose of this exercise is to capture information that comes out as you teach which isn't planned or prepared.

It is a good idea to do this step more than once. Classes can vary enormously from one time to the next, depending on the individuals and the type of questions or topics which surface.

Teach as you normally teach but make sure that you capture everything that is covered in the class. For example, use the IWB to record the following:

- ◆ Write down any questions the students ask.
- ◆ Capture any drawings you have used to explain key points.
- ◆ Write down website or useful links/books/other resources you have recommended.

One of the most valuable aspects of Smartboard™ is the ability to flick back to different slides, elaborate on previous ideas and add notes and annotations to previous flipcharts. What this means is that the end product does not always reflect the way the lesson develops.



KEY POINT

KEY POINT

Capture the information in the sequence it was taught.
If, for example, you return to a diagram and add a feature or text, you could copy the slide at the second point in the class and add the feature to this second slide.



CAUTION

CAUTION

REMEMBER TO **SAVE** THE SMARTBOARD LESSON AT THE END OF CLASS. THIS IS THE BASIS OF YOUR ELECTRONIC RESOURCE DESIGN

6.5 Generate a planning table

The next step is to take the storyboard you captured in your lessons (the IWB flipcharts) and create a planning table. For an example see *Table 1 (p.15)*. This will detail topics, sub-topics, and key points to be covered. In this step you identify the key learning points and work out what resources are required for each sub-topic.

An Excel or Word type document is all that is required to be able to organise your module structure. It is helpful to use an application that allows you to drag and drop the topics and sub-topics until you are satisfied with the order - often this is not achieved on the first attempt.

The story board created by the IWB flipcharts provides a guideline on the linear progression. I use a mind map to help me think more creatively about how the video clips may be ordered and ensure all the keypoints are linked to topics and sub topics. Stair example - see *Figure 4(p.14)*.

As you build your planning table you should be considering:

- ◆ The logic of how the ideas build.
- ◆ Any gaps where key points were not covered.
- ◆ Did you make any incorrect assumptions?
- ◆ Where can you source the other material.

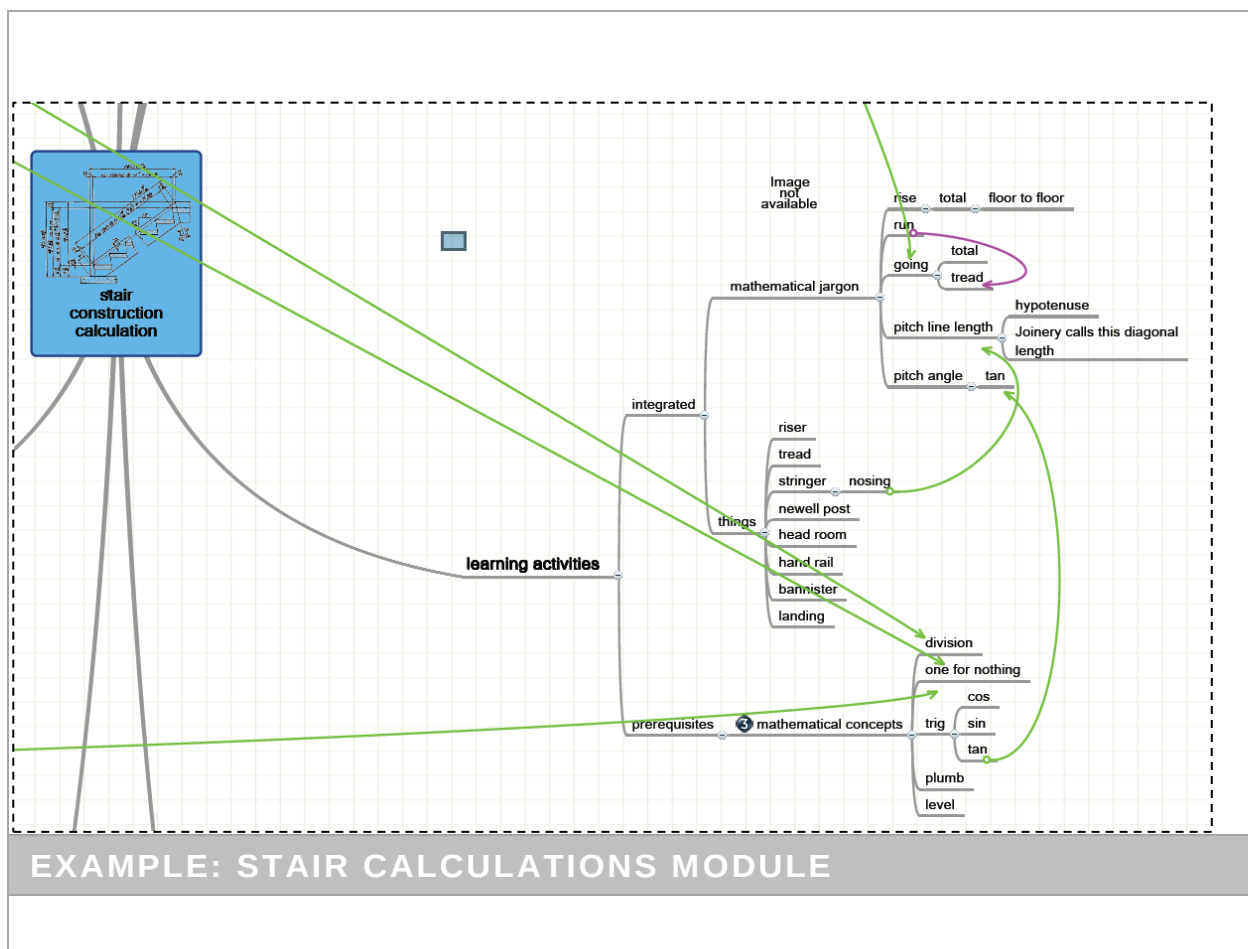
It is important to keep each sub-topic concise and at this level of break down. The intention is that each sub-topic becomes one individual avi. file of not more than 2-3 minutes in length – short and sweet to keep their attention. Try watching a YouTube video and you will soon realize that 5 minutes can feel like quite a long time – even when you are interested!

This was also given as feedback by a focus group of 15 pre-trade carpentry students. Depending on your learners and the topic you may find that longer videos are workable.

EXAMPLE: STAIR CALCULATIONS MODULE

For **Stair Calculations**, the Mindmeister mind mapping tool was used. It is free, and it supports collaboration across all platforms. It is also printable and may be saved in many formats.

An example of part of the mind map from the case study is given below.



EXAMPLE: STAIR CALCULATIONS MODULE

Figure 4



KEY POINT

KEY POINT

Reflection should be done soon after each lesson.

You may have forgotten to capture one or two aspects of the lesson using the IWB and you are more likely to remember that soon after than later.

Table 1

EXAMPLE: STAIR CALCULATIONS MODULE		
An example of some (but not all) entries in the Stair Calculation planning table is given below. Just try a few ideas out!		
Topic	Sub-topic	Key points to make during this sub-topic
Overlay of maths onto physical parts	Rise	Introduction
		Floor to floor is the most important
		Must use a level to ensure that rise is true to the foot of the stair
		All rises must be equal
		Number of individual rises is discrete - can only be whole number
	Total going individual going and run	Is the horizontal distance from the front face of one tread to the front face of the next tread
		The total going is the sum of the individual goings
		The total going is what is shown on architectural drawings
		Numbering of stairs is always from the bottom up
Overlay of maths onto physical parts (cont'd)		The idea of 'one-for-nothing' : there is always one more rise than going.
		Going is not limited to discrete jumps
		The run of the stairs is the total going plus one individual going.
		The going + the nosing (overhang) (tread projection) = the tread size
	6 pitchline (known as margin line by joiners)	Imaginary line that completes the triangle created by the total rise and total run
		Called the hypotenuse in trig
		Can be laid over the elevation on architectural drawings
		Known by joiners as the diagonal length
		Note that pitchline may be defined by a triangle either above or below the line

7 Identify and gather resources

Once you are happy that everything is covered and that the sequence is simple and logical, you should note down which resources can be used to support that piece of learning.

Add a fourth column to the planning table so that you can record the asset against the sub-topic to which it applies. For example see *Figure 4*.

EXAMPLE: STAIR CALCULATIONS MODULE			
See in the following example for stairs how images and 3D models have been listed, that can be used to illustrate the points being made.			
Topic	Sub-topic	Key points to make during this sub-topic	Resources used
Overlay of maths onto physical parts	Rise	Introduction	Image of stairs
		Floor to floor is the most important	Out of level floor
		Must use a level to ensure that rise is true to the foot of the stair	Out of level floor
		All rises must be equal	5 rises discrete.sldprt 4 rises discrete.sldprt

Figure 5

When naming each resource use a unique and easily recognisable name. This makes it easy to jump to that resource quickly and smoothly. When naming files, it is useful to use the first few letters of the name to give enough information to recognise quickly what they are.

7.1 Write linking paragraphs

The last task before you can go ahead and start recording your first sub-topic is to think about the words you are going to use to introduce and close each sub-topic. For an example see Table 2 (p.16).

In writing your introduction, you should set the context for each learning resource and make sure that learners are aware of the things they need to know before starting.

In closing, it is always good to revisit objectives or summarise the main learning point.

There are two key reasons why you do this:

- ◆ It gives you a clear start and helps you avoid stumbling as you begin recording.
- ◆ The intention is that these resources can be used flexibly and it may be that a class does not work through the material in the same linear way in which it was prepared, i.e., they may view some assets but not others.

Therefore it may not make sense for you to say:

“You have just looked at” or “In the last section ...” Better to say “By now you should be familiar with” - that way it doesn’t matter how they got there, as long as they have the required pre-requisite learning.

Table 2

EXAMPLE: STAIR CALCULATIONS MODULE				
Topic	Sub-topic	Key points to make during this sub-topic	revision notes and first sentences	resources used (e.g., slide #, SolidWorks file..)
design	8. stair proportions	1. The values given in Table 6 are based on recent research in North America. The often used design rule of twice the rise plus the going $(2R+G) = 600$ does not always lead to safe stairway geometry and can exclude some safe moderate pitch stairs.	This clip assumes that you know all the names of the stairs parts. We now look at the safe sizes of those parts	extract from D1

8 Record the assets

Recording is always done best in front of a live audience, but not in front of an actual class. Ask a small group of peers to sit in on a dummy lesson and get them to critique your proposed topic delivery - either at the time, or after each chunk has been recorded.

8.1 Preparation

Open the resources you are going to use

Open all of the resources you are going to use for that asset before you begin - this saves time waiting for applications to load. However, do not have too many resources open at any one time, as this may slow your computer.



KEY POINT

KEY POINT

Remember you can record each chunk as many times as you like.

Editing is a very time consuming process for which you may not have the time, the software or the inclination when a 5 minute re-record is all that is needed.

Check your recording hardware and software

If you are not familiar with voice recording on your computer then be prepared to spend some time and perhaps get some help setting this up.

- ◆ You will need a good quality microphone.
- ◆ You also need to test that both your hardware and software are functioning correctly.
- ◆ The built in microphone and default recording setting may not be adequate and you may need to change the settings in the control panel to increase the input volume. Run some comparative tests to decide what is the best setting for your environment.

Other tricks

- ◆ When working with programs that require very detailed mouse movements, using your finger for control can be frustratingly clumsy; you may find it necessary to use the mouse.
- ◆ If you have too many applications open at any one time, you may encounter problems with the response of the IWB pen working smoothly.

8.2 Practice and test equipment

Above all – you should practice before you press the record button! It is surprising how much you may stutter and falter when you know you are being recorded. It may also make it easier if you have people in the room when you are recording to simulate a real classroom situation.

Whatever works for you!

You should also test that everything is in working order as it is frustrating to deliver a perfect learning event and fail to capture it!

STEP	DETAILS
1	Print a hard copy of the planning table to refer to. Alternatively, you could put them onto small 'cue cards' as you would with any other presentation.
 KEY POINT	KEY POINT This may be where a dual screen becomes useful and you can view an electronic copy during your sequence recording.
2	Keep a pen handy to jot down any ideas on your planning table as you think of them during your recording - particularly if you are going to re-record after a 'less successful' first attempt.
3	Turn on the computer with the Smartboard software.
4	Turn on the Smartboard and display to Recorder button.
5	Connect and turn on the microphone.
6	Complete a test recording.

8.3 Record the sequence

 CAUTION	CAUTION These guidelines were created using a Smartboard. Other IWBs will have similar features but they may be named and accessed slightly differently. In order for your video to flow smoothly, you must be familiar with how your own IWB functions before you start to record a sequence.
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HINTS AND TIPS WHEN RECORDING AN ASSET

The following hints and tips are useful for those of you who have not previously used an IWB to record learning, or have used it fairly infrequently:

- ◆ Be familiar with how your IWB works.
- ◆ Focus on achievability and not perfection! You can still get your message across with a few small issues, as long as they do not distract from the content.
- ◆ Talk smoothly, but crisply and clearly.
- ◆ Remember that the audience will not be able to see you gesticulate. If the point is important, annotate this on the IWB or describe it, e.g., “the gap should be about this big [gesture] should be recorded as “the gap should be no bigger than the diameter of a 20 cent piece”.
- ◆ Be careful how close your mouth is to the microphone, as this can sometimes affect the sound quality, making it husky or fuzzy.
- ◆ Leave only short gaps in-between each paragraph. Remember that when someone else views this video, they will not see you in front of them. Gaps between sentences will seem much longer than if their eyes are following the tutor during a pause.
- ◆ Use the Pause feature on the IWB to stop between each key point – you are more likely to complete a short portion and not have to re-record than if you try to tackle too much at any one time.



KEY POINT

KEY POINT

The Smartboard has a feature, where you can pause during your recording; look for this feature on other IWBs.

Pausing can be very useful to ensure that you record in small manageable blocks. The end result is almost seamless.

- ◆ Make sure that any images or models you are using in the recording are centred in the middle of the *recording area*. Note that this may not be the middle of the *screen* if you have set a recording area at the beginning.
- ◆ Use the mouse and cursor for precision clicks.



KEY POINT

KEY POINT

Sometimes you may need to use the mouse when recording, as the fine accuracy you occasionally need cannot be achieved by whiteboard interaction alone, i.e., just your finger on the screen.

- ◆ Open all the files you are planning to use for that session first, before you start recording, to avoid delay whilst applications load. This means that you will also need to be familiar with moving from one application to another.

It helps to align all of the windows in each application when you record just a portion of the screen to avoid having a 'drag' action captured in our asset as you try to pull the application into the recording area.



KEY POINT

KEY POINT

Hints for working with multiple windows:

- ◆ Alt + Tab shows you all open applications – press Tab until you have selected the application you want to view and release the Alt key.
- ◆ Ctrl + Tab allows you to move between window within one application.
- ◆ Press the Windows key to display the task bar and select you file from here (particularly useful when you are within a PowerPoint presentation).

START RECORDING

STEP	DETAILS
1	Display the Recorded buttons.
2	Set the IWB options, typically: ◆ Standard setting ◆ Video quality to auto ◆ Target files to .avi ◆ Identify the location it saves to (so that you can find your video after you have recorded it).
3	Select to record 'Area' and draw out the area to avoid capturing unnecessary screen icons in your final product.
4	Record your video.
5	When you have finished recording, click on 'Stop'.

8.4 Review and refine

STEP	DETAILS
1	Replay each recording. Consider playing what you think is the finished product to a colleague. They may spot something you didn't see.
2	Don't be afraid to re-record. You may not always know why a recording is not ideal when you play it back, but when you compare it to a better one, you can always tell. Try recording each key point 2-3 times and listen to them a short while afterwards. Going away and coming back to it may highlight different factors.
3	Create a final folder to house your finished products. Copy each final avi. file into that folder, so as to avoid confusion as to which one was the best recording.

9 Package for delivery

How you make these assets available to others to use will depend on your audience and sharing options available to you.



KEY POINT

KEY POINT

Remember that the audience do not need to have interactive whiteboard facilities; they just need hardware and software which can play the correct type of files these are usually .avi files.

Ideally you will create a single page with links to each asset, laid out in a manner reflective of the progression through the course, i.e., matching the outline in the planning *Figure 6*

You could, for example:

- ◆ Create a web page with links.
- ◆ Create a word document with hyperlinks and then create a .pdf from it.

MAKE THE ASSET AVAILABLE

You could for example locate the assets:

- ◆ In a shared drive
- ◆ On an Intranet
- ◆ In a learning management system

◆ On YouTube

Figure 6

CPIT			
Stairs			
TOPIC	SUB-TOPIC		CLICK TO VIEW ASSET
Tutor information	1	Key points for using this resource	
Parts Terminology	2	Stair technical terms	
Optional project	3	Introduction to the 3D model	
Calculations Terminology	4	Rise definition	
	5	Tread, going and run definition	
	6	Pitchline or margin	
Design	7	Clearances	
	8	Stair proportions	
Calculations	9	Individual rise	
	10	Pitchline angle	
	11	Individual going	
	12	Diagonal length	
	13	Find the best rise and going	
	14	Site measure	
	15	Marking up the string	
OTHER RESOURCES			
			Sample link
			Sample link 2

10 Glossary

YOU WILL NEED TO KNOW THE MEANINGS OF THE TERM	DEFINITIONS
Asset	An *.avi file which explain the key points of a particular sub-topic.
Electronic resource	Any file which can be run on IWB hardware to teach key points for recording assets – eg. PDF, jpeg, virtual 3D models, wave files, mp3.
Flip chart	Slides or pages like PowerPoint slides which are used to present graphics in IWB software.
IWB	Interactive White Board such as Smartboard or Promethean.
Module	The sum total of the content to be covered by the teaching resource.
Planning table	An table, e.g., an excel spreadsheet or MS Word table. This table defines the course structure, key points, notes and resources.
Reusable Teaching Object (RTO)	An electronic set of *.avi files to support teaching and learning in classroom delivery and then reused by students for revision purposes.
Storyboard	IWB file containing flipcharts captured in the initial lesson presented to learners which gives a design start point.
Sub-topic	A logical, self-contained group of several key points which need to be covered in order to understand the content to the required level.
Topic	A collection of sub-topics, grouped logically to support learning of a particular topic.
Sample asset	 9 individual rise calcs.avi

11 Rationale and Theory

Rationale

Interactive White boards (IWBs) are gaining popularity as a tool for presenting lessons in class rooms (Hedberg & Freebody, 2007) and anecdote). The interactive capacity of IWB and the ability to store the images that are created during the course of a lesson allows the tacit skills and “tricks” of a tutor (Sennett, 2008) to be stored and reviewed, potentially without the need for clumsy and imposing video recording of lessons. Those ephemeral gems lost at the stroke of a white board eraser to make space for the next lot of text and sketches may now easily be caught in context to be shared with others who teach the same topics. While IWBs are being used to capture and retain resources for a particular class, they are not currently used as an engine to develop packages which can be delivered by other tutors. If IWBs are suited to this application it might provide a way for large scale development of simple but effective electronic content. Resource creation may become more economic and scalable helping to make better education more accessible and affordable (Daniel, Kanwar, & Uvalic-Trumbic, 2009).

Tutors/trainers often need to develop resources themselves or with limited support. The guidelines provided in this project, provide a process to assist with the development of quality resources for use with and without IWB. This may lead to an increase in the pool of freely available and shared quality multimedia teaching resource packages. Successful use of the guidelines developed here has the potential to enable talented tutors currently working in isolation to share some of their talent.

The reusable teaching object (RTO) created by the process described through completion of this project, enhance students learning of numeracy by creating images and virtual 3D constructs. (Alonso, López, Manrique, & Viñes, 2008) discuss this as the multimedia principle. The students will learn the specific skill of using maths and geometry to build stairs but more generally to recognise numeracy as a problem solving skill that they may be able to apply in other contexts. The value and appeal of developing numeracy skills will also be more convincingly demonstrated.

There is a great role to be played by the providers of the learning materials in ensuring that the learners develop the necessary skills to construct knowledge (Njenga & Fourie, 2010, p. 204). This project contributes to the improvement of teaching practice by providing a structure in which tutors are able to reflect on practice while working through the guidelines presented in the report and think about how to structure their lesson in a way that is able to be captured and logically recreated as an RTO (Parkinson & Beauchamp, 2005). Therefore, this project contributes to more methodical development of learning resources based on sound pedagogical theory.

As the technology that this project is based on becomes more widely available, practitioners will benefit from the availability of RTO's and guidelines to help 'integrate' the IWB into practice and ultimately, potentially 'transform' teaching into a rich and dynamic multimedia interaction with students (Burden, 2002).

Many modern instructional design models for the creation of eLearning modules – often referred to in the literature as reusable learning objects (RLO's) - demand a large team of experts and multiple iterations of many steps (Mowat, 2007). This is in part because of the complexity in the task of creating a standalone object that is able to be used by a learner without the guidance of an instructor. These RLO's have "as much as 10,000% more complexity than is actually needed" according to (Jimenez, 2005). Therefore this project created a process for producing reusable teaching objects (RTO) that is simple and compatible with traditional classroom teaching.

Method used to construct these guidelines

These guidelines were developed through the use of a case study. This involved collecting tutor generated IWB files while teaching students how to apply geometry and trigonometry to design and construct a simple straight flight stair. This was a suitably self-contained project that the researcher personally understands well and is aware is very often taught poorly. The very well defined parameters of this subject allowed the project team to focus on the process of decoding the IWB file and creating the RTO rather than getting too bogged down in details of the lesson itself.

Generating the RTO was a two-step process, requiring the tutor to

- 1) construct their lesson to generate and capture as many of their teaching strategies and students' learning activities as possible, and
- 2) to then decode the lesson to expand and improve the data captured in the IWB file. This second step recognises that much of the teaching and learning in a classroom is embedded in social interaction (Lave & Wenger, 1991) that is not necessarily captured by the IWB. For example, conversations that are not recorded on the IWB.

Thus the IWB file generated will have some gaps in content and not all aspects of staircase construction would be captured in the tutor's IWB use. It follows, the tutor then needs to analyse the data based on sound teaching and learning theory to fill in the gap. (Alonso, López et al. 2008) to make the file a comprehensive resource. Therefore, the analysis and transformation of the data, as generated through the IWB files, was the subject of this research rather than stair construction per se.

Brief literature review

A review of the literature has shown no research completed on the development of RTOs through the capture of learning activities on the IWB. This is corroborated in, "An investigation of the scope of recent research in New Zealand into "instructional technology" which found, "only one paper reviewed specifically researched hardware in the form of Interactive White Boards (IWB) (Collecutt, Douglas, Mardle, & Fielden, 2006) and this paper was not related to eLearning design.

Nor could any literature on RTOs for teaching stair calculations be found. In addition, the information available on construction of stairs seems poorly constructed. This may perhaps be partly due to the history of construction maths and the move from the use of secant tables to modern scientific calculators using cosine, sine and tangent. Because no work on developing RTOs from IWB files has been undertaken before, there is a need for clear, pedagogically sound guidelines to be produced. Tertiary institutions are good at doing research on their subject but not so good at researching how to teach their subject. There is also a tendency for work done on teaching to be repeated rather than built up. The final form of the RTO, the structure of which was researched, was one of the outputs of this research project.

A constructivist framework, based on socio-cultural understanding of how learning evolves through interactions between teachers and learners framed this project. (Lave & Wenger, 1991) The conversational framework (Laurillard, 2002) between teachers' concepts and students' concept development through interaction with peers and teachers, is deemed to have been partially captured during a lesson through using the IWBs file capture capability. In this project, the additional step of reflection on the 'raw' lesson IWB files to assist in capturing some of the tacit knowledge of tutors provides for a concerted attempt at producing a RTO that reflects authentic practice within a situated learning environment.

External assistance

Synapsys (a well-established education/elearning consultancy) kindly donated 20 hours staff time to guide me through their development model to create the RTO. The project began with a meeting to: outline treatment; product specification; identifying required research; and map the development process. This was followed by storyboard treatment of content; confirmation of specification for resources to be developed; write-up; review and alterations.

11.1 References

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