Autodesk University 2012

Creative Pedagogy, CAD/CAM, Iterative Design, and Teenagers

Speaker: Rhys Evans, Head of Technology, Ysgol Dinas Brân
Co-presenter: Matthew Bell, Autodesk
Code: ED3371

Learning Objectives

At the end of this class, you will be able to:

- Describe a range of creative design strategies
- Follow a design-and-make process from concept to working prototype
- Apply a range of creativity strategies to extend student responses beyond predictable outcomes
- List the elements of a creative learning environment

About the Speaker

I enjoyed a successful ten year career in engineering and it has been a great help to me since becoming a teacher.

I am a member of the Design and Technology Association Secondary Working Group that offers advice and guidance of matters relating to Design and Technology to teachers across the UK

In 2001 I won a Teaching Award for 'The Most Creative Use of ICT in Wales'.

In 2002 I received a Leadership Award from the Design and Technology Association.

In 2005 I was made a 'Fellow of the Teaching Awards'.

I was one of the authors of the current National Curriculum order for Design and Technology in Wales that became statutory in 2008.

In 2011 I was Primary Engineer Secondary Support Teacher of the Year.

I am the James Dyson Foundation Design and Technology Teacher of the Year 2012.

It is one of the most prestigious awards in the field of Design and Technology Education.

I am Head of Technology at Ysgol Dinas Brân in north Wales, UK.

Class summary

This class will focus on how students age 10 to 20 are taught to use Autodesk® digital design technologies to design and make creative products and working prototypes that address a variety of needs.

We will demonstrate methods for a creative design process and explain how metacognitive thinking skills have been applied in the classroom.

We will also discuss our methods and the results of action research carried out on a range of mixed-ability students across the age range.

Who are the members of the learning community?	Senior management link – whole school responsibility to give clear support for the programme but should not be lead/chair person. Lead practitioner should have expertise in the focus area or should attend CPD training and share good practice. In order to share good practice an inter-department working group should be set up. Initially made up of early adopters and self-motivators each cycle the group membership should change to ensure as many staff as possible have time in a range of PLC's. Eventually the more reluctant staff will rotate around to an area they have been avoiding this will provide an opportunity to bring them on-board or at least make them aware of how they will be performance managed in this area.
What is your focus?	Consistency of practice in AfL and Thinking Skills within departments.
How and why have you chosen this focus?	The whole school review of AfL provision undertaken in 2009 (REE) had shown implementation and understanding of AfL and Thinking Skills was variable across the school. Following investigation it was clear that a lot of good practice was embedded in the teaching and learning but not all staff were comfortable with the terminology and we had no clear picture as to how consistent implementation was across departments let alone whole school. A number of factors were identified as contributing to this including the lack of a whole school forum to encourage discussion and sharing of good practice and that there had been significant staff changes since the review.
What are the expected outcomes?	A full and clear picture of the current implementation of AfL and Thinking Skills within departments based on empirical evidence rather than anecdotal evidence will be achieved. This will support and encourage consistent good practice within departments. In parallel, identified good practice will be shared across the school at regular PLC meetings and common themes identified to support whole school consistency in AfL and Thinking Skills. The identification within departments of what constitutes the distinct 'characteristic ways of thinking' within their field and the modes of thinking that indicate for example; 'how designers think' or a geographer.

What is your inquiry question?

A line must be drawn in the sand to serve as a benchmark to measure from.

An inter-departmental working group must be formed to serve as a steer for the programme and provide a local support and forum to share research findings and good practice.
Through discussion within the identified group suitable topics for research and development should be identified. A whole School and departmental target should be set. In addition, a personal target should be identified for each member of the PLC and this should form the basis of the performance management for that member of staff.

How to choose an inquiry question?

The following is an example of the approach adopted by my department.
An inspection was imminent and consistency in AfL and Thinking Skills was a likely focus based on the recent experience of colleagues in other schools.
This was the question chosen by the design and technology department:

> *What AfL and Thinking Skills strategies are consistently in place within the Design and Technology department?*

What kind of support do you need?

All departmental staff to discuss and share the strategies they use regularly in the classroom.

This process will help highlight 'in-house' expertise that can be accessed easily and is readily available.

Once local support has been identified focussed CPD can be applied for that is in line with the departmental and school development plans.

What did you do in the classroom?

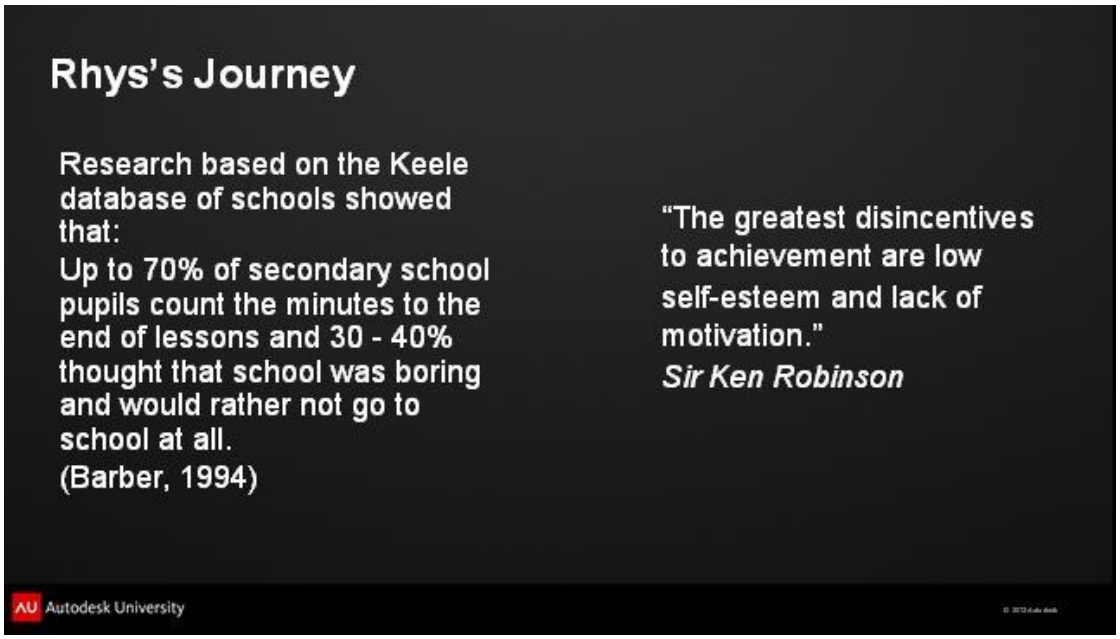
Make clear to the learners that the design process is a structure for ordering and supporting the development of their thinking and by using it they provide evidence of Assessment for Learning as it is a formative process.
Within the design process specific thinking tools were used at specific times to scaffold the learning experience.

What was the learners' contribution and response?

When presented with a design opportunity/challenge/problem to solve learners;
Use Mind Mapping to analyse and break down the task.
Use ACCESS FM when analysing existing products. This provides a consistent approach to questioning and enables meaningful comparisons to be drawn between different products and the work of different designers.
Use PMI when evaluating their own ideas and those of others to identify
Plus – what is good about their idea
Minus – what would benefit from more thinking or may need to be discarded
Interesting – what is it about the idea that 'grabs' their attention and/or what is the narrative element to the idea, what is the story behind it e.g. a pupil may comment; "I was inspired by natural forms based on a pebble I found on a beach to create the shape of my tactile wooden box.
Pupil Self-evaluation, we trialled two new approaches to pupil self-evaluation. The first was a digital one utilising MS Excel and tried to be all things to all people. In use it was too complicated and relied on access to PC's that could not be guaranteed at the time required. The second utilised a Metacognitive approach. It was much clearer and simpler to use, it did not require the use of PC's but significantly it did offer the opportunity for deeper reflection within an apparently easy but deceptively simple format that encourage deep reflection.

Slide 4

Slide 5



As a creative person I was like many of you misunderstood in school and at home. My parents didn't have any time for arty creative things even though they were both creative. They suppressed it and as I wasn't a great student I found myself pushed out of school and into an engineering apprenticeship. Within three months I knew I was not going to stay a maintenance engineer but I also understood I had to see something through and get some qualifications so while I enjoyed a lot of the work I increasingly missed a creative outlet so much so that it began to feel driven to do something else. I think this is a common feeling for creative people, we feel this need to do it. We don't have to be induced to do it we have to do it. This made me think about school and ask the question why do we find ourselves as teachers looking for ways to manipulate young people into learning when it should be their natural state? Maybe there was something we could do better?

Ysgol Dinas Brân where I work was one of the schools that took part in this research.

I was in my second year of teaching (and just starting to look beyond getting the children to behave and think I might actually be able to do this job!)

When our deputy Head teacher read out some of the findings of this research and urged us (the staff) to read it and see if we could do something about it – predictably, most didn't and quickly forgot about it.

When I was appointed to my position at the school I quickly noted how traditional and 'old fashioned' much of the project work was and I knew instinctively we were missing an opportunity.

Before my appointment the department had received a significant investment a few years earlier but had been criticised by HMI for the standard of designing and by implication 'creativity'.

I was lucky that my Head of Department was open to change and I was allowed to try out new ideas.

I was relatively inexperienced and while some ideas worked some did not but I had no methodology to help me structure or measure the impact of my ideas and worked largely on instinct as there was no one to advise/guide me as Creativity was assumed and implied at this time. I was in fact 'navigating without a map.' If mentioned at all

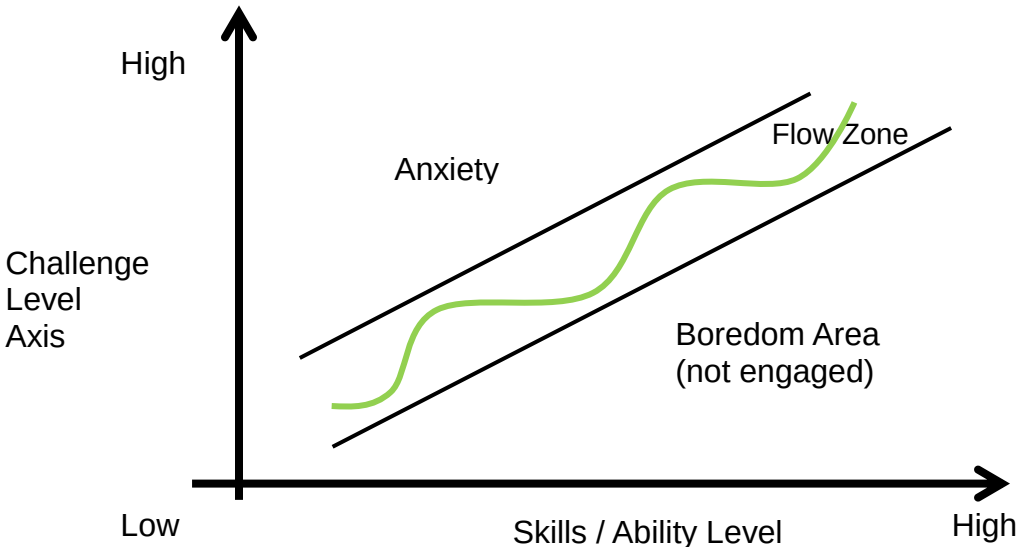
it was common to question if creativity and thinking could be taught the prevailing mood of the time was that creativity was some kind of mystical natural talent that you either have or don't have and that each individual had a set allocation of it!

I didn't believe that.

- When I was appointed the departments GCSE pass rate was 35% this wasn't good enough but was typical for a school of our type at that time.
- The courses run for two years and my first set of results raised the pass rate to 66% much better but still not good enough.
- Over the last twenty years we have continued to make changes to the way we teach, the learning environment, the courses and the results have steadily improved to the point we now typically post GCSE results of around 90% A* - C grade. Our other vocational courses and our advanced courses regularly achieve 100% pass rates. How did this happen?
- From the beginning I decided I needed to find out how to ensure I engaged my pupils and I reflected back on my education lectures in Middlesex University and how we talked about good behaviour came from stimulating and interesting lessons not control and that environment was a vital factor.
- I found it enjoyable to read widely on education and one word started to stand out more and more – Creativity!
- I became convinced that people like Howard Gardner, Tony Buzan, Edward de Bono, Ken Robinson and Mihaly Csikszentmihalyi were right and that Creativity and Thinking not only could be taught but must be taught.
- It was a breakthrough for me to realise it was not just about what we taught that had to be creative but, the learning environment and the pedagogy that had to be creative for the big changes to take place.
- I adopted a simple approach of start small and prove by example. I looked around and chased funding. We offered to pilot programmes and carry out surveys, we completed funding bids no matter how small to put each brick in place we wrote a vision document (and costed it). I joined our national professional subject association and became an active member. I remain a member of the Secondary Advisory Working Group and I am the longest serving member.

Optimal Experience is defined by (Dr. Mihly Csikszentmihalyi) as:

- Facing a challenge that requires a skill you possess – so we need to ensure the learner has opportunity to apply skills they possess. This begs the questions when and where did then learn these skills?
- Absorbing yourself in the activity – in order for the learner to become absorbed the activity must be relevant and interesting.
- Clear goals and feedback – clear learning objectives and success criteria must be used at all times.
- Concentration on the task in hand – the teacher as facilitator is crucial here to ensure pace and progression is maintained or a state of equilibrium 'drift in, drift on, drift out' may slowly creep in over time.
- Transformation of time during the experience – it is common for our learners and even staff to be surprised how fast a lesson has gone. When you are enjoying yourself time passes quickly and I have never had a slow day in teaching.
- Experiencing the 'flow' state
- Activities that consume our attention are intrinsically rewarding.



Flow is the mental state of operation in which a person performing an activity is fully immersed in a feeling of energized focus, full involvement, and enjoyment in the process of the activity. Proposed by Mihály Csíkszentmihályi, the positive psychology concept has been widely referenced across a variety of fields.[1] According to Csikszentmihalyi, flow is completely focused motivation. It is a single-minded immersion and represents perhaps the ultimate in harnessing the emotions in the service of performing and learning. In flow, the emotions are not just contained and channelled, but positive, energized, and aligned with the task at hand. To be caught in the ennui of depression or the agitation of anxiety is to be barred from flow. The hallmark of flow is a feeling of spontaneous joy, even rapture, while performing a task[2] although flow is also described (below) as a deep focus on nothing but the activity – not even oneself or one's emotions. Buzz terms for this or similar mental states include: to be *in the moment*, *present*, *in the zone*, *on a roll*, *wired in*, *in the groove*, *on fire*, *in tune*, *centred*, or *singularly focused*.

Flow (psychology)

From Wikipedia, the free encyclopaedia.

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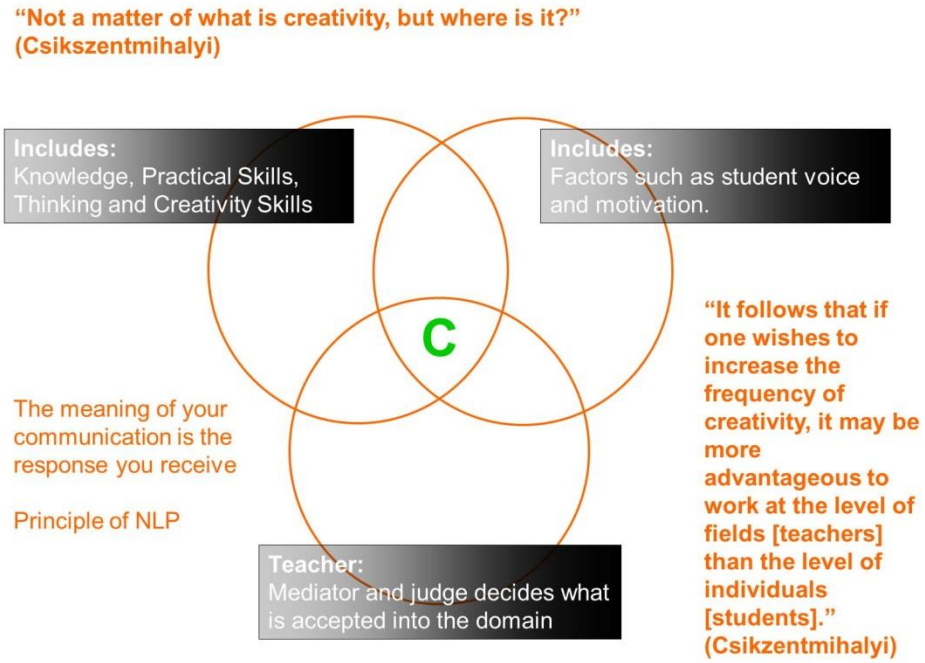

I believe that the teachers, student relationship is essential in an effective learning experience. If you influence the teachers you influence the students and these things happen in parallel as both teacher and student are interdependent. I believe that without getting the teachers ‘on board’ and in that dreadful politician's speak ‘on message’ then you have a major obstacle to creativity.

However, teachers are part of a two way learning experience; in in the words of the Japanese proverb ‘To Teach is to Learn’.

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The Cultural Domain refers to the knowledge, activities and disciplines that the learner needs to engage in to be able to fully access their Creative Potential as a designer or engineer. The Social Field refers to the other people the learner must engage with. The thinking strategies will vary depending on the activities and the people involved.

The Assessment for Learning (AfL) process is about the people we interact with and therefore belongs in the social field but the strategies and underpinning knowledge used to inform it are a discipline in the Cultural Domain.

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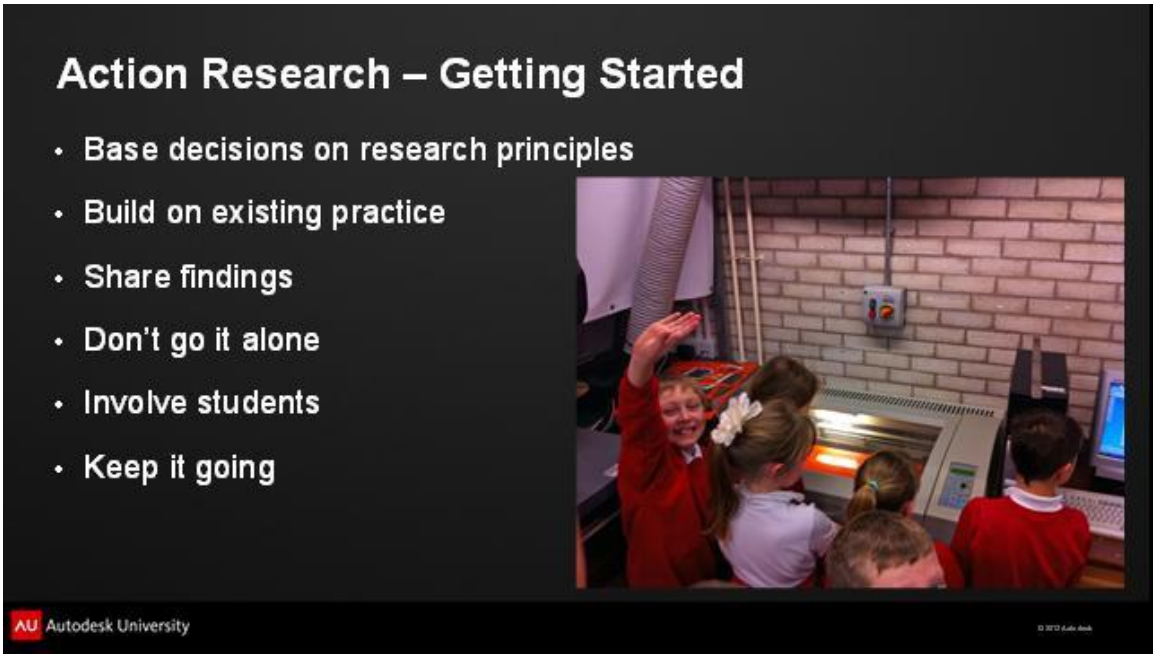

It was my contention that I had listened too often to colleagues recount anecdotal opinions as fact and if we were going to make significant lasting, measurable change we needed to adopt a more rigorous approach to our research backed by empirical evidence.
In order to do this we were going to need a structured approach to our research and a plan.
Details of our method are in the speaker notes so I am only going to skim over them here.

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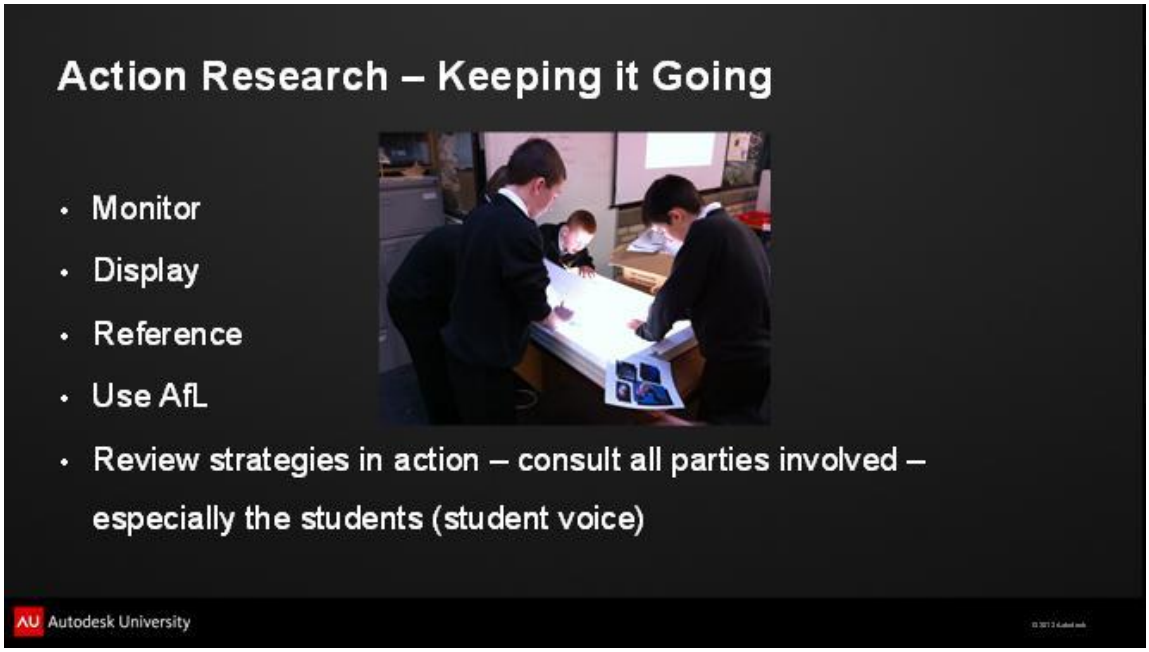
A professional learning community (PLC) is an action research group.
We have a number of them within the school addressing priorities such as numeracy, literacy, AfL, assessment, use of data (2011 – 2012)
I am also a member of the Local Education Authority PLC on AfL and Thinking Skills
Additionally, I have been a member of the National PLC on AfL and Thinking Skills
This diagram is an adaptation of an implementation model widely adopted in Wales.
It is SMART

Slide 12



- Once the strategies are decided they must be monitored, especially by classroom observation
- Make the strategies visually obvious throughout the department/school
- Refer to strategies during whole school events such as open evenings to share a common language of design between staff, parents and pupils
- Use AfL to inform the assessment policy and outline exactly how formative assessment is to be carried out and that everyone has a copy – discuss at departmental meetings.

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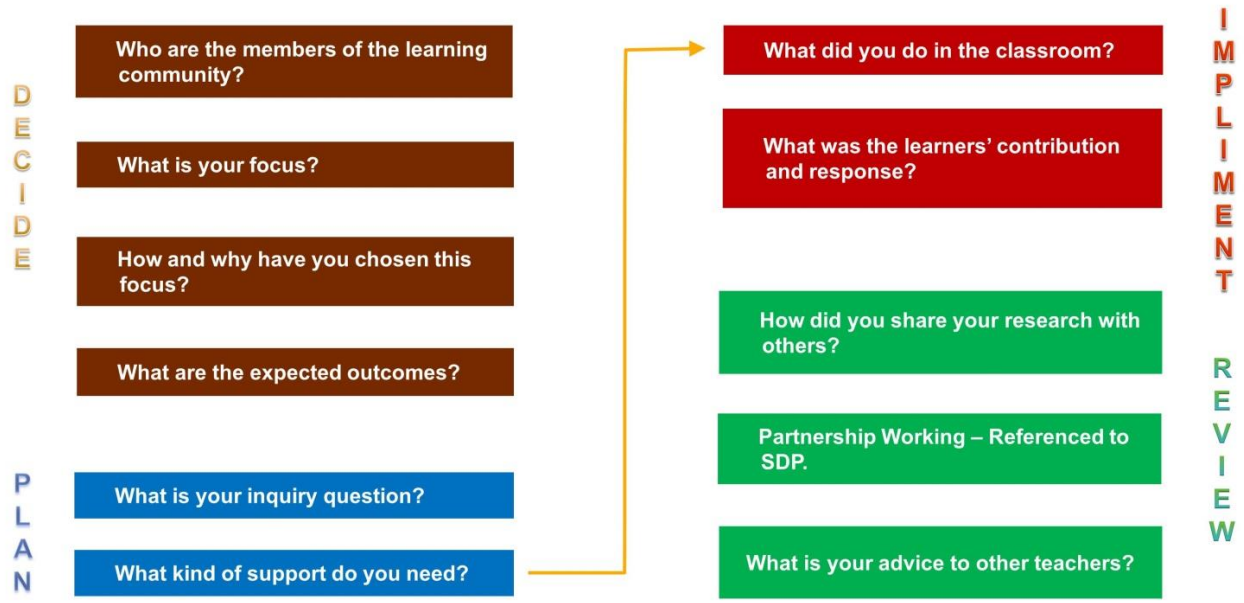

This diagram identifies the questions that were asked and the grouping of the questions into the main phases of the research project.

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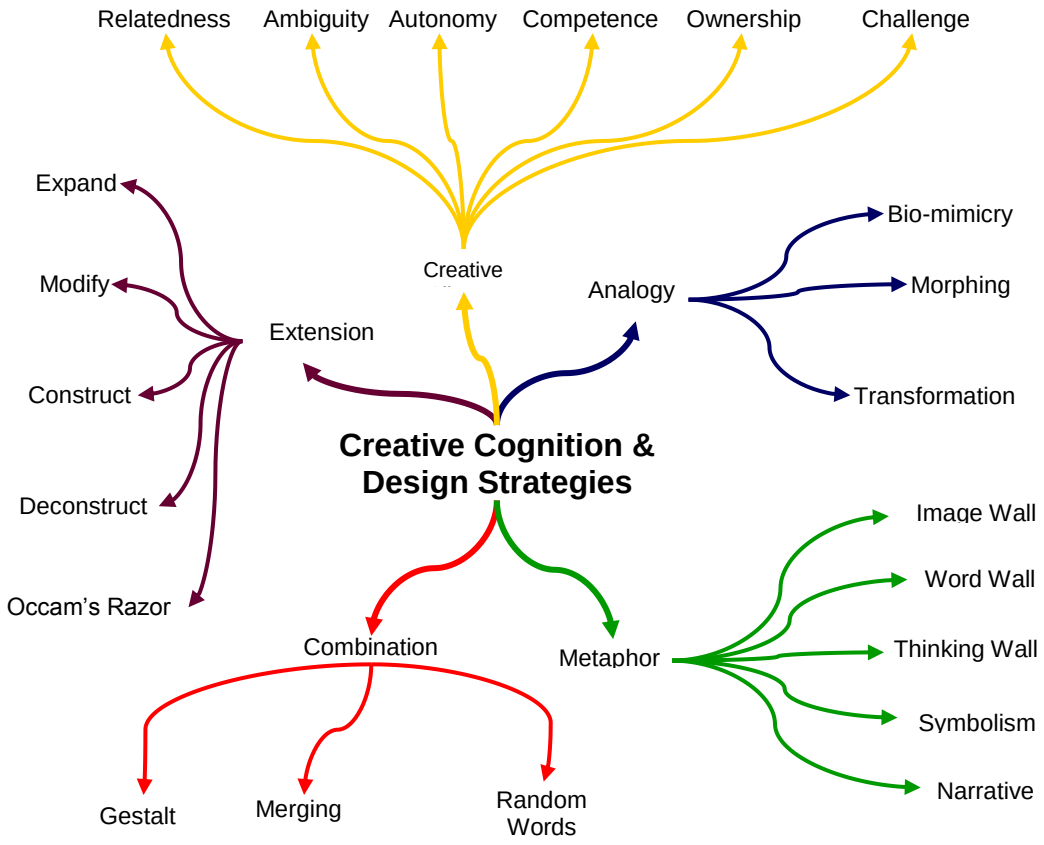

I produced this diagram as a simple visual aid to my planning.

I would never attempt to use all the strategies in one project. It is more of a buffet where you pick the strategies you either have applied of want to apply in the project you are planning.

As much as anything it makes it easy to check coverage over a scheme of work for a year group or key stage.

It is a recognition that you can and should plan for creativity as well as the technical procedural elements of a course which are the elements that are traditionally planned for in detail.

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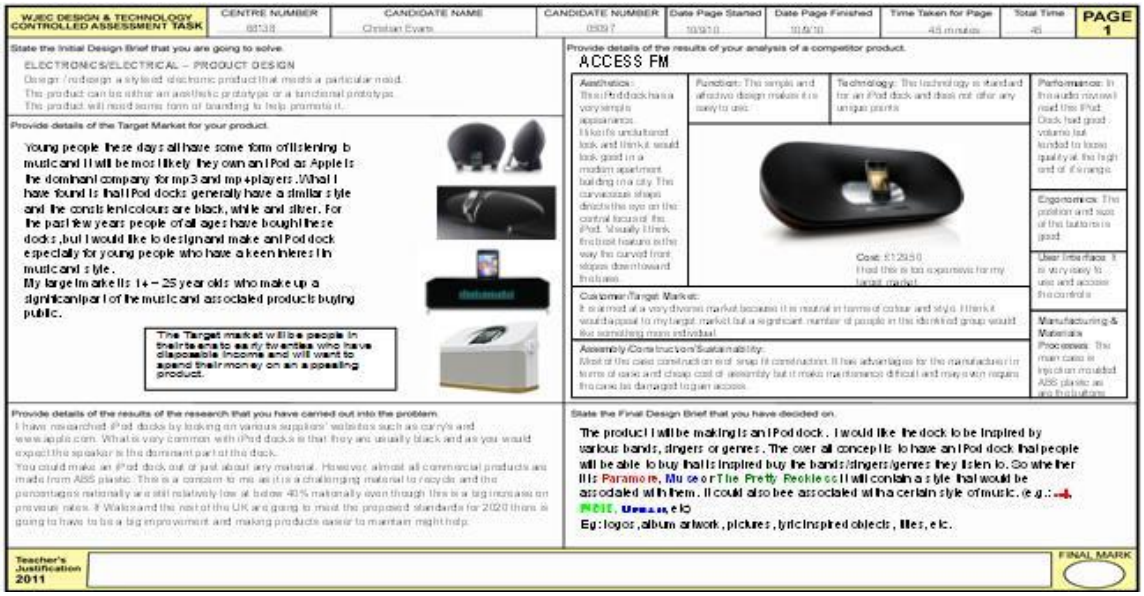
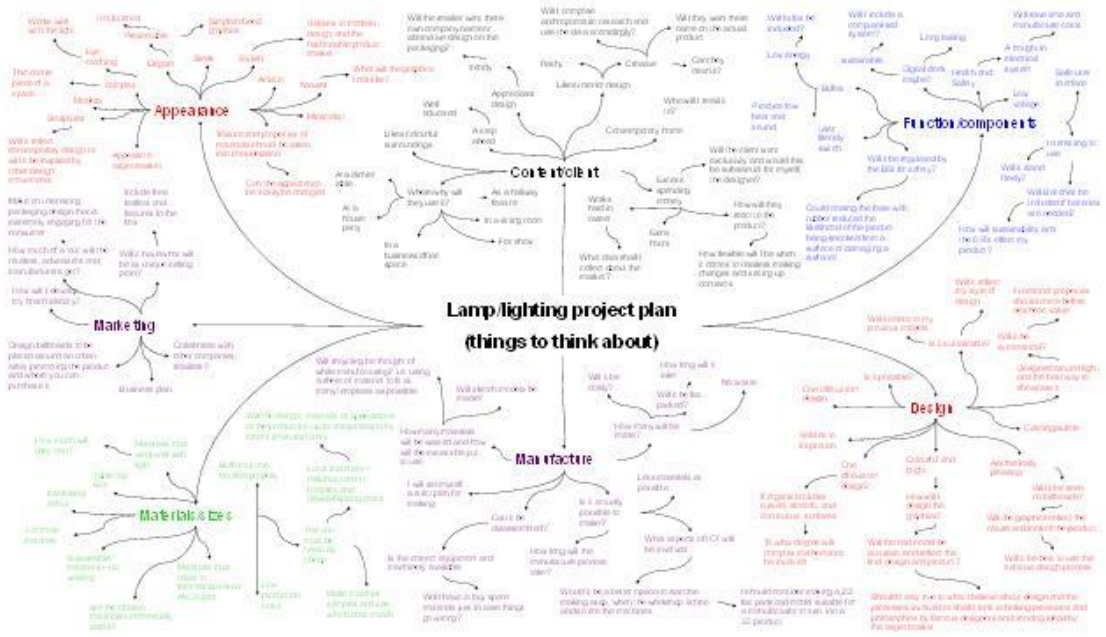


This slide illustrates the use of ACCESS FM in GCSE design and technology coursework using the WJEC examination board template.

To find out more about ACCESS FM go to :

http://accessfm.com/

Slide 19



This is an example of the use of Mind mapping by Rob one of my students to structure his research into an open ended investigation.

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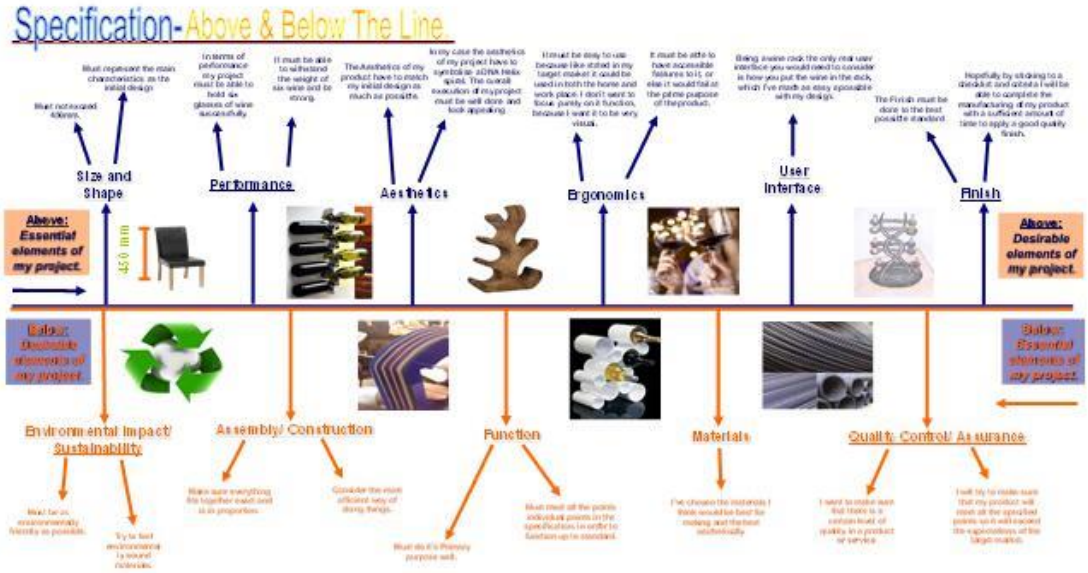

This is a very interesting development by Christian one of my students. He has created what I believe is a unique structure and one that I have certainly not seen before. It elegantly addresses the needs of the examination board in a highly visual and clear manner. It provides a hierarchical structure showing the order of importance of a range of criteria and place them ‘above or below the line’ to indicate whether they are the elements that are visible and are the interfaces that most often come into contact with the user/client (above the line) or if they are below the line and therefore usually hidden either from sight or contact – most often the technological, technical, operational elements and or properties.

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This is the use of an image board by Gwennan to create a readily accessible source of inspirational imagery.

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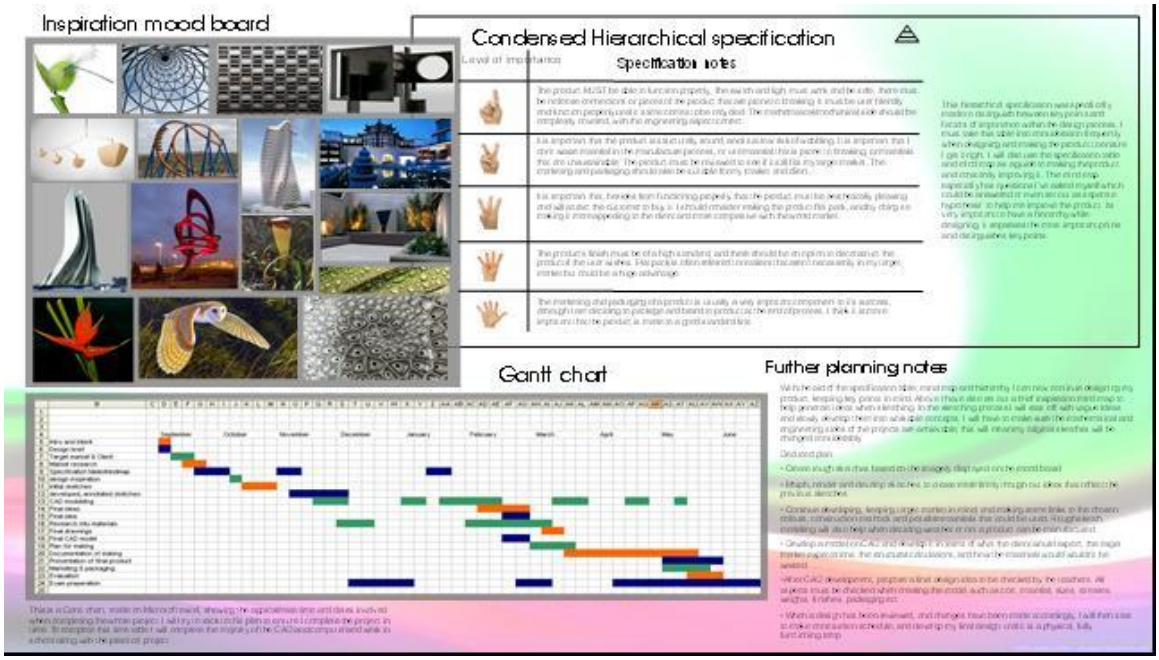

In this slide Rob has combined the use of inspirational images and a range of planning techniques to produce a rich source of information in an accessible form.

Slide 23

In this slide Gwennan has carried out research into existing products focussing on one influential designer.

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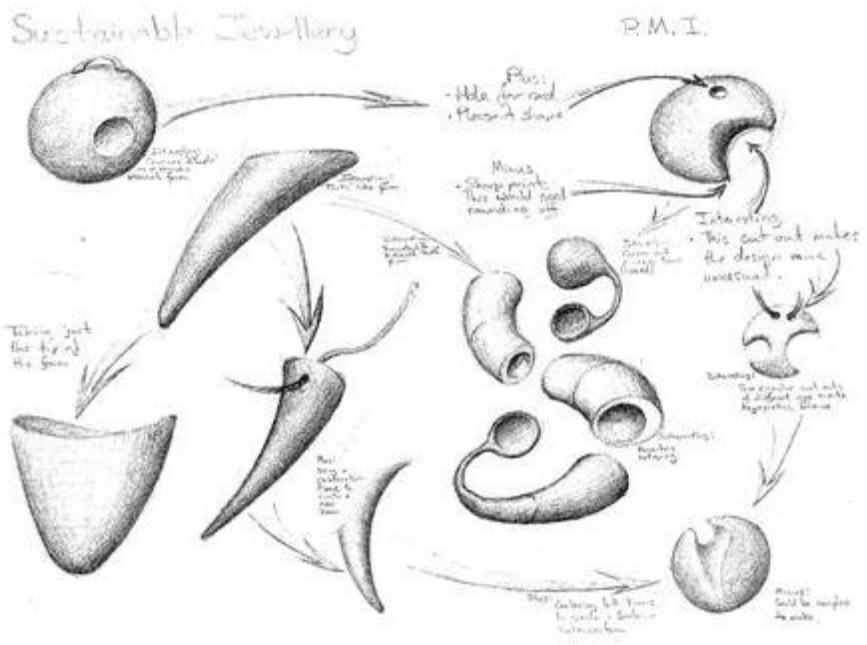

This slide shows a lively well annotated design sheet. The comments are structured using PMI from the CORT programme by Edward de Bono.

While the Plus and Minus elements of PMI are relatively straight forward I find students require more guidance with the ‘Interesting’ part.

I often get them to use this as an opportunity to explain the ‘narrative’ element to the idea by asking them to explain where the idea came from. This often brings some valuable comments and insights into the creative process.

Through such a simple attention directing tool to ‘scaffold’ their designing the quality of pupil comments is much improved.

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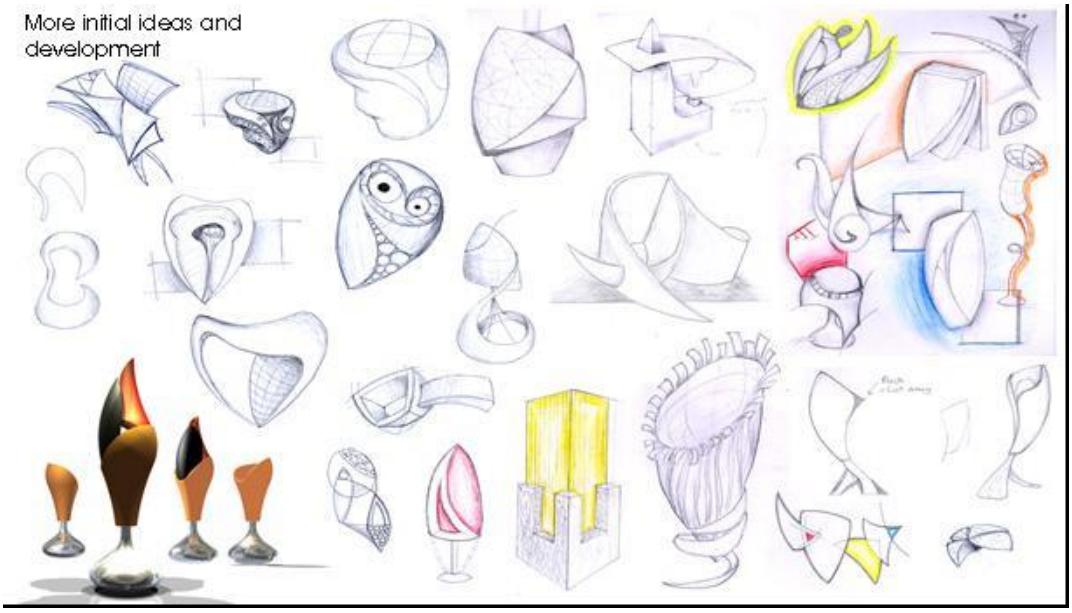

In the case of this student I knew he would provide detailed written analysis both before and after this design sheet so I was happy to allow him to ‘play’ with his design sketches without breaking his creative flow.

This is a case where teacher judgement is essential and why any approach has to be flexible as the rigid imposition of a formulaic structure has to be carefully balanced in order to achieve creative outcomes.

He has applied a range of creative strategies such as **Extension** and **Metaphor** focussing in particular on the use of **Bio-mimickery.**

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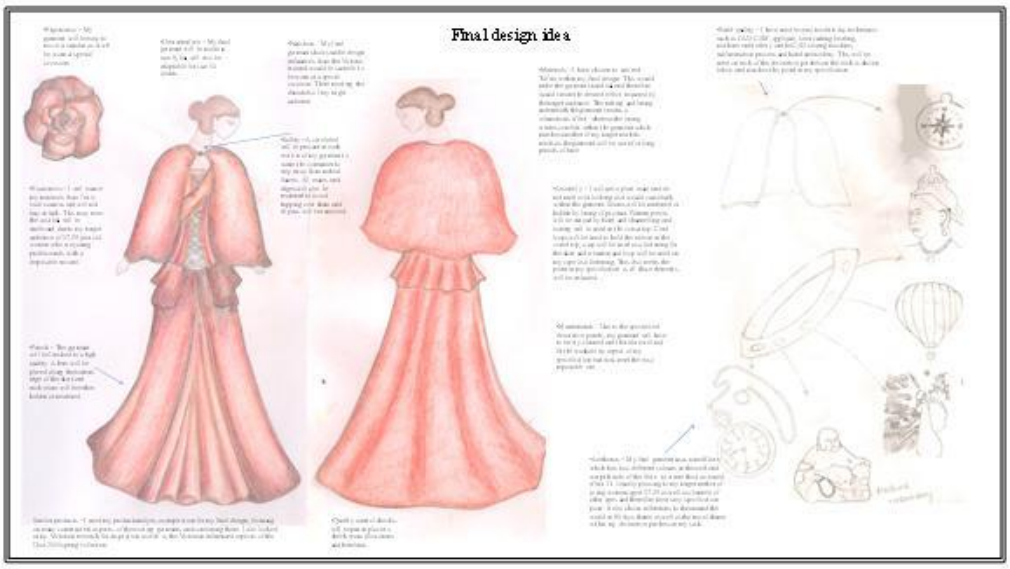

This project uses **Metaphor, Analogy** and **Extension** as **Design Strategies f**ocussing in particular on the **narrative element** of **Metaphor** as a **Design Strategy.**
This garment is inspired by ***Around the World in 80 Days*** it is a classic adventure novel by the great French writer Jules Verne, first published in 1873.
It takes a Victorian theme and brings it up to date incorporating significant use of digital technologies.
A number of the details were designed and manufactured using CAD/CAM. The buttons were laser engraved and cut.
The flowers were extensively prototyped, tested and manufactured using a laser cutter.
The print elements were digitally manipulated and Dye-Sublimation printed.

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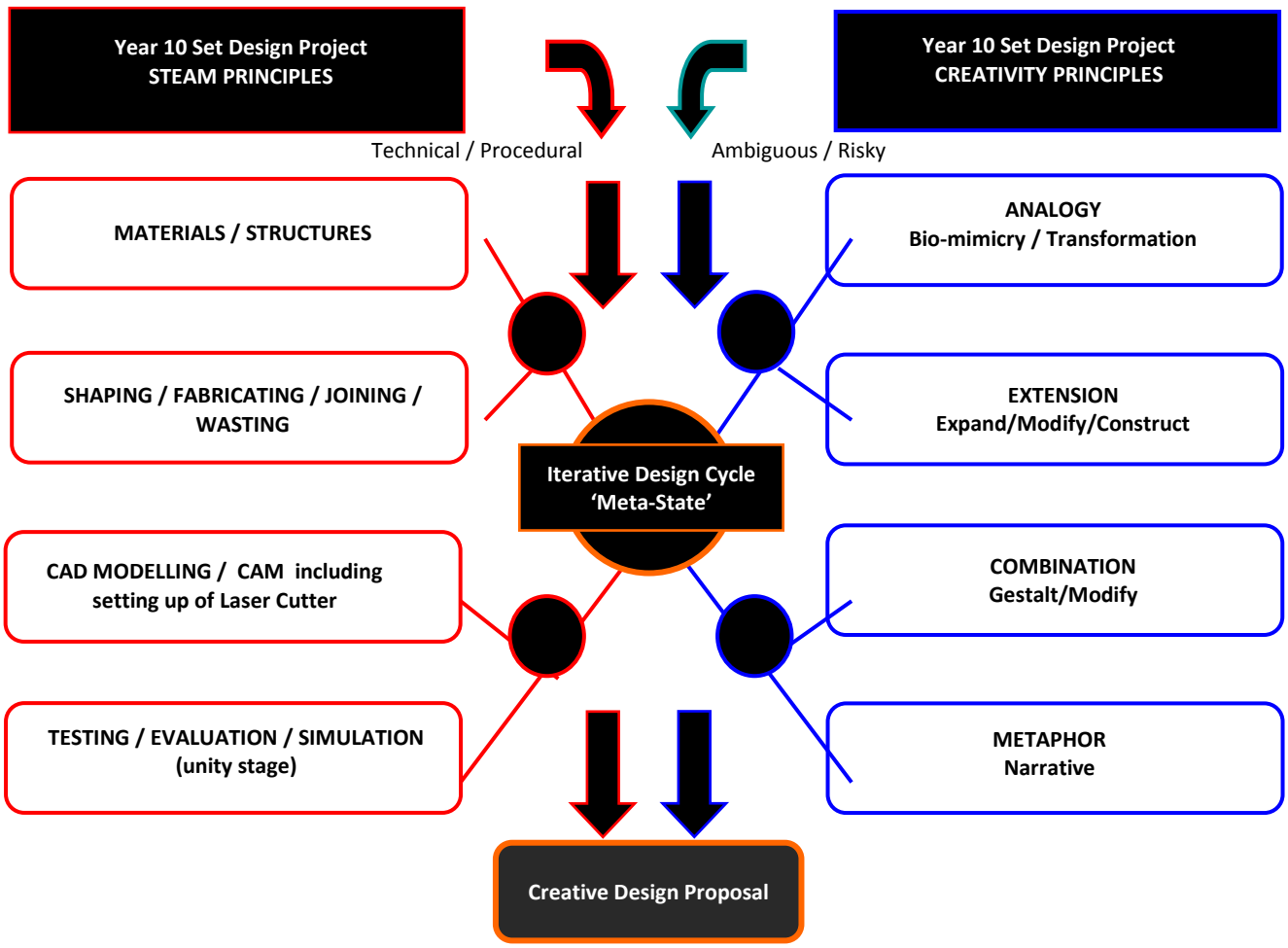
An Applied Pedagogical Model



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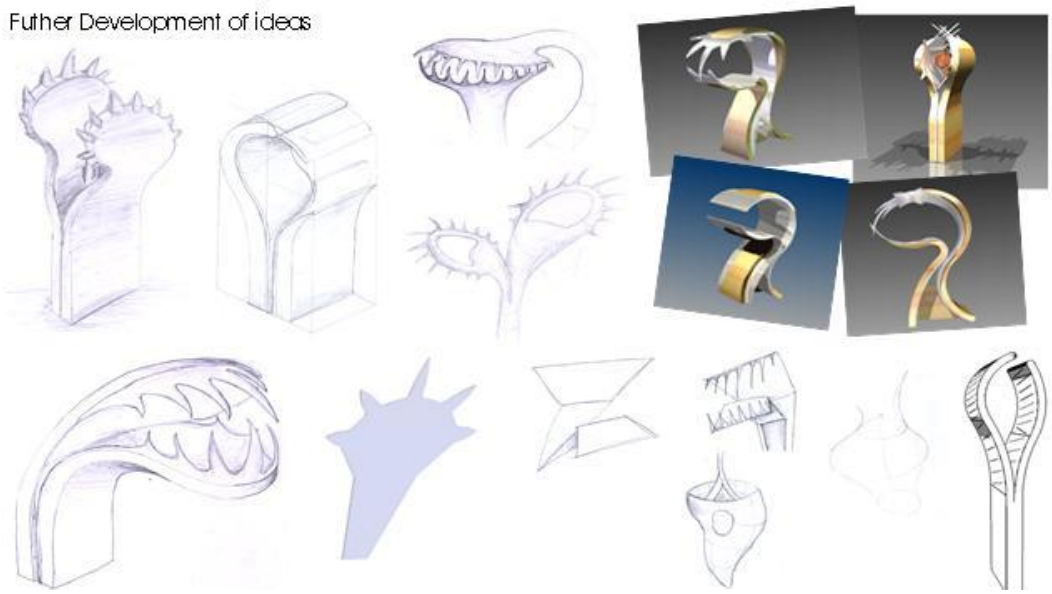

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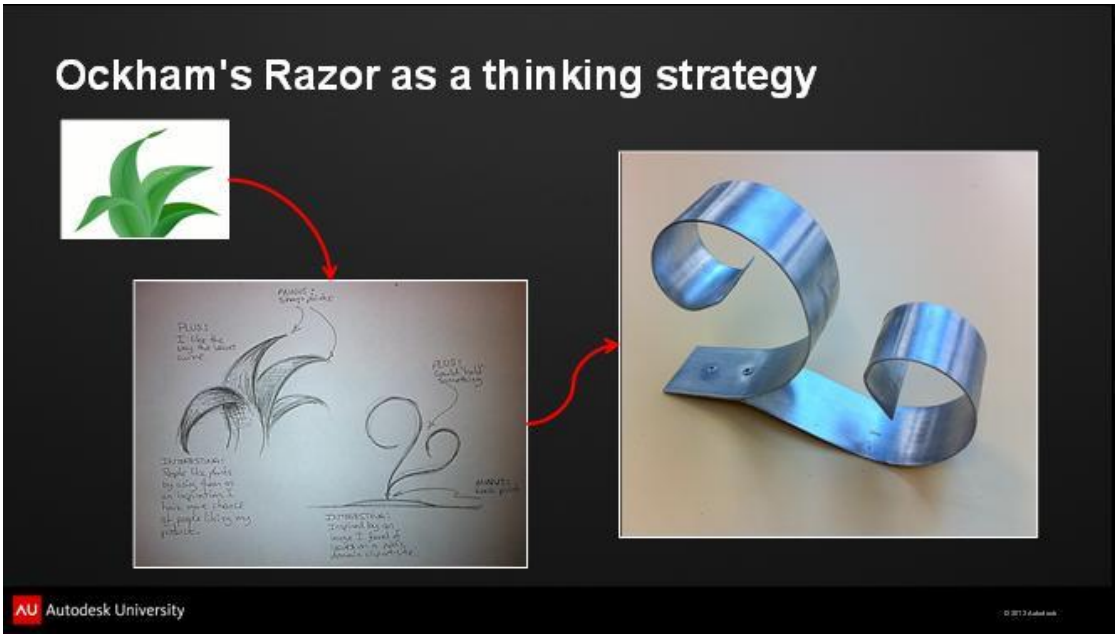
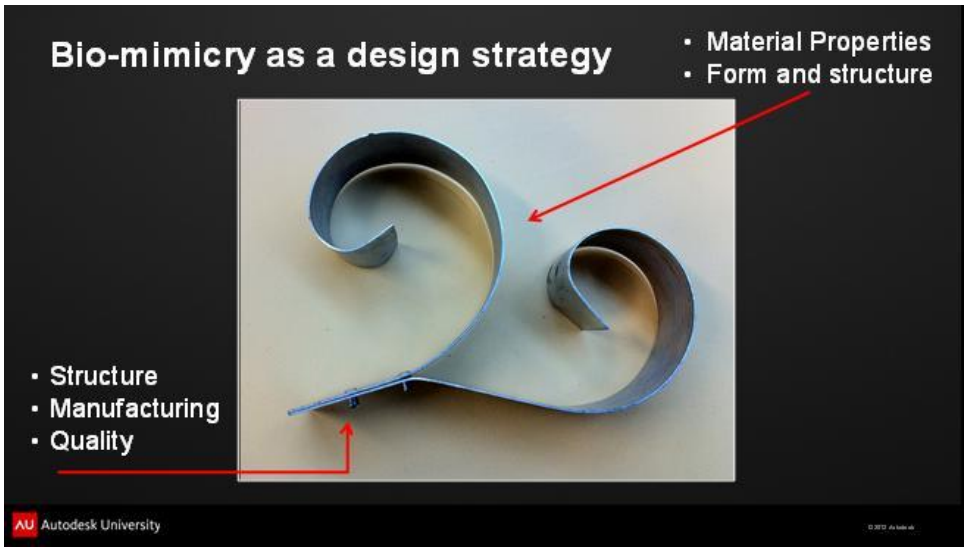


This deceptively simple product hides a sophisticated use of the material by a student of this age (13).
The material properties and suitable construction methods have been explored in detail and applied appropriately to produce a simple but elegant product that addresses the main requirements of the design brief.
The thinking strategy of Ockham's Razor has been applied to reduce the instance of components to the bare minimum required.
It is simple but not simplistic – see next slide for further detail.

Slide 30



In this image the clever use of the material and construction becomes more evident in this prototype candle holder. The design allows the holder to adapt to a range of candle sizes and hold them secure.
It was observed by classmate that it would also make a good letter rack and a whole range of other suggestions followed.
The design was arrived at by using bio-mimicry as a design strategy and adapting a plant like form and structure.

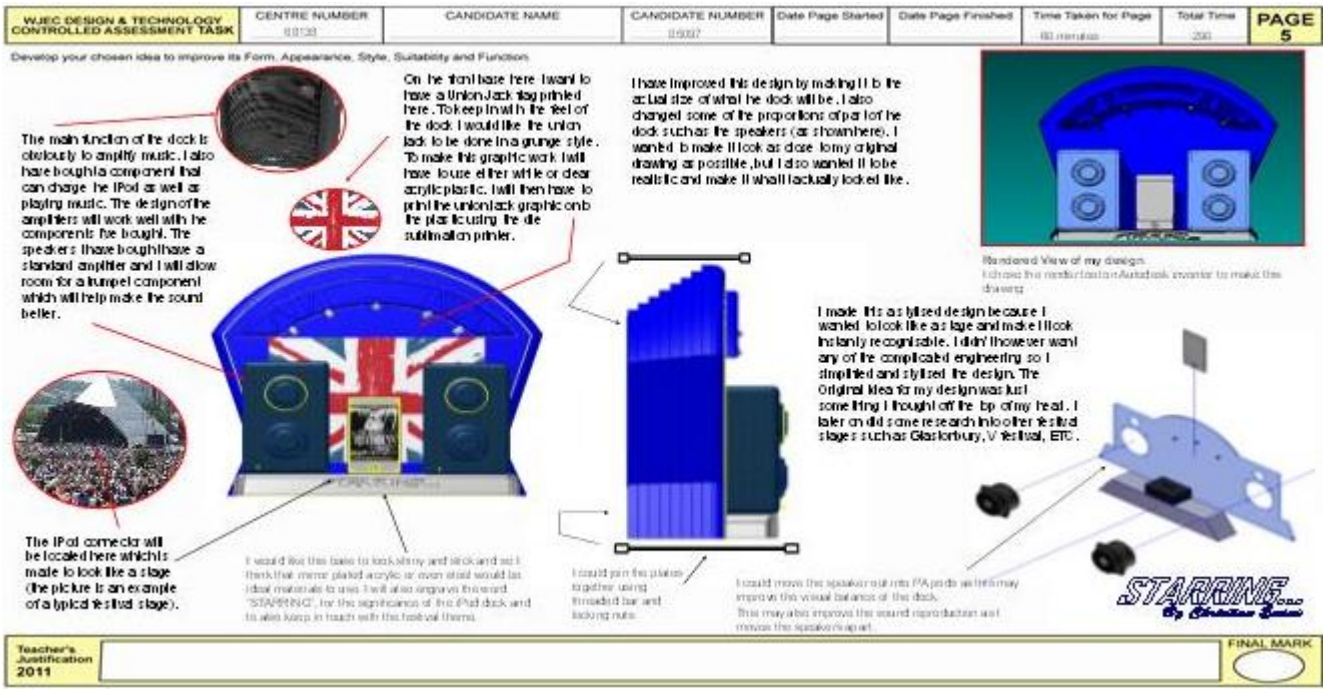
Following some experimentation the pupil had an appreciation and understanding of the properties of the material. In particular, a design was arrived at that took advantage of the ‘springiness’ of the material and the fact that it increased when the material was folded to work harden it and increase the natural spring (elasticity) of the material.

The pupil understood that when using pop rivets a large part of the rivet sticks through the under side of the joined plates.
This would make the product unstable. So the design was adapted to allow for this engineering ‘hard point’ by folding the base to create an attractive’ cranked’ asymmetrical design that allowed room for the rivets to project while maintaining a stable platform.

Slide 31

In this example the student has again arrived at a deceptively simple form that belies the sophistication of the design thinking that is clearly evident.
The use of analogy draws on the form and structure of a chair to scale the form into a creative response to holding a mobile phone.
The design makes very clever use of the material through sophisticated folding of a single sheet of material into a 3D form.
This requires mathematical accuracy, engineering precision, sophisticated 3D visualisation, great hand eye coordination, creative thinking, great technical application of a range of making skills and materials knowledge.
All this is achieved while taking account of the needs of the user by ensuring it is safe to use (rounding corners, removing sharp edges etc.) and a desirable product.
It is also fully recyclable, has no harmful surface finishes, makes maximum use of the material with minimum waste.

Slide 32



This slide shows how the student addresses the steadily increasing level of technical information as the project moves toward realisation.

The embedded application of digital tools (AIP) is very evident and it is clear they are a considerable help in addressing the technical requirements.

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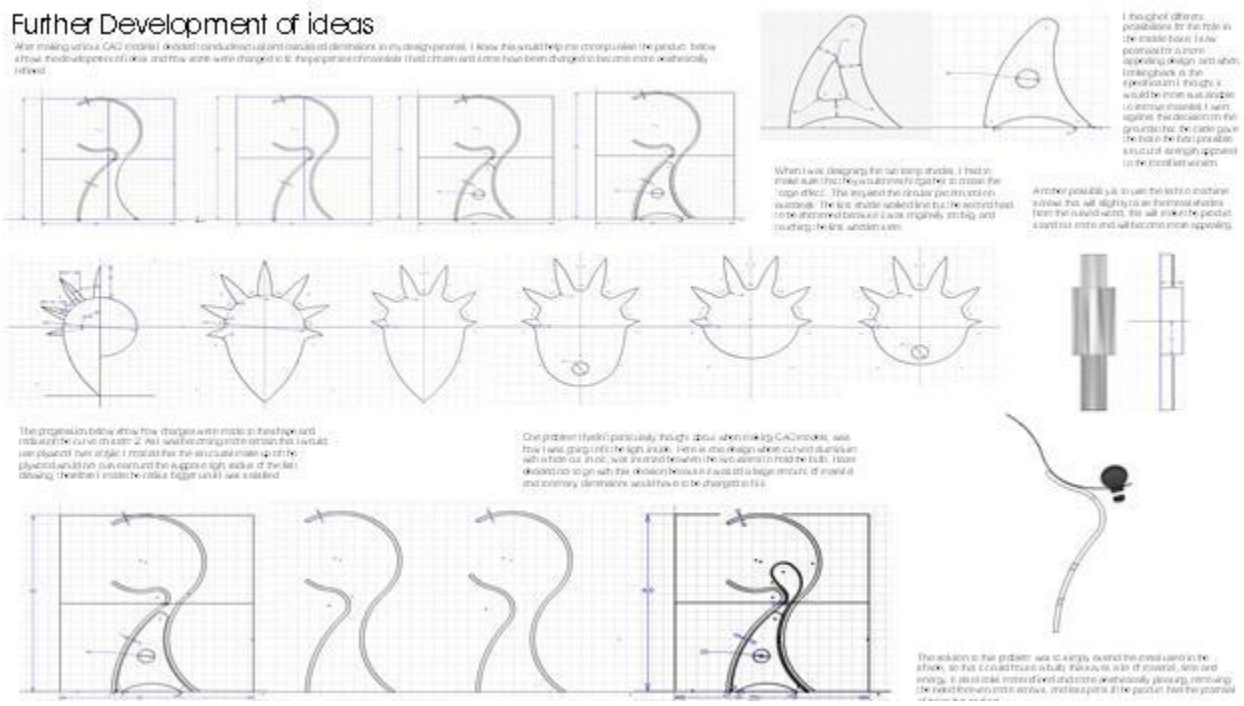
Iterative designing to practically address engineering requirements.

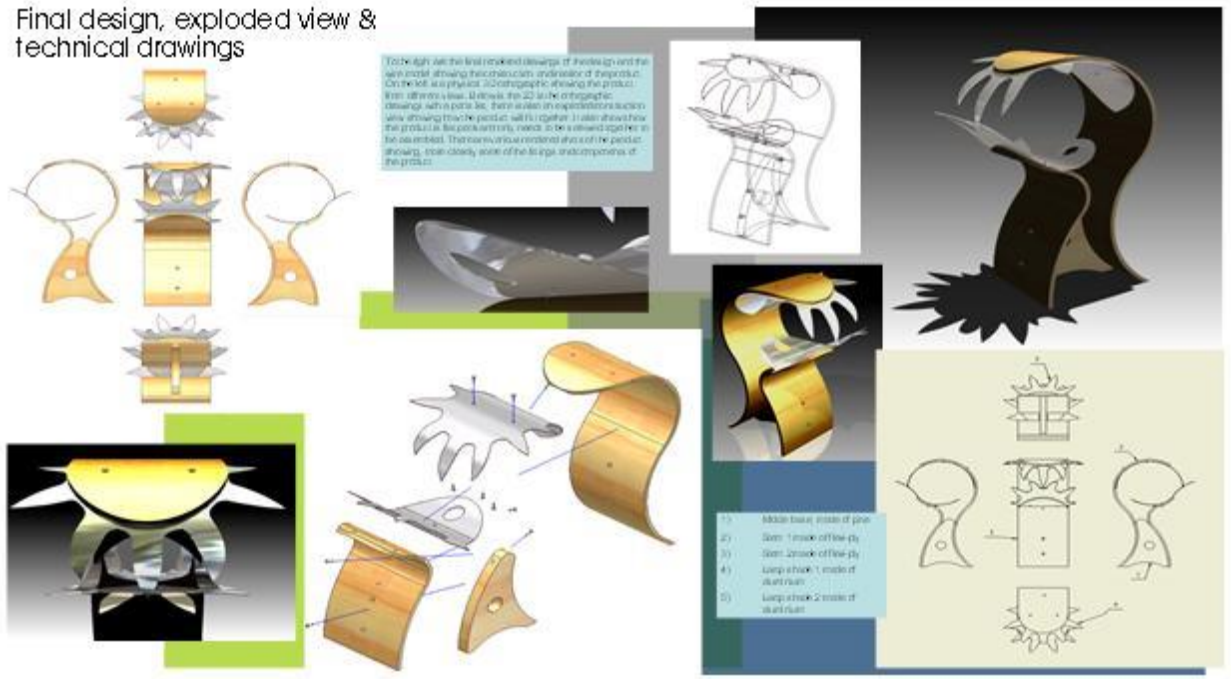
Every project has ‘engineering hard points’. These are the constraints the designer must work with for example the circuit boards in this project had a space and position requirement. This slide shows how the student had made a range of measurement and applied these to the digital model. He then took advantage of sketch modelling techniques using cheap material (cardboard) and the ease of adjustment to the digital model to generate increasingly accurate models for the back plate using the laser cutter.

Slide 34



In this slide we see the student carrying out design iteration on screen using digital modelling.

Slide 35



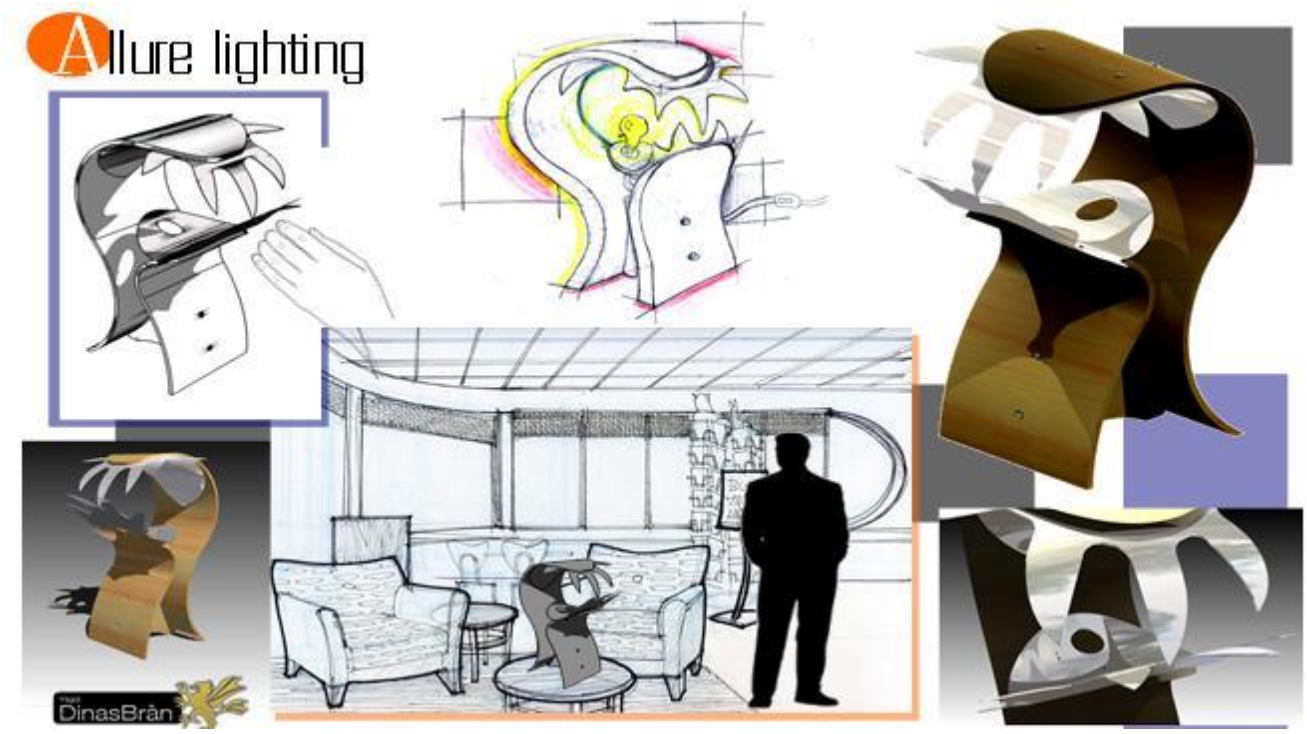
Final design showing:

- exploded isometric view
- orthographic view
- wire frame
- studio renders

Slide 38

Final assembly and testing.

Slide 39



Sketches and renders for marketing purposes.

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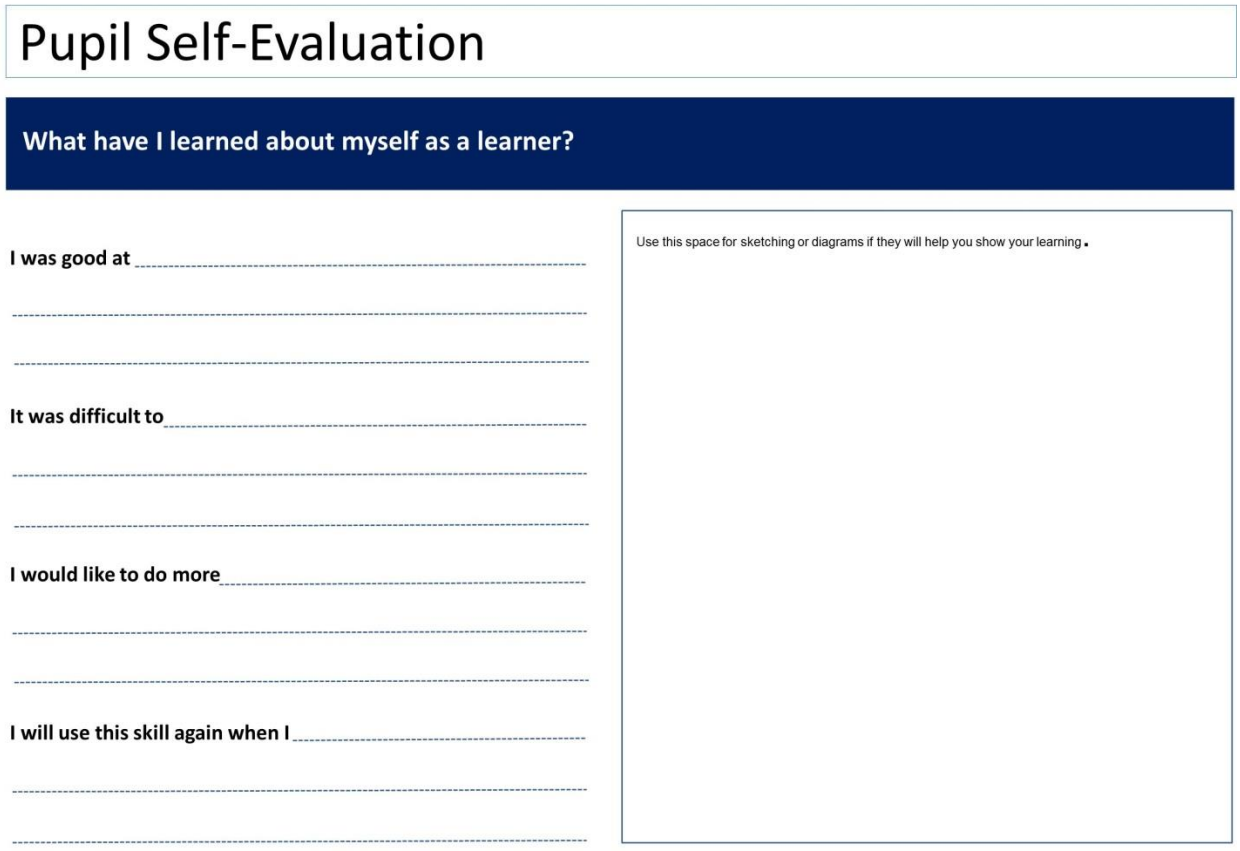

This is a ‘Meta-cognitive’ approach to self-evaluation.
Instead of the traditional approach that focusses on outcome this approach focusses on the process and the learning journey.
We use this sheet in KS3 (11 – 14).
This is a deceptively simple approach that draws out deep reflection in the pupils.
I incorporated a significant space to encourage the use of diagrams, images and sketches in their reflection as this is often clearer than when they use words alone.

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WJEC DESIGN & TECHNOLOGY CONTROLLED ASSESSMENT TASK	CENTRE NUMBER	CANDIDATE NAME	CANDIDATE NUMBER	Date Page Started	Date Page Finished	Time Taken for Page	Total Time	PAGE 13

Make a full evaluation of the final product comparing it with the initial intention. The evaluation must be a piece of continuous writing

In my specification I stated that "my dock" must function as a desk tidy. I believe I succeeded the first point because my dock wasn't overly sized and was made to fit in the boundaries I set. The materials I specified were acrylic plastic sheet, acrylic rod and treated steel strip bar. When I actually made the dock I decided to only use acrylic plastic because I didn't want to go over the top on materials and I wanted to keep the balance in terms of colour and style. I stuck to three main colours for the dock and I stuck to these when choosing the colours of the acrylic plastic. The three colours were blue, red and purple. I initially stated that I wanted the cost of the dock to be set at a reasonable price which would make a decent profit, but I also stated I did not want to alienate the large market by pricing it too high. In making the dock I used around £25.00 in acrylic plastic and £19.00 in electrical components. My bold outlay came to just over £50.00 which is a good price for a prototype product. I pushed myself to the limits of my knowledge and my practical skills. I learned a lot and had to be much more organise than I usually am to make the most of the Controlled Assessment lessons. This meant I planned carefully and practiced skills and processes so I could make the most of the time available.

Plus points:
I think my product is very attractive. I think I could use it to persuade a company to work with me to manufacture it.
The structure is very strong but it is rather heavy.
I am very pleased with the way the die sublimation printing went. I think it really adds a visual impact to the front of my dock and makes it stand out. In order to do the die sublimation printing I had to practice. All of our class had already made key rings to learn how to use it but I decided to practice some more and printed a funny picture on a mug for my dad and printed my sisters favourite band (The Wanted) on a pencil case for her. I then felt confident to do the printing in the CAT time.
The materials look really good and have a very nice finish. The mirrored acrylic was very successful on the back.

Minus Points:
The dock is quit expensive if I was going to sell it as a commercial product. I would be competing with premium brands like Bose if I wanted to make a reasonable profit.
While my product is unique it would be hard to compete against established brands.
Happily, I made it as a prototype to test my ideas and possibly use it to pitch the idea to a manufacturer. With that in mind the cost is actually quite cheap.
There are a number of improvements I would make and I will go into detail on those on the next page.

Other People's Views:
I have received mostly positive Reponses from the people who have seen my product. Even people who don't say anything positive haven't said anything negative so I think that is good. A lot of my class mates like the idea and the look of my dock and that is particularly good as they are in my target market age range. Even my teachers who are definitely not in my target market age range have been positive about the look of my product.

Specification:
I feel I have addressed all the points I identified in my specification and I am very pleased with the result. It is safe and easy to use. It functions very well. It uses materials I am confident in using and the school has the equipment to shape. The cost has come out O.K. The environmental impact is relatively small as it is easy to repair and disassemble at the end of its life.

Teacher's Justification 2011		FINAL MARK

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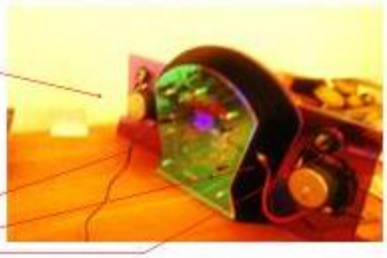
WJEC DESIGN & TECHNOLOGY CONTROLLED ASSESSMENT TASK	CENTRE NUMBER 69738	CANDIDATE NAME	CANDIDATE NUMBER	Date Page Started	Date Page Finished	Time Taken for Page 60 minutes	Total Time 172	PAGE 14

Now that you have evaluated your final product put forward suggestions for improving the design and also suggesting any improvement of the manufacture to ensure a better quality product.

If I was likely to change anything I think I may re-design the back, in particular where the speakers are. I think if I covered the back of the speakers it may improve and amplify the sound better.

I think I made the prototype product as well as I could allowing for my skills, the available materials, the equipment that I had access to and the time available. But I would not make a commercial product in this way. An improvement I would make would be to contact an injection moulding company to have the case made out injection moulded ABS plastic. The mould tools would be very expensive and the tooling would cost in the region of £6,000 pounds from a UK company. I could reduce this to around £2,000 if I used a Chinese company to make the moulds but it would take much longer for them to arrive from China and if there was a problem it would take a very long time to sort out by sending them back etc. All the time waiting would be lost sales so I would have to think very carefully about which manufacturer I would use.



An element I would improve is the volume display. It does not sit flat to the back and I would move the circuit board mounting rods slightly so it would sit flat.

I would tidy up my wiring at the back and secure it in some way.

I would find an alternative mechanical way of fixing the 'woofer' to the dock. The adhesive I used holds it fine and is the same way the manufacturer of the dock'd disassembled' hold them in place this way but I feel it is a bit 'cheap and would look better held in place with a bracket and Allen screws – it would also be better for maintenance.

At the front I would make some custom captive lock nuts either out of stainless steel so they cold be polished or chrome plated steel.

I would try out different methods of securing the iPod connector as it works well but I am not very keen on the ABS plastic housing salvaged from the old case.

Teacher's Justification 2011		FINAL MARK

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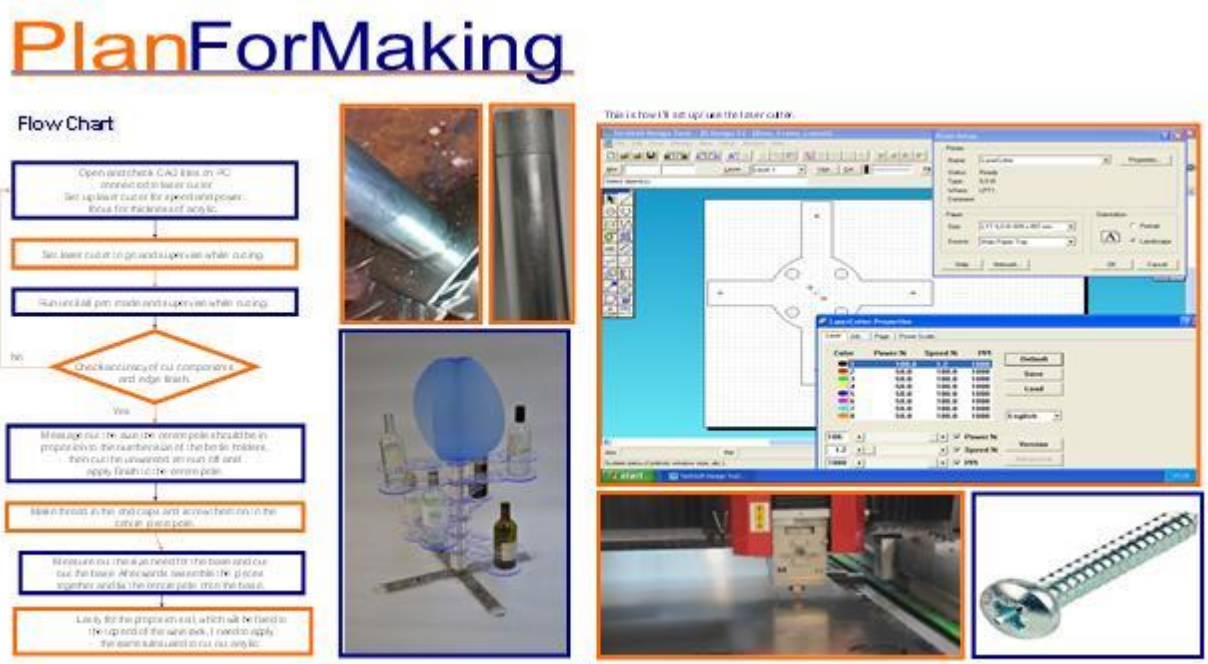
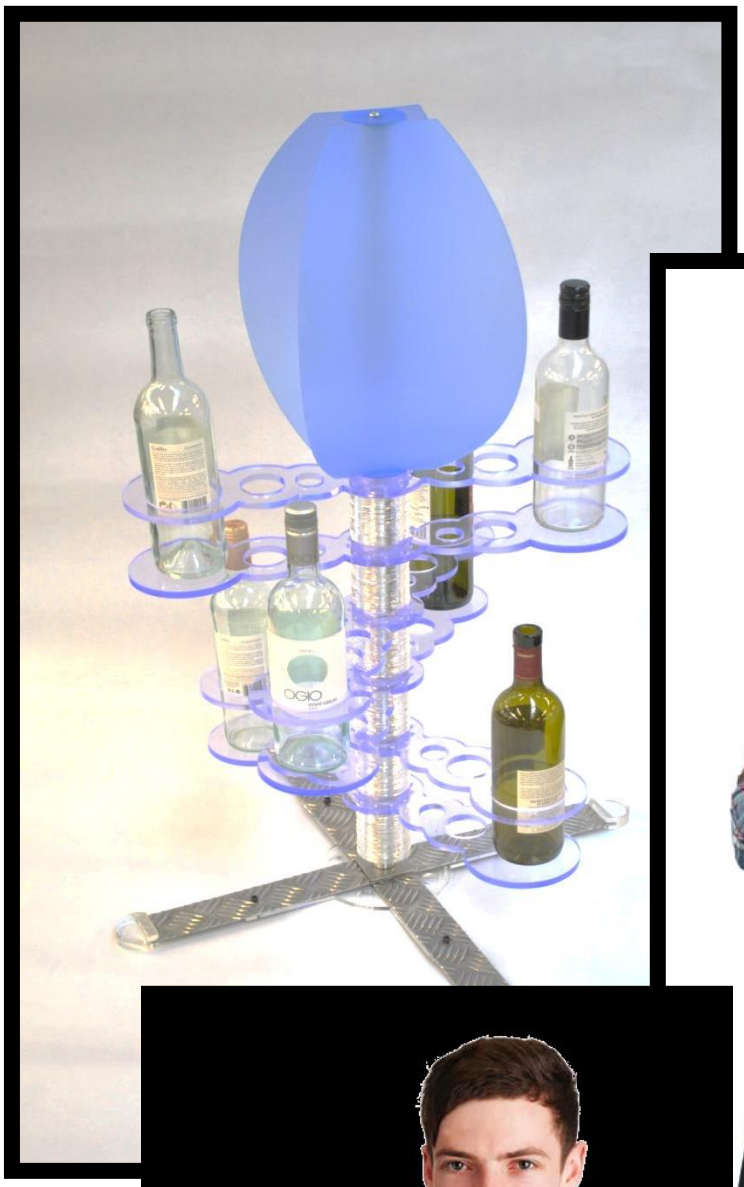


A simple flow chart to help structure the manufacture of the product by identifying the main tasks.



Share your research with others?

Partnership Working – Referenced to SDP.

- Within the school at the Learning Development Meeting I showed classroom resources I am developing to support further development of the range of thinking skills and metacognitive reflection by pupils.
- Within the LA I shared a range of my resources that were well received with representatives from all Denbighshire schools.
- Across Wales I shared my resources with the AfL and Thinking Skills Conference in Llandudno in 2010.
- My research into thinking skills has been adopted in England as part of the National Key Stage 3 Strategy and by the Design and Technology Association and it is available to members for download.
- I presented my current research at Autodesk University in Las Vegas in December 2011 to an international panel of educators where it was very well received it was suggested I consider writing a book on 'Teaching Thinking in Design Education.'
- My proposal has been accepted to present at Autodesk University 2012 on **'Creative Pedagogy, CAD/CAM, Iterative Design, and Teenagers.'**

Advice to other teachers?

- Start small pick on something that you are confident can be used by all pupils and most importantly by all staff in the department. Teachers are the gate keepers of what actually goes on in the classroom. If you want a particular approach or strategy to be used they have to be on board with it first. If they see no value in it or worse see it as just more work and another 'hoop to jump through' it will come across that way to the pupils.
- The best thinking strategies and tools are the ones that get used.
- Don't be afraid to share your thoughts and resources with other. They are usually grateful and it opens up a dialogue where by others share with you and thereby aid your own understanding.
- Don't take negative comments personally they say more about the person making them than they say about you.
- Teachers must believe creativity can be taught
- "The key elements of creative tasks are in place e.g. ambiguous and risky, but include 'task directed scaffolding' (Nicholl 2008)
- The creative process may be inspired by virtually anything and supported by the ease of access, manipulation, and the possibilities of tracking the development of ideas or revisiting them in order to explore other possible routes.
- The learning environment must be conducive to creativity
- Base your starting point on something you can measure from
- In order to be Creative you have to Do something