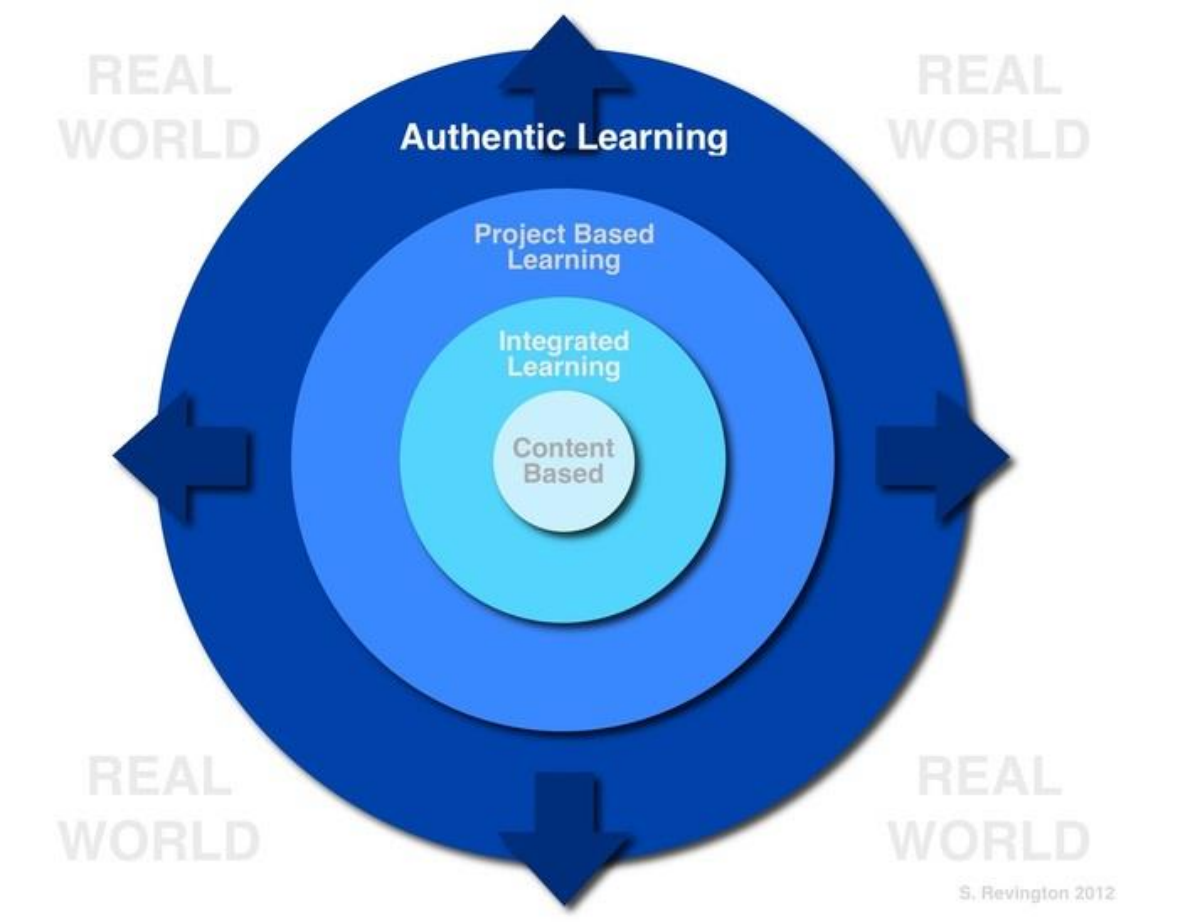
Authentic Learning: Real-world Project Based Learning



Paul Herring MACS (Snr) CP, St Peters Lutheran College

Overview of this presentation:

- Introduce AL & my experience and how we have been using this approach for many years in Senior IT classes
- Why Authentic Learning
- An example for Junior High
- The CT approach
- Short discussion - fitting into your curriculum in 2016?
- Why so vital – The Second Machine Age
- Conclusion
- Questions

Digital Disruption: It's not the owner of a stage coach who builds railways

Authentic Learning – think differently

- Good ideas involve recombinant innovation
- Thinking ‘outside the box’
- “You’ll be paid in the future on how well you can work with robots”

Some of the Key Characteristics:

- Learning is centred on authentic tasks that are of interest to the learners.
- Students are engaged in exploration and inquiry.
- Learning, most often, is interdisciplinary.
- Learning is closely connected to the world beyond the walls of the classroom.
- Students become engaged in complex tasks and higher-order thinking skills, such as
  - analysing,
  - synthesizing,
  - designing,
  - manipulating and
  - evaluating information.

Some of the Key Characteristics:

- Students produce a product that **SHOULD** be shared with an audience outside the classroom.
- **Design Thinking** is very much a part of Authentic Learning
- Learning is more student driven than with most other approaches
- Students have opportunities for social discourse.
- Students receive feedback (and assessment?) from external experts/clients/interested parties

My/Our Experience:

- School Achievement Program in Digital Technologies
- Locker App
- Swimming Carnival
- Talking Books
- Websites
- Kiosk Systems
- Learning Objects/Tutorials

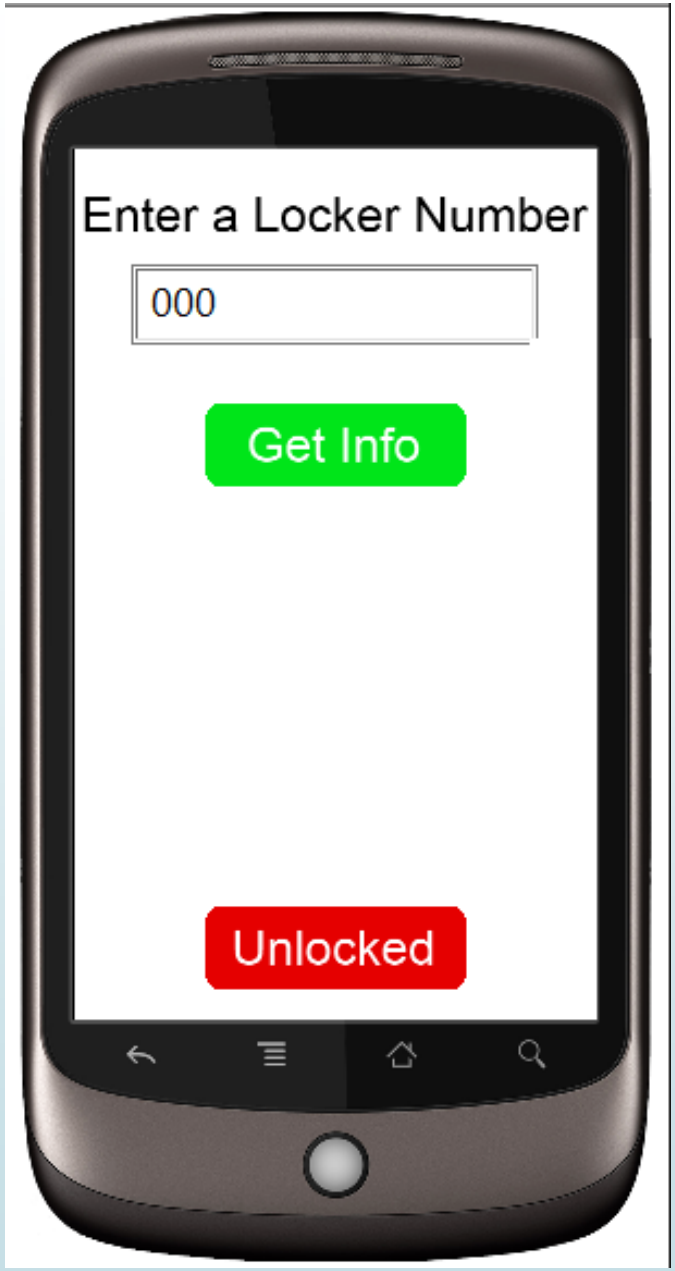
School Achievement Program in Digital Technologies

- Real jobs; real earnings

- 12,000 run of 12 page quarterly newsletter
- Websites for many local and state companies
- Kiosk Systems for Resort
- Cartoon Books for well-known local cartoonist
- Information Systems

- Won Federal 'Best Practice in IT' education award

Locker App



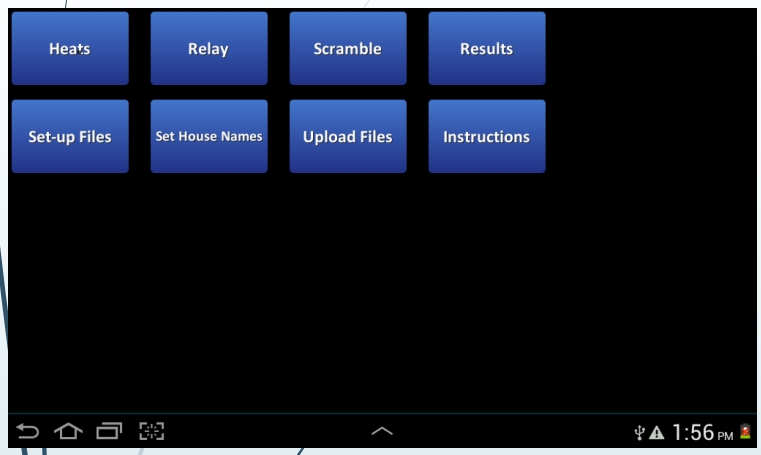
Swimming Carnival app

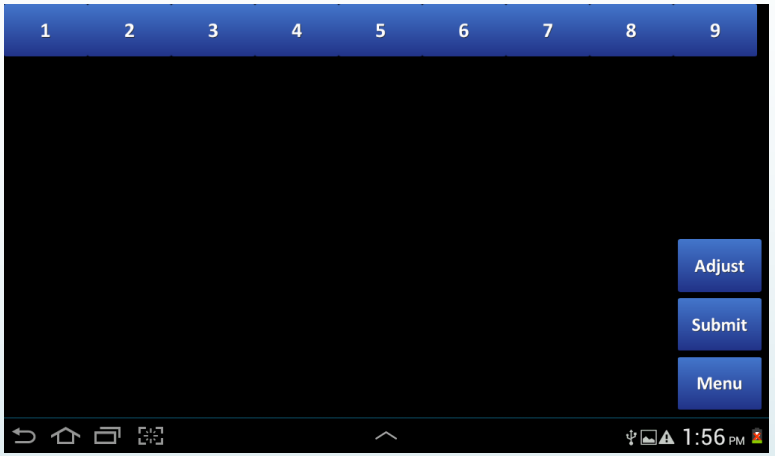
9 Lanes
9 Houses

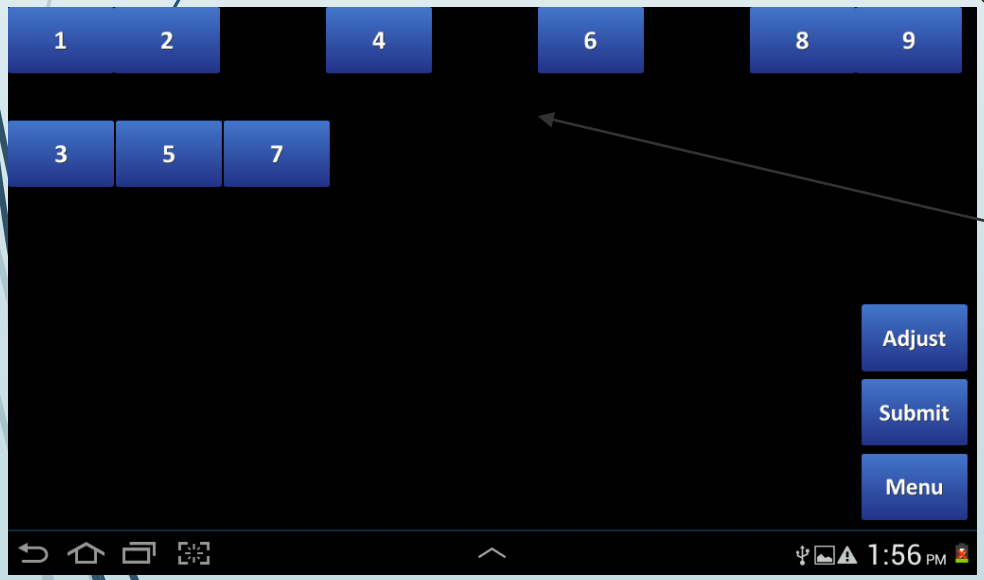
1 2 3 4 5 6 7 8 9

Judges call placings; 9 others hand out place cards;
Swimmers take to their House desk where 9 recorders note placing.
Then submitted to Chief scorer to add up. Eg. 1 = 10; 2= 6; 3 = 3; 4 =2; 5 –9 = 1

Solution using Corona SDK







IT Solution:

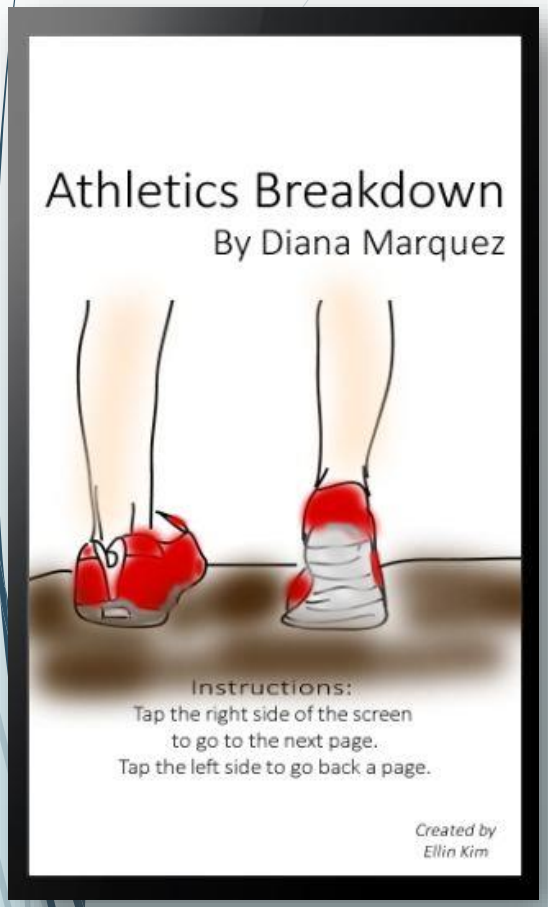
2 Staff – Judge & recorder

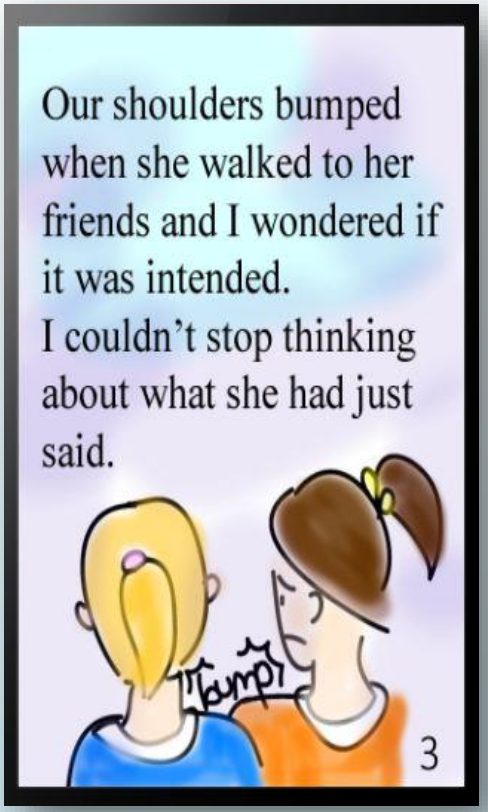
Recorder taps each lane cell as placings called out.

Simple animation moves cells to second row.

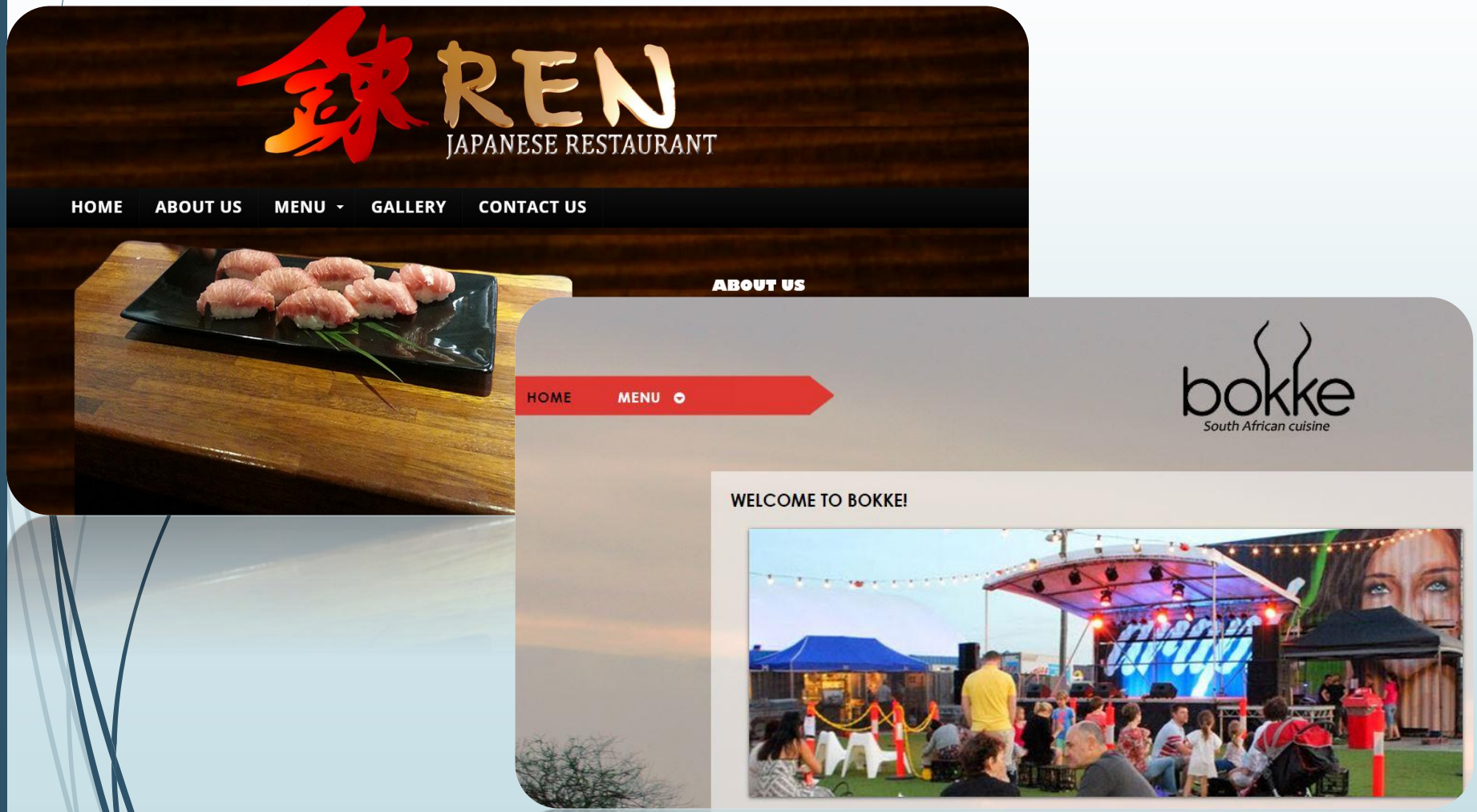
Can be adjusted – once ok, submitted and scores auto-updated

Talking Book for young writers on Tablets or Smartphones



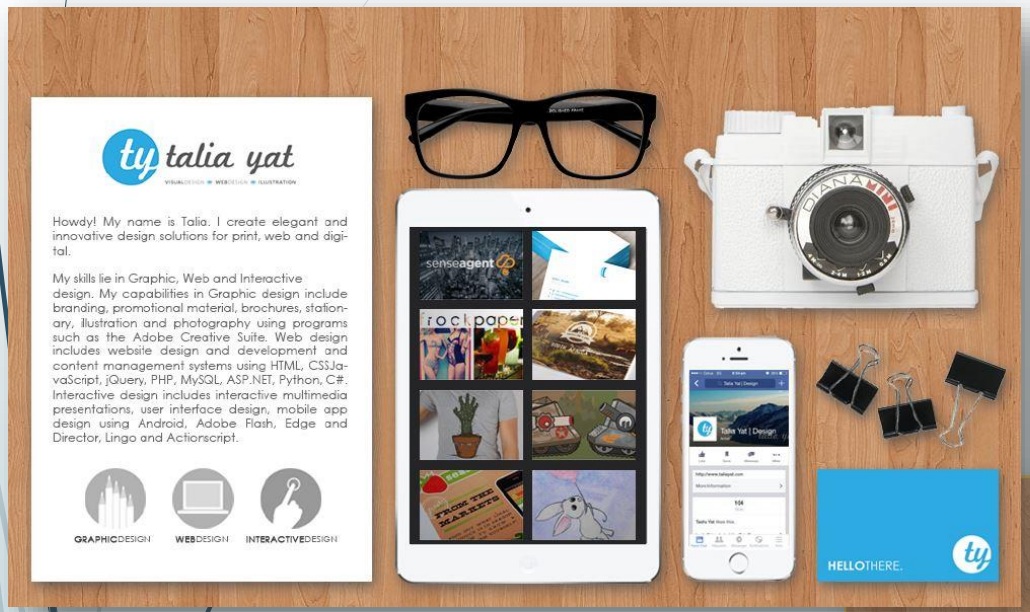


Web Sites for Clients



Tutorials & Learning Objects

Real World Solutions: Advertising Kiosks



The Key Characteristics of Authentic Learning

Authentic tasks have real-world relevance

- Activities match as nearly as possible the real-world tasks of professionals in practice rather than de-contextualised or classroom-based tasks.

A lot messier!

Authentic tasks are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity

- Problems inherent in the tasks are ill-defined and open to multiple interpretations rather than easily solved by the application of existing algorithms.
- Learners must identify their own unique tasks and sub-tasks in order to complete the major task.

Authentic tasks comprise complex tasks to be investigated by students over a sustained period of time

- Tasks are completed in days, weeks and months rather than minutes or hours, requiring significant investment of time and intellectual resources.

Authentic tasks provide the opportunity for students to examine the task from different perspectives, using a variety of resources:

- The task affords learners the opportunity to examine the problem from a variety of theoretical and practical perspectives, rather than a single perspective that learners must imitate to be successful.
- The use of a variety of resources rather than a limited number of preselected references requires students to detect **relevant from irrelevant** information.

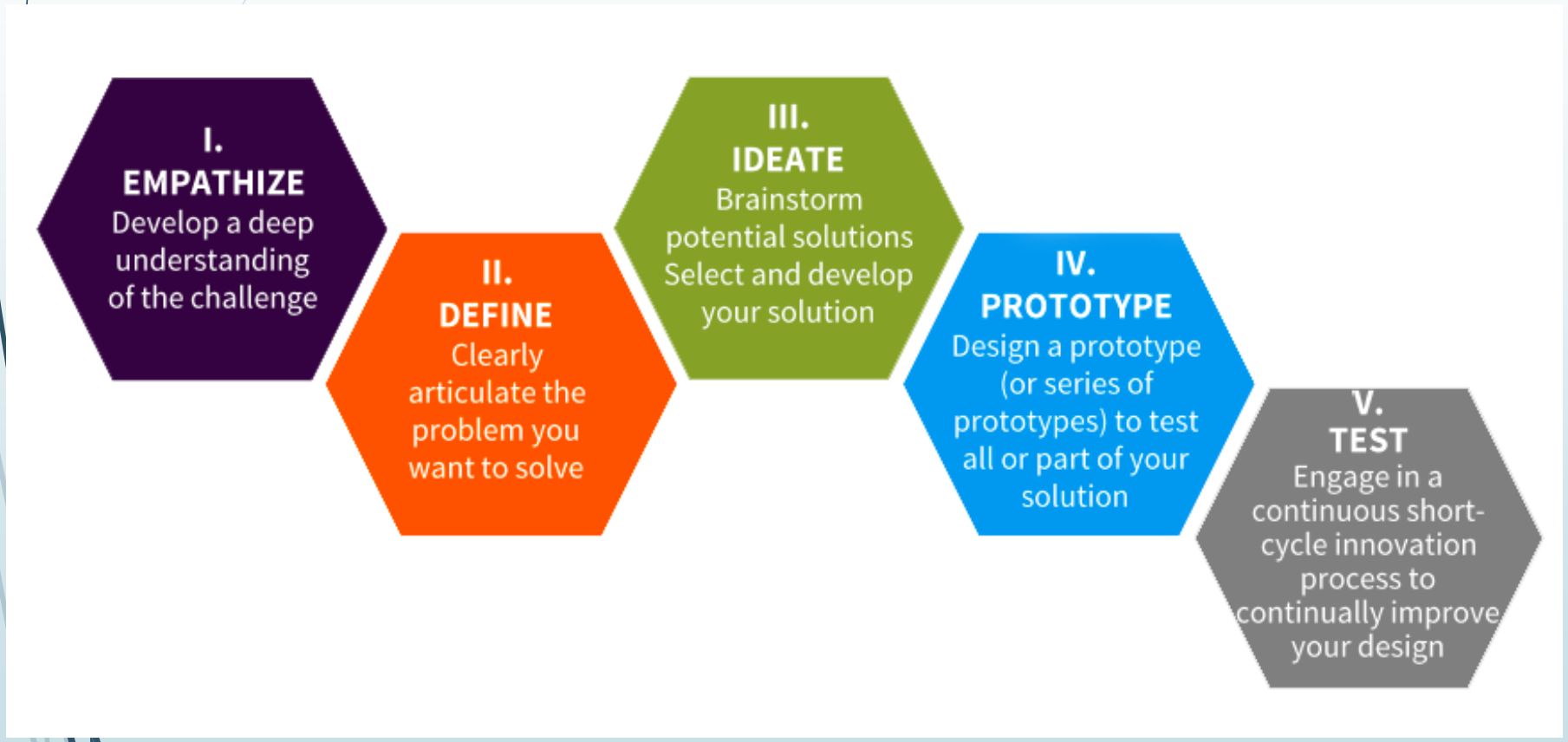
Authentic tasks provide the opportunity to collaborate

- Collaboration and 'complex communication' is integral to the task, both within the course and the real world, rather than achievable by an individual learner.

Authentic tasks provide the opportunity to reflect:

- Tasks need to enable learners to make choices and reflect on their learning both individually and socially
- Evaluation – part of the Design/Develop/Evaluate cycle

Authentic tasks incorporate Design Thinking



Authentic tasks can be integrated and applied across different subject areas and lead beyond domain-specific outcomes

- Tasks encourage interdisciplinary or cross-curricula perspectives and enable diverse roles and expertise rather than a single well-defined field or domain.

Authentic tasks are seamlessly integrated with assessment

- Assessment of tasks can be seamlessly integrated with the major task in a manner that reflects real world assessment, rather than separate artificial assessment removed from the nature of the task.

Authentic tasks create polished products valuable in their own right rather than as preparation for something else

- Tasks culminate in the creation of a whole product rather than an exercise or sub-step in preparation for something else

Authentic tasks allow competing solutions and diversity of outcome

- Tasks allow a range and diversity of outcomes open to multiple solutions of an original nature, rather than a single correct response obtained by the application of rules and procedures

High school and college students are capable of delivering high level, quality -real WORLD projects- especially for Social Justice

– Wendy Muhlhauser,President/Author/Speaker at SissyMarySue LLC

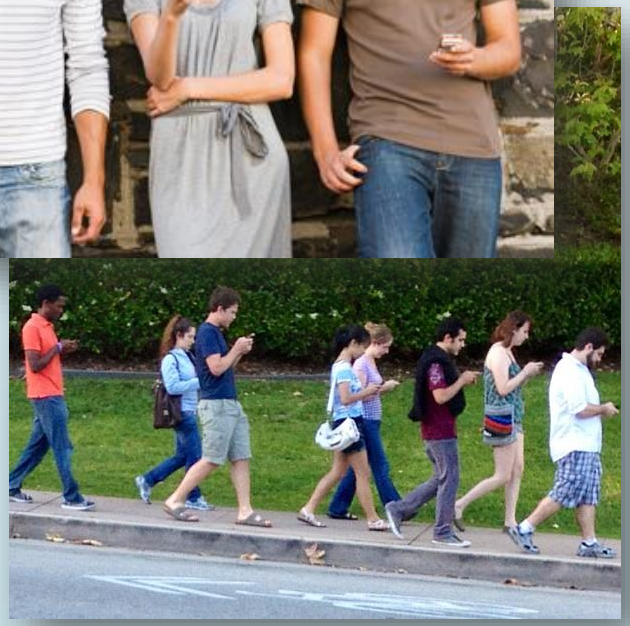
- "I believe when high school and college age students are entrusted with real world projects with the potential to **positively impact** the greater good in our world, they are capable of delivering **incredible, quality work**!
- They are far more **invested** when they can actually make the connection with the effort put forth in contributing to our world.
- When they are entrusted with such projects this translates into **empowerment**.
- When the learning feels meaningful the growth, discoveries and potential for **real critical thinking** is measurably enhanced!
- Our world will be in better hands by providing this kind of opportunity for learning, accomplishment, as well as, for personal and academic discovery!"

Suggested Junior High Example of an Authentic Learning Task:

Design and create a commercially viable Board Game

Tasks: Start with

- Research – the social value, especially in today's 'social-media' connected/'absorbed' world
- On-line, survey, play?



Typical Starting Questions:

What is the game concept going to be?
Is there a niche market for this concept?
What's the target market? (age appropriateness)
What do most successful board games for this age look like?
Who shall we consult?
What materials does one need to create their own prototype?
Should we create an IT version for testing – using Scratch?
How are board games manufactured?
What do most board games for that demographic look like?
What materials does one need to create their own prototype?
How are board games manufactured?
How are they designed?
How are game boards packaged?

- How are board games marketed?
  How can one be sure that the new game(s) work?
  What kind of themes, colours and interest will our target market be interested in today?
  What about working with earth-friendly materials?
  What are some of the greatest game board successes?
  What made them successful?
  Is there a history of board games.
  How are we going to present them and to whom?
  When's a good time to introduce the games and market them?
  What kind of expertise do we have at our disposal?

- Teams:
  How many, what roles, tasks, responsibilities?

Project Management:

Design:

- Research including game playing one like King of Tokyo?
- Roles
- Brain-storming – Ideation
- Further research
- Design objects, narrative, layout, play mechanisms (in Scratch?),
- Pitch, including Kickstarter Video

Develop:

- Create basic version
- Test, trial basic version
- Present to evaluation team – 'angels', teacher, parents, game experts
- Do initial marketing
- Create game website

Evaluate:

- Reflect on & evaluate roles, social interaction, learning, game viability, etc?

Pitch to 'Angels':

This should contain such things as:

- An overview of the game so that the audience of your pitch should be able to "play" the game in their "mind's eye"
- Supporting evidence (Market Research) for the potential success of your new concept/idea for a game
- Artistic representations of the basic design – either hand-drawn or digital
- Rough sketches of some of the main characters and environment
- A Working Title and one-sentence description (plot overview), & genre
- The proposed target audience (demographics) –this choice must be consistent with your supporting evidence

Pitch to 'Angels':

- An overview of the levels, narrative, core objectives and game play theme
- Game structure – how the game proceeds – worlds, sub-quests?
- Distinctive features – what sets game apart – Example: Unique character(s), customizable options, unique sub-worlds and puzzles??
- Character features – what the player avatar will do
- Game world, description – includes look and feel – Example: modern robot city, or a recycling plant
- Features that provide the game flavour
- Internal rules for how player will interact with the world i.e. Character internals (hit points, stamina, rewards)
- Environment interactions

Cross-curricula:

- **Maths**
  - money, simple accounting, data management, graphs & surveys, mathematic/statistical game concepts - problem solving,
- **Art**
  - board design, graphic arts, logos, advertising, set designs, packaging
- **English - Creative Writing**
  - letter writing, advertisements, radio commercials, manual writing,
- **English**
  - oral presentations, research, rule books, board game history, problem solving agendas, comprehension, making predictions
- **Drama**
  - role playing, advertising video, voice over dramas
- **Technology**
  - Build artefacts
- **IT – Computational Thinking**

Authentic Learning is highly motivating:

*Ultimately, the **most effective motivators** are*

- ***autonomy***
  - *the ability to chart your own course,*
- ***mastery***
  - *the ability to become an expert at something), and*
- ***purpose***
  - *the idea that what you are doing serves a purpose larger than yourself.*
    - **Dan Pink – see Ted Talk 2009**

Some Challenges:

- Our timetable structure
- The silo nature of our curriculum
- The challenge of change & the unknown
- Coping with (apparent) failure
- New assessment techniques & strategies

Alternative AL Approaches:

- Add community involvement to existing projects
  - Eg. Chris Chapman's brilliant class sessions on the the First Machine Age – add 'Market Square' day?
- Look for IT based solutions to existing problems

The Power of the Mobile – Add-ons

- touchscreen
- accelerometer
- gyroscope
- camera
- compass,
- barometer
- Magnetometer
- Proximity Sensor
- Orientation Sensor
- Infra-red sensor
- Bluetooth
- NFC
- Force Sensor
- Ultra-sonic sensors
- RFID
- IR Spectroscopy
- GPS, etc...

SO:

- what opportunities are open to utilising these sensors
- & what problems can now be solved?

Authentic Learning

using Computational Thinking:

Computational Thinking is a problem-solving process that includes (but is not limited to) the following characteristics:

- ***Formulating problems*** *in a way that enables us to use a computer and other tools to help solve them.*
- ***Logically organizing and analyzing data***
- ***Representing data*** *through abstractions such as models and simulations*
- ***Automating solutions*** *through algorithmic thinking (a series of ordered steps)*
- ***Identifying, analyzing, and implementing*** *possible solutions with the goal of achieving the most efficient and effective combination of steps and resources*
- ***Generalizing and transferring*** *this problem solving process to a wide variety of problems*

Introducing the Authentic Learning Approach: - As a 4 Step Process

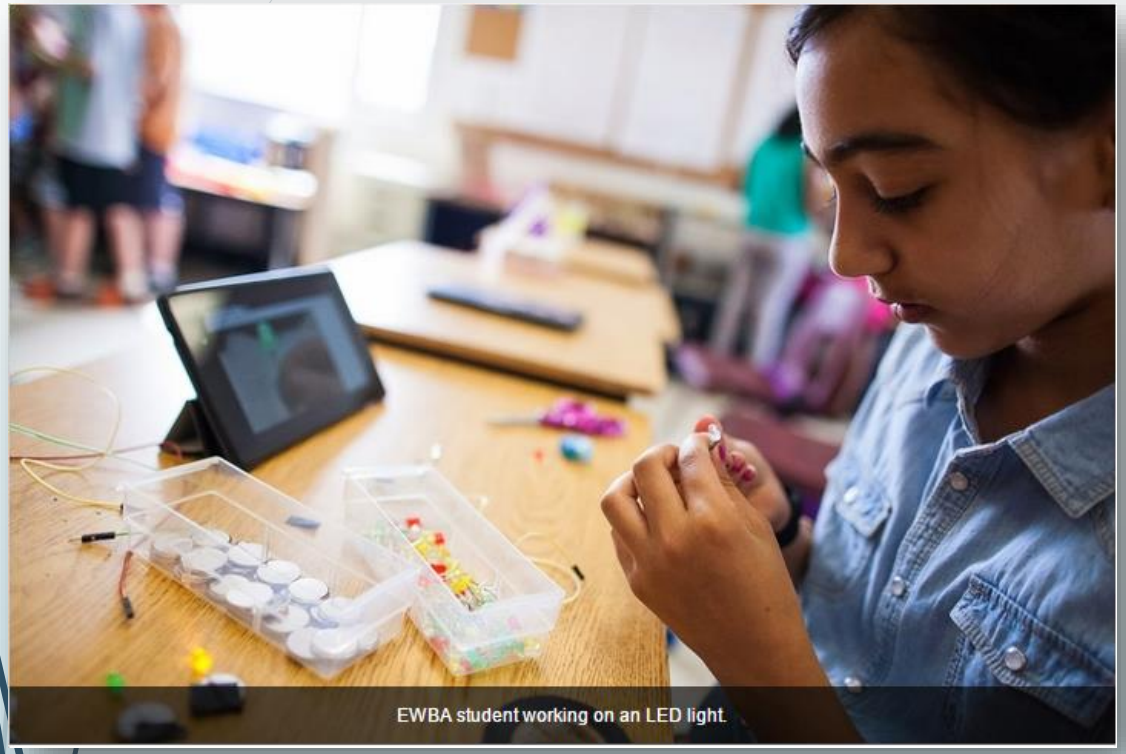
1. Real world issue
   - Posing the right question
2. From the Real world
   - to modelling or technical formulation
   - *Design & Algorithmic Thinking*
3. Computation
   - *Programming/Coding*
4. Verification
   - *Testing, evaluating, refining & introducing solutions back into the real-world*

Practical Examples - Commercial

- The question – can't read the sign?

- The question – which avocado‘

Real World Solutions: More Practical examples - Raspberry Pi


EWBA student working on an LED light.

Seventy Torres Strait Islander girls have coded a Raspberry Pi with an LED, GPS module and FM transmitter for emergency beacons to help their communities signal if brush fires become widespread, or alert people of poisonous snake and spider bites.

More Practical examples - Helping with dyslexia

Eighth-graders develop app to help dyslexics read better:

They envisioned the Mind Glass app allowing background colours and text fonts or sizes on Web pages or mobile devices to be altered for the specific needs of an individual, much like how prescription glasses help people see.

How far can we go with Authentic Learning?

Using the Power of the Mobile

How many different uses for the GPS device that
comes with your smartphone can you imagine?

- How many do you think exist right now
- How many distinctly different uses.
  - There are many Car Navigation apps on the market, but what about other uses?
- How many you can come up with?

Some Smartphone GPS Apps:

1) *Normal car/bike/walk navigation*
2) *track mileage for reimbursement*
3) *flight log book*
4) *mashup between a to-do list and GPS*
5) *tracks your phone, so if you get lost*
6) *share your location details with friends*
7) *amenities nearby*
8) *Google Maps*
9) *Golf*
10) *Runkeeper*
11) *Speedo*
12) *Altimeter*
13) *Family Locator is the most reliable & accurate family locator & children safety app.*
14) *Family Locator app lets your family be in touch and stay connected with your friends anytime.*
15) *Find the value of Taximeter*
16) *Truck Fleet management*
17) *location like Google Earth*
18) *emergency road side assistance*
19) *Track your luggage, laptops, pets and anything of importance - need unit in collar*
20) *GPS games - eg. GeoCache, a global GPS based treasure-hunt*
21) *Freight Tracking*

Questions? Discussion

The Second Machine Age:

The second machine age is unfolding right now.

We are at an inflection point in the history of our economies and societies because of digitization.

It's an inflection point in the right direction

- bounty instead of scarcity,
- freedom instead of constraint
- but one that brings with it some difficult challenges & choices

To become valuable knowledge workers in the new machine age our students need to develop the following skills:

- **ideation,**
- **large-frame pattern recognition, and**
- **complex communication**

Bounty and Spread

- **Bounty** is the increase in volume, variety, and quality & the decrease in cost of the many offerings brought on by modern technological progress.
- It's the best economic news in the world today

- **Spread**, however, is not so great:
- it's ever bigger differences among people in economic success—in wealth, income, mobility, and other important measures.
- Spread has been increasing in recent years.
- This is a troubling development for many reasons, and one that it appears will accelerate in the second machine age unless we intervene.

Spread – winner takes all:

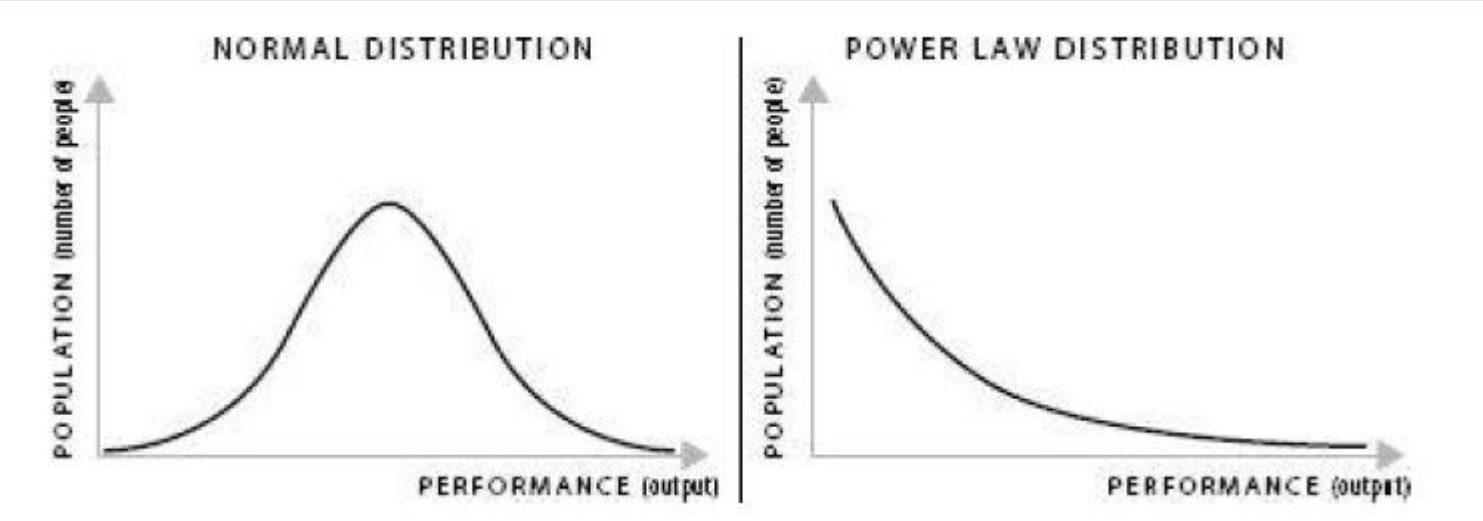
- Winner-take-all markets are where the compensation was mainly determined by ***relative* performance**,
- Whereas in traditional markets, revenues more closely tracked ***absolute* performance**.

Eg:

- Best, hardest-working construction worker = 1000 bricks/day; - get's top dollar
- Another doing 900 bricks/day may get 90% of this income – this is an economy base on absolute performance

vs **Relative Performance**:

- Software programmer
  - writes a slightly better mapping application
  - It might completely dominate a market,
  - Programmer/Company is global & becomes 'superstar'
  - There would likely be little, if any, demand for the tenth-best mapping application (90% as good?), even it got the job done almost as well.



Winner Takes All:

Results from shifts in the technology for production and distribution, particularly these three changes:

a) the digitization of more and more information, goods, and services,

b) the vast improvements in telecommunications and, to a lesser extent, transportation, &

c) the increased importance of networks and standards.

"… while the economic bounty from technology is real, it is not sufficient to compensate for the huge increases in spread."

Crowdsourcing:

- **Nasa -** ability to forecast solar flares
  - solar particle events (SPE's)
- No method available after 35 years!
- Placed challenge on **Innocentive**
  - A clearing house for scientific problems
- Anyone can work on the problems
- Solved by Bruce Cragin
  - retired radio frequency engineer
- SPEs now predicted 8 hrs in advance with 85% accuracy, and 24 hrs in advance with 75% accuracy

Stanford MOOC:

- 2011- Sebastian Thrun, a top artificial intelligence researcher (and one of the main people behind Google's driverless car)
- Over 160,000 students signed up for the course. Tens of thousands of them completed all exercises, exams, and other requirements, and some of them did quite well.
- The top performer in the course at Stanford, in fact, was only the 411th best among all the online students.
- As Thrun put it, "We just found over 400 people in the world who outperformed the top Stanford student.

Zara:

Zara store managers do a lot of visual **pattern recognition**, and engage in **complex communication** with customers,

and use all of this information for two purposes:

- to order existing clothes using a broad frame of inputs, and
- to engage in **ideation** by telling headquarters what kinds of new clothes would be popular in their location.

The boundary between uniquely human creativity and machine capabilities continues to change:

Bobby Fischer (13) made a pair of remarkably creative moves against grandmaster Donald Byrne.

First he sacrificed his knight, seemingly for no gain, and then exposed his queen to capture.

Thought insane, yet won the game. Today run-of-the-mill Chess program does the same.

Collegiate Learning Assessment:

- This new US tool assesses critical thinking, written communication, problem solving, and analytical reasoning

- It involves a number of tasks including a performance task with some background reading then 90 mins to write essay to extract info & write a view or recommendation
- 45% of US College students showed no improvement over 2 years of uni;
- 35% had none over 4 years!
- The average improvement was quite small.

- Some though did very well – these students – **studied alone, read and wrote a lot more, and had more demanding teachers**

Today, the cognitive skills of college graduates:

—including not only STEM disciplines,

but also humanities, arts, and social sciences

—are often complements to low-cost data and cheap computer power.

This helps them command a premium wage.

Ability to interpret and use data:

Google chief economist Hal Varian – career advice:

- seek to be an indispensable complement to something that's getting cheap
- and plentiful.

Examples include:

- data scientists,
- writers of mobile phone apps, and
- genetic counsellors

So **ideation, large-frame pattern recognition**, and the most **complex forms of communication** are cognitive areas where people still seem to have the advantage, and also seem likely to hold on to it for some time to come.

Unfortunately, though, these skills are not emphasized in most educational environments today.

Teachers matter:

The impact of a good teacher can be huge.

A study of 2.5 million American schoolchildren, found that students assigned to better teachers (as measured by their impact on previous students' test scores) earned more as adults, were more likely to attend college, and were less likely to have children as teenagers.

"Replacing a [bottom 5%] teacher with an average teacher would increase the present value of students' lifetime income by more than $250,000 for the average classroom in our sample."

Key Characteristics Summary:

- Authentic tasks have real-world relevance
- Authentic tasks are ill-defined, requiring students to define the tasks and sub-tasks needed to complete the activity
- Authentic tasks comprise complex tasks to be investigated by students over a sustained period of time
- Authentic tasks provide the opportunity for students to examine the task from different perspectives, using a variety of resources:
- Authentic tasks provide the opportunity to collaborate
- Authentic tasks provide the opportunity to reflect and evaluate

Conclusion:

Authentic learning really is fun and empowering and it can be a great help towards developing the crucial skills of:

- ideation,
- large-frame pattern recognition, and
- complex communication