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**The CRAR³FS²
Framework for
Developing
Teachers' ICT skills
for
Science Education
through
Cyberhunts**

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INTRODUCTION

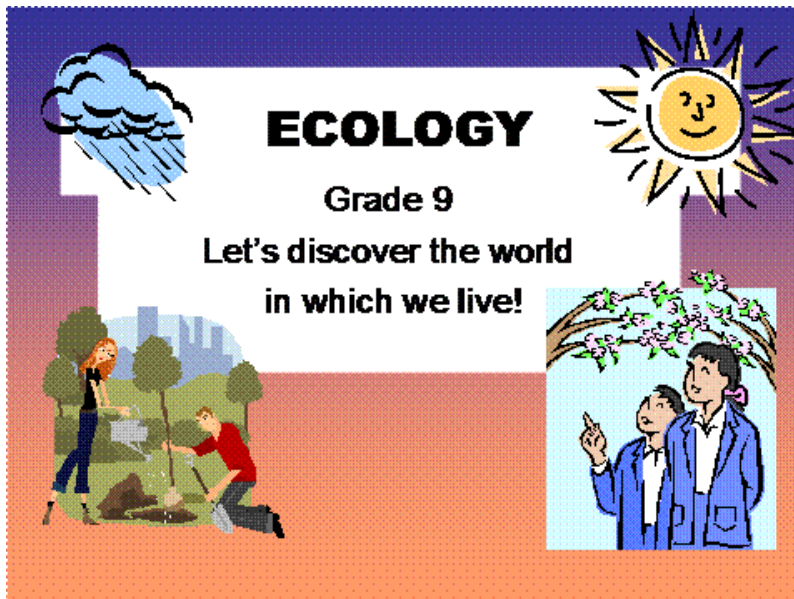
- A great deal has been written in the South African *White Paper on e-Education* (DoE, 2003, 2004) in terms of:
- **HOWEVER:** There is a **paucity of information on how teachers and schools are expected to practically integrate or make use of ICT** within the South African context (Hodgkinson-Williams, 2005).
- This paper forms part of a larger study

CYBERHUNTS: TEACHERS AND/OR LEARNERS CAN BECOME THE DESIGNERS

- What is a cyberhunt?
 - ❖ A cyberhunt is an ***online activity***
 - ❖ Learners use the Internet as a tool to find ***answers to questions based upon a certain theme or topic***
 - ❖ ***Hyperlinks*** are provided on which the user have to click so that the hyperlink to which the hyperlink points, can open and be displayed on the computer screen
 - Resources can be text based, graphical, digital media, etc.
 - ❖ ***Questions composed*** should be on ***different cognitive levels***

EXAMPLE OF SIMPLE CYBERHUNT

- Example of a cyberhunt created in PowerPoint

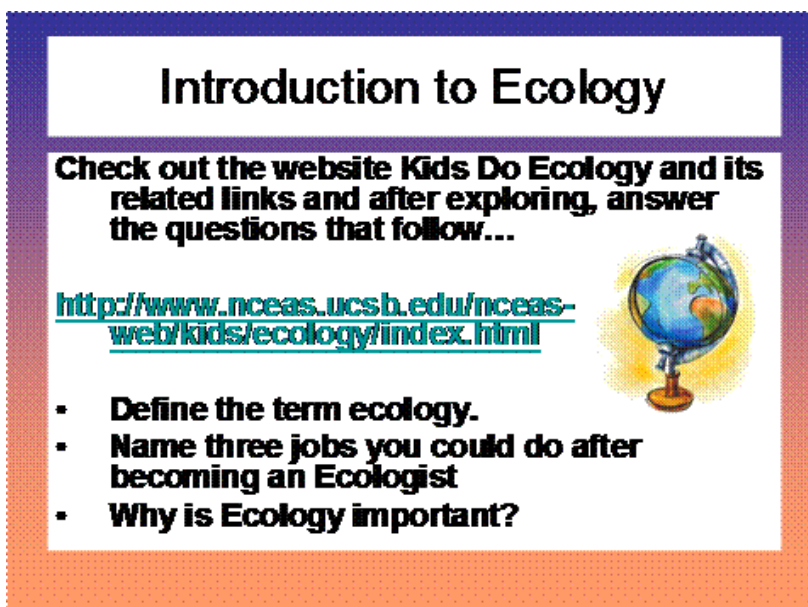


ECOLOGY

Grade 9

Let's discover the world
in which we live!

The slide features a blue rain cloud with rain falling on the left, a smiling yellow sun with rays on the right, and two illustrations at the bottom: one of a woman and a man planting a tree in a park, and another of a man and a woman in blue jackets looking at a tree with pink blossoms.



Introduction to Ecology

Check out the website **Kids Do Ecology** and its related links and after exploring, answer the questions that follow...

<http://www.nceas.ucsb.edu/nceas-web/kids/ecology/index.html>

- Define the term ecology.
- Name three jobs you could do after becoming an Ecologist
- Why is Ecology important?

The slide includes a small illustration of a globe on a stand to the right of the text.

LEARNER CREATED CYBERHUNTS (#1 of 2)

- The main difference between learner-created cyberhunts and other web based activities:
 - ❖ In the learner-designed cyberhunt, the learners have to compose questions on different cognitive levels that their peers (or even other teachers) have to answer by exploring the provided hyperlinks.
 - ❖ It is important to note that the composition of questions and memoranda by learners is not a key element in webquests and project-based learning web based activities.
 - ❖ We are of the opinion that cyberhunts do have the possibility to generate thought

LEARNER CREATED CYBERHUNTS (#2 of 2)

- Learners may therefore use the learner-designed cyberhunts to:
 - ❖ Enrich their knowledge,
 - ❖ To ameliorate understanding of a topic(s) with which they struggle and/or even to learn and discover at their own pace.
 - Thus, cyberhunts could be used to move learners who struggle with certain aspects within the curriculum, through the Zone of Proximal Development
- It is therefore argued that the generation of thinking is precisely what could happen when learners ...
 - ❖ answer the composed questions in a cyberhunt or
 - ❖ when learners themselves compose questions when they design their own cyberhunts.

Designing to learn OR Learning as design: Why is it important?

- Teachers and/or learners can be the **designers** of cyberhunts
 - ❖ **Why should learners become designers?**
 - The only ***people who significantly benefit from the design process during the design of educational software through the use of design tools are the designers themselves, not the learners*** (Jonassen, Myers & McKillop, 1996).
 - Design emphasis ***process and product***
 - ***Reflection is a key element*** during the learning as design process
 - Learning as design is underpinned by ***constructivist principles***
 - ***Possible to achieve the Critical Outcomes*** of the National Curriculum Statement
 - ***Knowledge creation*** a possibility

RELATING SCIENCE & ICT: USING CYBERHUNTS AS A STRATEGY TO ADDRESS THE CRITICAL OUTCOMES

- In the Science Learning Area, the curriculum attempts to address issues of developing scientifically literate citizens (Department of Education, 2002).
- The generative use of ICT via Cyberhunts is seen as one way of attaining these learning outcomes and to address the cognitive development of learners (Du Plessis & Webb, 2008).
- Cyberhunts as a strategy is ONE strategy to address the critical outcomes AND NOT the ONLY strategy

RESEARCH QUESTION

- What elements should the teacher development process for ICT in SCIENCE integration using cyberhunts as an Internet strategy make provision for?

CONTEXT OF THE RESEARCH AND DELIMITATION

- Teachers from 6 SMIS disadvantaged schools comprising of 6 disadvantaged schools
 - ❖ Four primary schools and two high schools in the Port Elizabeth Missionvale area) formed the convenience sample used in this study.
 - ❖ Each of these six schools received 20 computers each from the Dell Foundation. From each school approximately six teachers participated.

ACTIVITY THEORY TRIANGLE AS THEORETICAL PLANNING FRAMEWORK: WHAT TO TAKE NOTE OF

Mediated (higher) functioning are interactions between the subject (individual) and object (task) mediated by tools, at the vertex of the triangle

Linked to Object: A **TEACHER DEVELOPMENT FRAMEWORK** to assist teachers with ICT implementation through the use of **CYBERHUNTS**

MEDIATING ARTIFACTS (TOOLS)

OUTCOME(s)

Teachers

SUBJECT

Mediating tools are the lesson design, the media used, the facilitator, the information, Internet, computer, fellow teachers, language, etc.

OBJECT

Teacher designed Cyberhunts as artefacts

Transformation Process

PRODUCTION

CONSUMPTION

EXCHANGE

DISTRIBUTION

RULES

COMMUNITY

DIVISION OF LABOUR

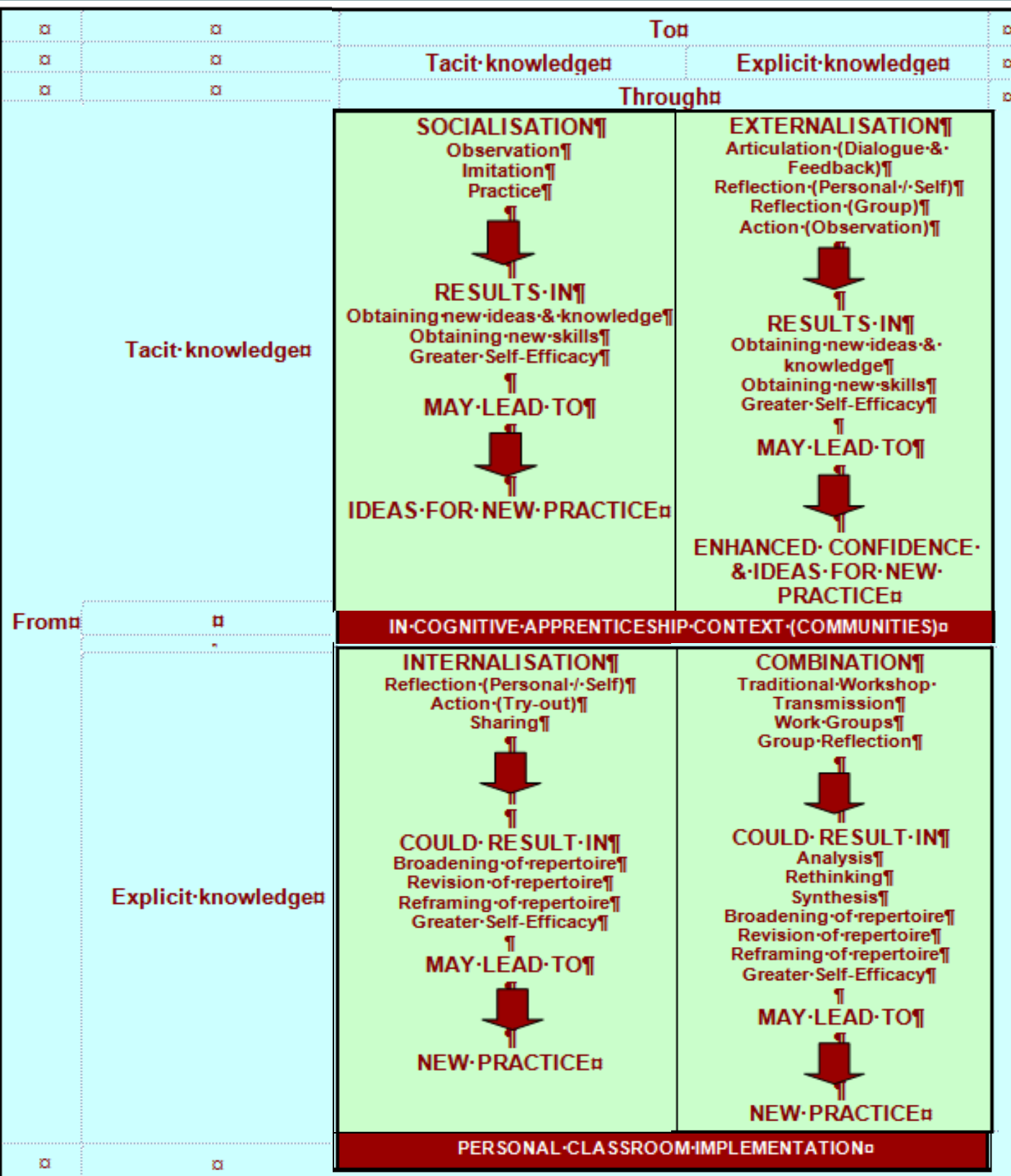
Rules: Teachers are subject to the rules of the training context (rules also developed as process proceeds)

Teachers work within the social community of the development/training context

Division of labour is negotiated: More capable peers assist others to move them through the **ZPD**

Unmediated (elementary) functioning occurs along the base of the triangle

KNOWLEDGE CREATION THROUGH INTERACTION: THE RATIONALE BEHIND THE CRAR³FS² FOR SCIENCE CYBERHUNTS



THE TEACHER DEVELOPMENT PROCESS FOR ICT IMPLEMENTATION & INTEGRATION OF THE INTERNET

- Acronym C R A R³ F S² holds the key for teacher development and classroom implementation.
- It is **ECLECTIC** i.e. based on the based ideas of the different teacher development models & based on the QUALITATIVE DATA collected from the participating teachers
- Figure of C R A R³ F S² follows ...

CRAR³FS²

Care Relate Assess Reflect Read Re-Plan Feedback Share Support

ON A CONTINUOUS BASIS DURING THE PHASES & STAGES BY THE PROJECT FACILITATOR & BY THE PARTICIPANTS

RELAXED ATMOSPHERE
CLASS VISITATIONS

CONTAIN ANXIETY
PACE

ONGOING SUPPORT
MODEL / COACH / MENTOR

CRAR³FS²

Care Relate Assess Reflect Read Re-plan Feedback Share Support

ON A CONTINUOUS BASIS DURING THE PHASES & STAGES BY THE PROJECT FACILITATOR

Care: Show that you care	Re-Plan: Plan by taking the needs into consideration
Relate: Build relationships throughout	Feedback: Empower learners by providing the learners with feedback on their progress and their needs.
Assess: Identify the positive and negative aspects that have occurred during	Share: Create opportunities to share experiences with one another during development sessions
Reflect: Journal writing provides a window for the learners and the teacher on the learning process (useful for sharing)	Support: Support & classroom visits by the project facilitator(s) and from peers at school Establish internal school based support group Create staff development sessions Arrange support sessions where participants from participating schools can share experiences and support one another
Read: Reading the journals empower the teacher to plan with a view to address mentioned issues for the next session	

PHASE 1

Introduction and Pre-Assessment stage:
Introduction to the project and the Internet as well as computer skills self-assessment

PHASE 3

Assessment stage:
This phase provide another chance for the project leader and participants to assess their basic computer literacy skills

Further data collection stage:
Provide participants with an opportunity to voice their experiences during the project

Tool stage

The rationale for choosing email as a tool, is that it presents participants with an opportunity to communicate with one another to share information or anyone else



GATHER DATA CONTINUOUSLY TO ASSIST WITH THE DEVELOPMENT PROCESS AND THE PLANNING OF ON-SITE SUPPORT

Journals
Reflection Sheets
Interviews
Observation
Questionnaires



PHASE 2

Design copy stage:
Initial first design following instructions of facilitator (facilitator explains & participants copy him)

Tool stage:
Obtaining additional tool skills from other software or applications

Design in group stage:
Participants design cyberhunt in group context

Presentation stage:
Participants test one another's cyberhunts

HOME LANGUAGE MOTIVATE ONGOING TRAINING ONGOING SUPPORT
KEEP DIFFERENT LEVELS OF PARTICIPANTS IN MIND
DEVELOP COMPETENCE TRAINING HANDS-ON & PRACTICAL MANUAL

PEER-FACILITATORS LISTEN PATIENCE APPROACHABLE
CLEAR EXPLANATIONS FEEDBACK PEOPLE SKILLS

COMMUNITY COOPERATE & COMPROMISE ASSISTANCE
CONSIDER GROUPING: HOW? CO-PLANNING

TEACHER DEVELOPMENT FOR TECHNOLOGY INTEGRATION

- How to think about planning for cyberhunts by USING ACTIVITY THEORY PRINCIPLES in the CRAR³FS² FRAMEWORK ...
- Graphical presentation to follow ...

CRAR³FS²

Care Relate Assess Reflect Read Re-Plan Feedback Share Support

ON A CONTINUOUS BASIS DURING THE PHASES & STAGES BY THE PROJECT FACILITATOR & BY THE PARTICIPANTS

RELAXED ATMOSPHERE
CLASS VISITATIONS

CONTAIN ANXIETY **ONGOING SUPPORT**
PACE **MODEL / COACH / MENTOR**

PEER-FACILITATORS LISTEN PATIENCE APPROACHABLE
CLEAR EXPLANATIONS FEEDBACK PEOPLE SKILLS

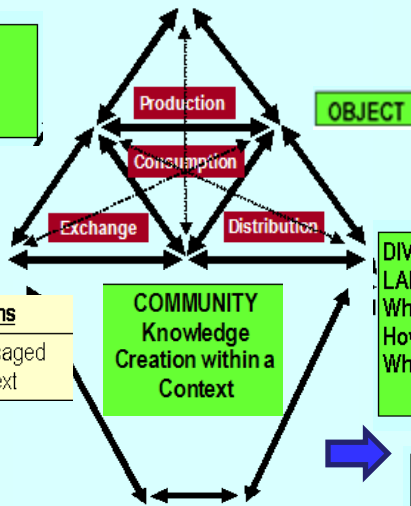
COMMUNITY COOPERATE & COMPROMISE ASSISTANCE
CONSIDER GROUPING: HOW? CO-PLANNING

Contradictions	
Traditional context	Envisaged context
DECIDE ON TOOLS PHASE What Tools are needed? What Tools do we have? What Tools have to be purchased? What Tools have to be developed? What? How? Why? MEDIATING ARTIFACTS (TOOLS)	

Contradictions	
Traditional context	Envisaged context
PLANNING PHASE FOR INTENDED OUTCOMES What are the Intended Outcomes? How to reach Intended Outcomes? How to assess if Intended Outcomes have been reached?	

OUTCOME(s)
What? How? Report?

SUBJECT	
School, Teachers and/or Learners	
RULES	
What? Why? How?	
Contradictions	
Traditional context	Envisaged context



OBJECT

Contradictions	
Traditional context	Envisaged context
DIVISION OF LABOUR What? How? Why?	

Transformation Process

ASSESSMENT & REPORT PHASE OF OUTCOMES OF TRAINING
Have the Intended Outcomes been Achieved? How was the Intended Outcomes achieved?
ASSESSMENT & REPORT PHASE OF IMPLEMENTATION OF OUTCOMES OF TRAINING
Are the Intended Outcomes visible in the School? Are the Intended Outcomes visible in the classroom?

Conditions for Learning	
Internal diversity Redundancy Decentralized control Organized randomness Neighbour interactions	
MOTIVATORS	
Who? How? Why?	
MOTIVATOR PHASE FOR COMMUNITY	
How can the Participants be motivated? How can the Community be motivated?	
Contradictions	
Traditional context	Envisaged context

RELAXED ATMOSPHERE	CLASS VISITATIONS	CO-PLANNING
PACE	MODEL/COACH/ MENTOR	TRAINING: ONGOING
CONTAIN ANXIETY	COMMUNITY	ASSISTANCE
ONGOING SUPPORT	COOPERATE & COMPROMISE	CONSIDER GROUPING: HOW?
DEVELOP COMPETENCE	LISTEN	APPROACHABLE
PEER-FACILITATORS	PATIENCE	CLEAR EXPLANATIONS
HANDS-ON & PRACTICAL	MOTIVATE	FEEDBACK
KEEP DIFFERENT LEVELS OF PARTICIPANTS IN MIND	HOME LANGUAGE	PEOPLE SKILLS

HOME LANGUAGE MOTIVATE ONGOING TRAINING ONGOING SUPPORT
KEEP DIFFERENT LEVELS OF PARTICIPANTS IN MIND
DEVELOP COMPETENCE TRAINING HANDS-ON & PRACTICAL MANUAL

CONCLUSION

- 'One-shot sessions' are not the answer, but ...
 - ❖ ***ongoing teacher development and ongoing supports*** seems to be the key.
- The ***C R A R³ F S² framework*** and ***cyberhunts*** could be used to develop science understanding and exploration
- ***Science based cyberhunts should be seen as one possible strategy AND should as the ONLY strategy***

END

RELATING TO ACTIVITY THEORY

- Activity
 - ❖ Plan and activity for the development of teachers to design cyberhunts
- Motive
 - ❖ To enable the participants to be able to design and implement cyberhunts at their respective schools
- Action
 - ❖ Participation in cyberhunt design project
 - ❖ Design cyberhunts as artefact
- Goal or need
 - ❖ Participants who can design ICT cyberhunts
 - ❖ Teacher development process that fulfil participants' needs
 - ❖ Cyberhunts as artefacts
- Operation(s)
 - ❖ Practical ICT cyberhunt design, expressing perceptions and experiences through journal reflection sheets, etc.
- Conditions
 - ❖ Requirements in order that the operations in the cyberhunt design process becomes “automatic” i.e.
 - necessary training context, an ICT laboratory or classroom, support materials, facilitator support, peer support, regular weekly training sessions, etc.

EXAMPLES OF CYBERHUNTS

(#2 of 2)

- Example of another [Cyberhunt](#) created in PowerPoint
- Example of a cyberhunt [online learning website tool](#) to assist teachers with their creation