

Leveraging on Digital Technologies to Enhance Learning

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Outline

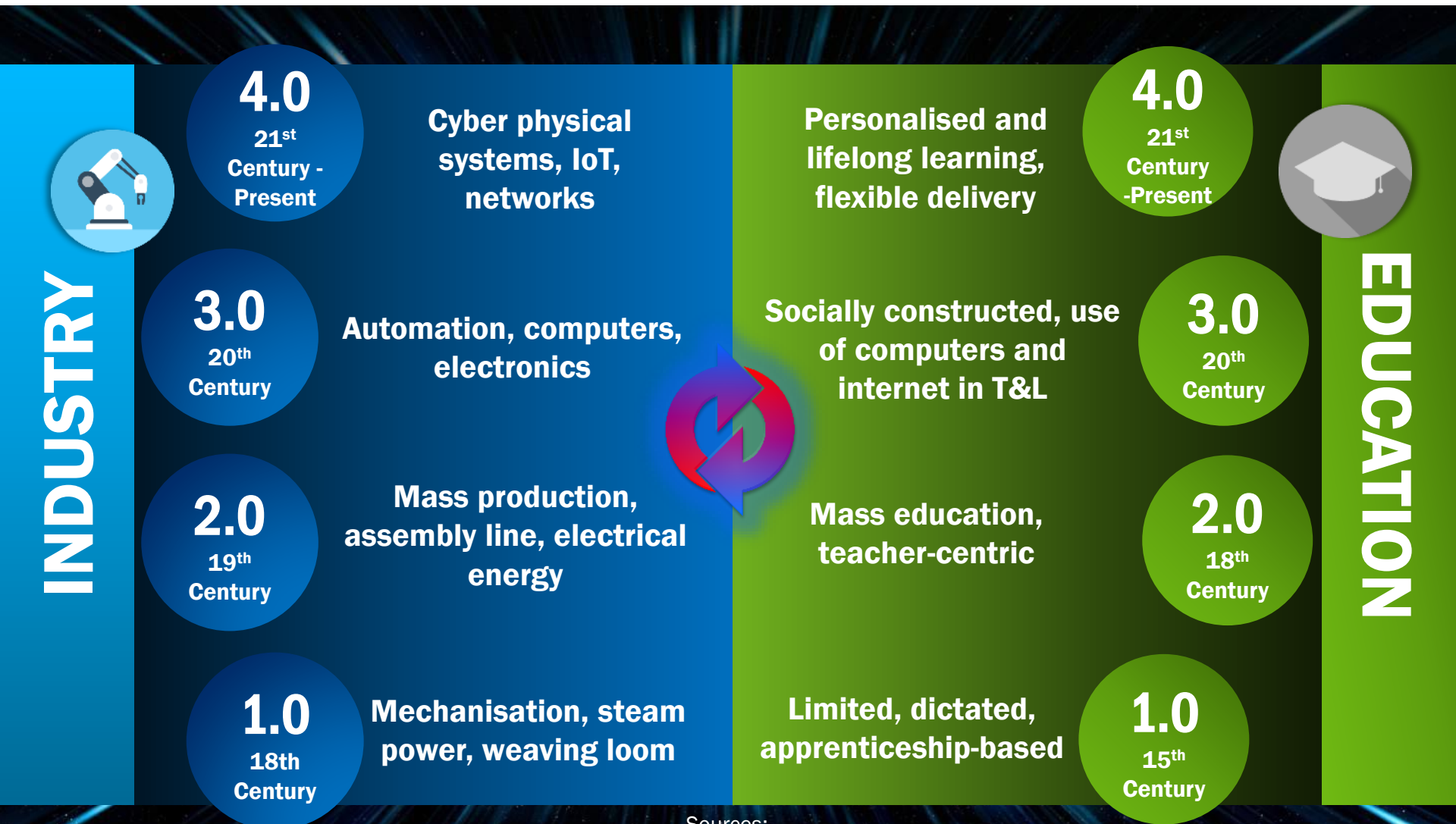
Changing
Landscape

Changing Practices

Examples



The 4.0 Revolution



Sources:

World Economic Forum 2016 and 2018

Harkins, A. M. (2008). Leapfrog Principles and Practices: Core Components of Education 3.0 and 4.0. Futures Research Quarterly.
FICCI-EY Future of Skills and Jobs in India. (2017). *Leapfrogging to Education 4.0: Student at the core*. FICCI Higher Education Committee.



Changing Habits



Padang in 1 Minute



Digital Age Learning Ecosystem

Digital Age Learning



**Demand for bite-sized
engaging contents**

**Personalised
on-demand options**

**Mobile devices as key
platforms**

Concerns of 4th Industrial Revolution



Changed again?

- 50% of subject knowledge learnt during the first year of a 4-year technical degree will be outdated by the time the student graduate

Replacing jobs

- 46% of Asian employers have difficulties filling jobs!

Shortening half-life of Knowledge & skills

- Only 40% of executives believe new employees have the requisite job skills

Concerns of 4th Industrial Revolution



Employment for life time?



Life-long Employability?

The three-stage model



The multistage life



Job Skills – Changing Demands



Employment for life time?



Life-long Employability?



in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity



in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

Skills for 21st Century Educators??



Digital Skills ??

Collaborative skills ??

Design Thinking Skills ??

Leapfrogging to Education 4.0



Next Generation Digital Learning Environments (NGDLE)

Learning Approaches	Blended and Flipped Learning	SMARTBOOKS
	Flexible Learning Environment, Personalised Learning	
	Adaptive Learning	
Technologies	LMS	AR/VR, Interactive eBooks, Learning Analytics
Tools	Authoring, Content Creation, Communications and Collaboration, Assessment	
Platforms	LRS, MICROLEARNING, SMARTBOOKS	
Capability & Capacity Building	IT Infrastructure	
	Curation of Content Development	
	DIY & Build Digital Competence	

Learning Approaches – Changing Perspective



Paavola & Hakkarainen, 2005

- Are we stuck to authoritative sources of knowledge?
- Topic based content delivery?

Technologies, Tools, Platforms



Examples

- eLearning - learn anytime, anywhere
- Bring Your Own Device
- AR/VR apps
- LMS, LRS
- E-Books

Challenges??

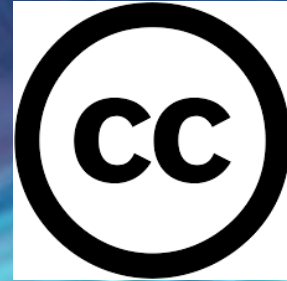
- IT infrastructure
- Staff Capabilities
- Short life of technologies
- Content creation



Can we leverage on extensive information,
knowledge available online?

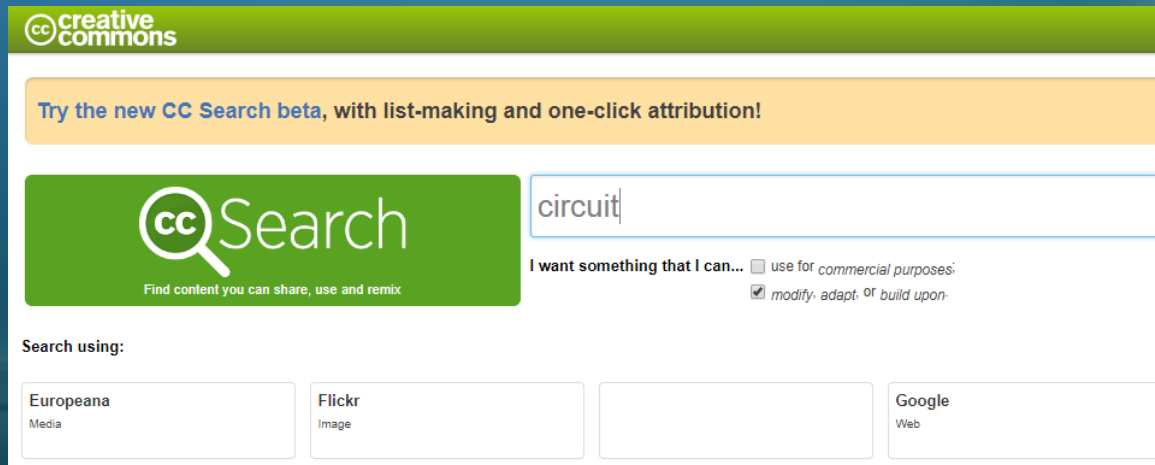
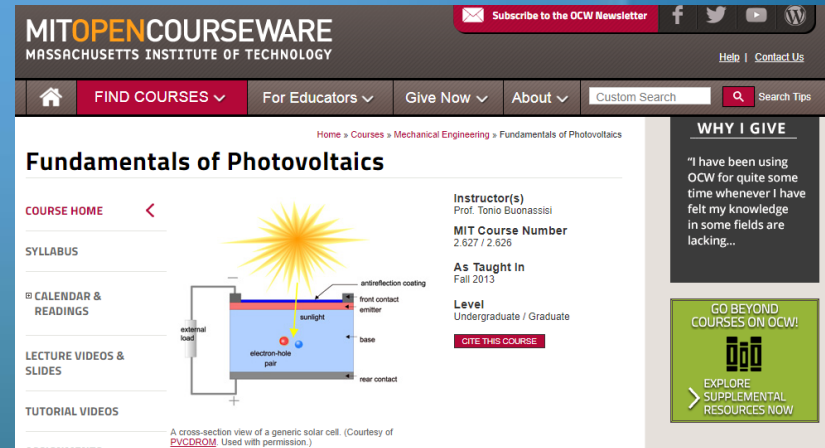
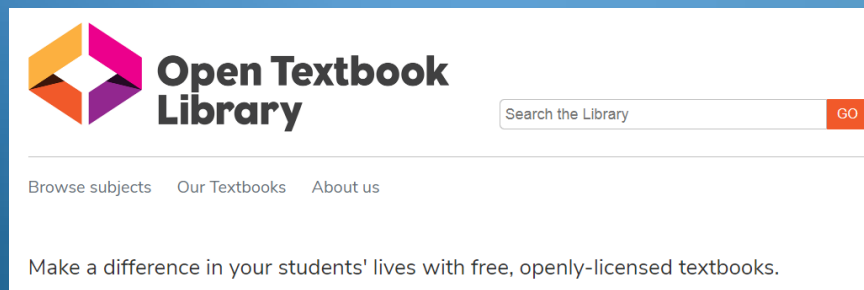
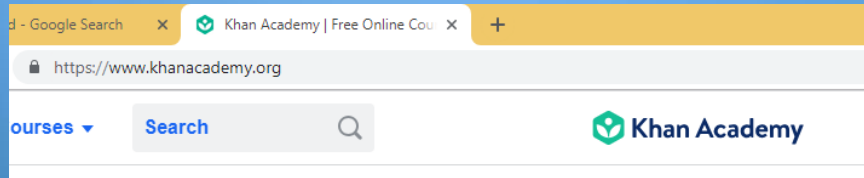
Leveraging on Curation of eLearning Contents - Examples

- **Open Educational Resources (OER)**
- **Linkedin learning**
- **Interactive eBooks**





Examples of OER





LinkedIn Learning Homepage

The screenshot shows the LinkedIn Learning homepage. The top navigation bar includes links for Home, People, Content, Reports, Settings, Resources, Me, and Go to learning. The Content and Reports tabs are highlighted with red boxes. Red lines connect these tabs to two text boxes below. The main content area features a video recommendation by Bill George on Self Awareness, Authenticity, and Leadership, with a 'Watch now' button.

Recommended for admins

Bill George on Self Awareness, Authenticity, and Leadership

By: Bill George
Duration: 30m 40s

[Watch now](#)

Content

Allows you to create learning paths, collections and custom contents here

Reports

Allows you to view the Learning Analysis for **Recommended Courses**



Features of Interactive ebooks



**One access point
for all course content**



Adaptive learning tools



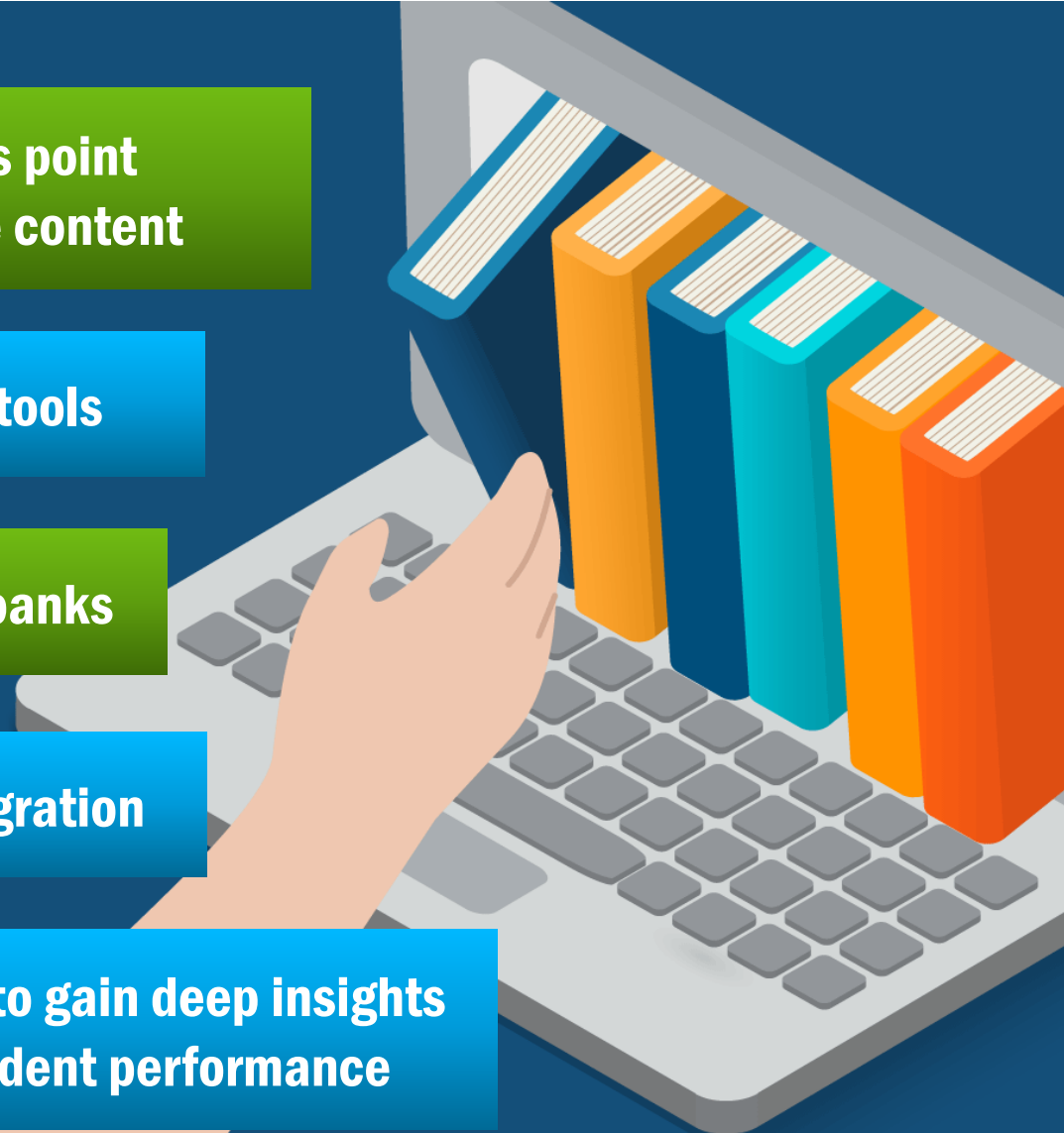
Assignment and quiz banks



Possible LMS integration



**Analytics to gain deep insights
into student performance**





Interactive ebooks

Learning Approach

READ



Students read the material and are guided by adaptive highlighting that emphasises important topics.

PRACTICE



As students read the material, e-book presents questions to help them make sense of what they know and don't know.

REVISE



To ensure mastery and retention, e-book directs students to revise material they're likely to forget based on analytics.

1 Defining Psychology and Exploring Its Roots



What is your definition of psychology? When you think of the word psychology, what first comes to mind?

Formally defined, **psychology** is the scientific study of behavior and mental processes. Let's consider the three key terms in this definition: *science*, *behavior*, and *mental processes*.

As a **science**, psychology uses systematic methods to observe human behavior and draw conclusions. The goals of psychological science are to describe, predict, and explain behavior. In addition, psychologists are often interested in controlling or changing behavior, and they use scientific methods to examine interventions that might help, for example, reduce violence or promote happiness.

Researchers might be interested in knowing whether individuals will help a stranger

Click the answer you think is right.

actions, but not reactions.

mental processes and thoughts.

behavior and mental processes.

people exclusively.

Do you know the answer?

Read about this

I know it

Think so

Unsure

No idea

- 1 The Science of Psychology
- 2 The Brain and Behavior
- 3 Sensation and Perception

How ebook resources were curated?



Pre-Class

Student view

*Some actions are not available in this mode, and assignment data is not saved.

Chemistry - Chemistry: The Molecular Nature of Matter and Change - Silberberg/Amateis, 8e, Equilibrium: The Extent of Chemical Reactions

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Page 776

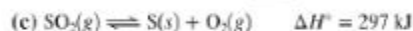
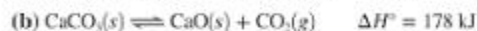
Let's review these ideas with a sample problem.

Highlight key concepts for learners

SAMPLE PROBLEM 17.13

Predicting the Effect of a Change in Temperature on the Equilibrium Position

Problem How does an *increase* in temperature affect the equilibrium concentration of the underlined substance and K for each of the following reactions?



Plan We write each equation to show heat as a reactant or product. The temperature increases when we add heat, so the system shifts to absorb the heat; that is, the endothermic reaction occurs. Thus, K will increase if the forward reaction is endothermic and decrease if

Available e-resources
(slides, videos)



Previous Highlight

Previous Section

Next Section

Next Highlight



Learners toggle between read/practice mode to complete assignment before class.

Virtual coach

How ebook resources were curated?



SmartBook Assignment- Read/Practice Mode

Which of the following statements correctly reflect Le Chatelier's principle? Select all that apply.

Check **all** that apply.

- ☐ When a system at equilibrium is disturbed, the system reacts to minimize the effect of the disturbance.
- ☐ After a system at equilibrium is disturbed it will shift to counteract the disturbance and return to the same equilibrium position as before.
- ☐ When a system at equilibrium is disturbed, it can never reach equilibrium again.
- ☐ When a system at equilibrium is disturbed, $Q \neq K$.

Do you know the answer?

I know it

Think so

Unsure

No idea

Which of the following statements correctly reflect Le Chatelier's principle? Select all that apply.

✓ Your answer is correct.

- ☒ When a system at equilibrium is disturbed, the system reacts to minimize the effect of the disturbance.
- ☐ After a system at equilibrium is disturbed it will shift to counteract the disturbance and return to the same equilibrium position as before.
- ☐ When a system at equilibrium is disturbed, it can never reach equilibrium again.
- ☒ When a system at equilibrium is disturbed, $Q \neq K$.
- ☐ When the system is disturbed it is no longer at equilibrium and $Q \neq K$.

Challenge

OK



Learners can "read about this" before or after answering question.

Learners answer question to the best of their ability and select a confidence level honestly.

This allow SmartBook to adapt to their ability & creates a personalized experience tailor-made for each student

Using Metacognition to Improve Student Confidence and Success

Practice auto-mark and provide learners with explanations.

How ebook resources were curated?



SmartBook Assignment- Reports (Student's view)

The screenshot displays the 'SmartBook Assignment- Reports (Student's view)' interface. On the left is a dark sidebar with a search bar and a list of navigation options: 'Table of Contents', 'Notes and Underlines', 'Reports' (highlighted), 'Current Learning Status', 'Topic Scores', 'Missed Questions', 'Most Challenging LOs', 'Self-Assessment', 'Tree of Knowledge', 'Practice Quiz', 'Settings', 'Help', and 'Leave SmartBook'. The main content area on the right lists seven reports, each with an icon, title, description, and a right-pointing arrow:

- Current Learning Status** (magnifying glass icon): View how much you have left to learn and how much you should refresh so that you don't forget your new knowledge.
- Topic Scores** (percentage icon): View the modules and sections you struggled with the most. You can look up each challenging section for more study.
- Missed Questions** (X icon): View frequently missed questions. You can practice questions you recently got wrong.
- Most Challenging Learning Objectives** (flag icon): View the learning objectives that are the hardest for you. You can lock these up in your book in order to study them further.
- Self-Assessment** (scales icon): View how aware you were of whether or not you knew the answers. This awareness can help you study more effectively.
- Tree of Knowledge** (tree icon): Watch your tree grow as you learn.

At the bottom left of the sidebar, there is a McGraw Hill logo and copyright information: '© 2010 McGraw-Hill Education All rights reserved. Terms Privacy'.

Learners can use the reports to evaluate his/her performances. This will enable learners to use SmartBook more efficiently.

Report for each learner is different.

How ebook resources were curated?



Use of learning analytics to improve student performance

- **Adaptive Assignment Reports** allow instructors to review detailed reports to better measure student progress, comprehension and retention.



Progress Overview ▶

View learner progress broken down by module.



Learner Details ▶

View learner progress details plus completion level breakdown for each module.



Module Details ▶

View information on how your class performed on each section of their assigned modules.



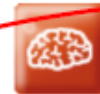
Practice quiz ▶

This gives you a quick overview of the quizzes results for your learners.



Missed Questions ▶

View frequently missed questions.



Metacognitive Skills ▶

View statistics on how knowledgeable your learners are about their own comprehension and learning.



Most Challenging Learning Objectives ▶

View the most challenging learning objectives.

Do learners really know what they think they know?
Do they know what they don't know?

How ebook resources were curated?



Using Metacognition to Improve Student Confidence and Success

I know it

Think so

Unsure

No idea

Learner	Correct & aware	Correct & unaware	Incorrect & aware	Incorrect & unaware
	61%	1%	5%	33%
	82%	0%	1%	17%
	63%	1%	4%	32%
	83%	0%	4%	13%
	80%	0%	7%	13%
	43%	6%	32%	19%
	55%	5%	14%	26%
	62%	0%	4%	34%
	6%	46%	47%	1%
	64%	0%	0%	36%
	46%	2%	2%	50%
	29%	18%	36%	17%
	64%	1%	7%	28%
	55%	0%	3%	41%
	71%	0%	5%	23%
	55%	3%	8%	34%
	67%	5%	9%	19%
	45%	1%	14%	39%
	77%	2%	4%	17%
	53%	3%	5%	40%
	75%	1%	8%	17%
	42%	1%	21%	36%
	55%	0%	3%	42%
	52%	21%	21%	6%
	51%	0%	3%	46%
	48%	1%	7%	44%
	67%	9%	8%	16%
	39%	3%	17%	42%
	31%	48%	17%	5%
	73%	0%	7%	20%

Students' Names

Learner is consciously aware of her state of knowledge.
-Formulate learning strategies to improve on her weaknesses

Overconfident learner
-Tends to be careless & have lots of misconception

High achiever – He knows his stuff!!!
Empower him to lead in collaborative learning/ group discussion

High achiever with low confidence



Curate or Create?

Content Creation/Development

Process of developing our own content aligned to the intended learning objectives from scratch.

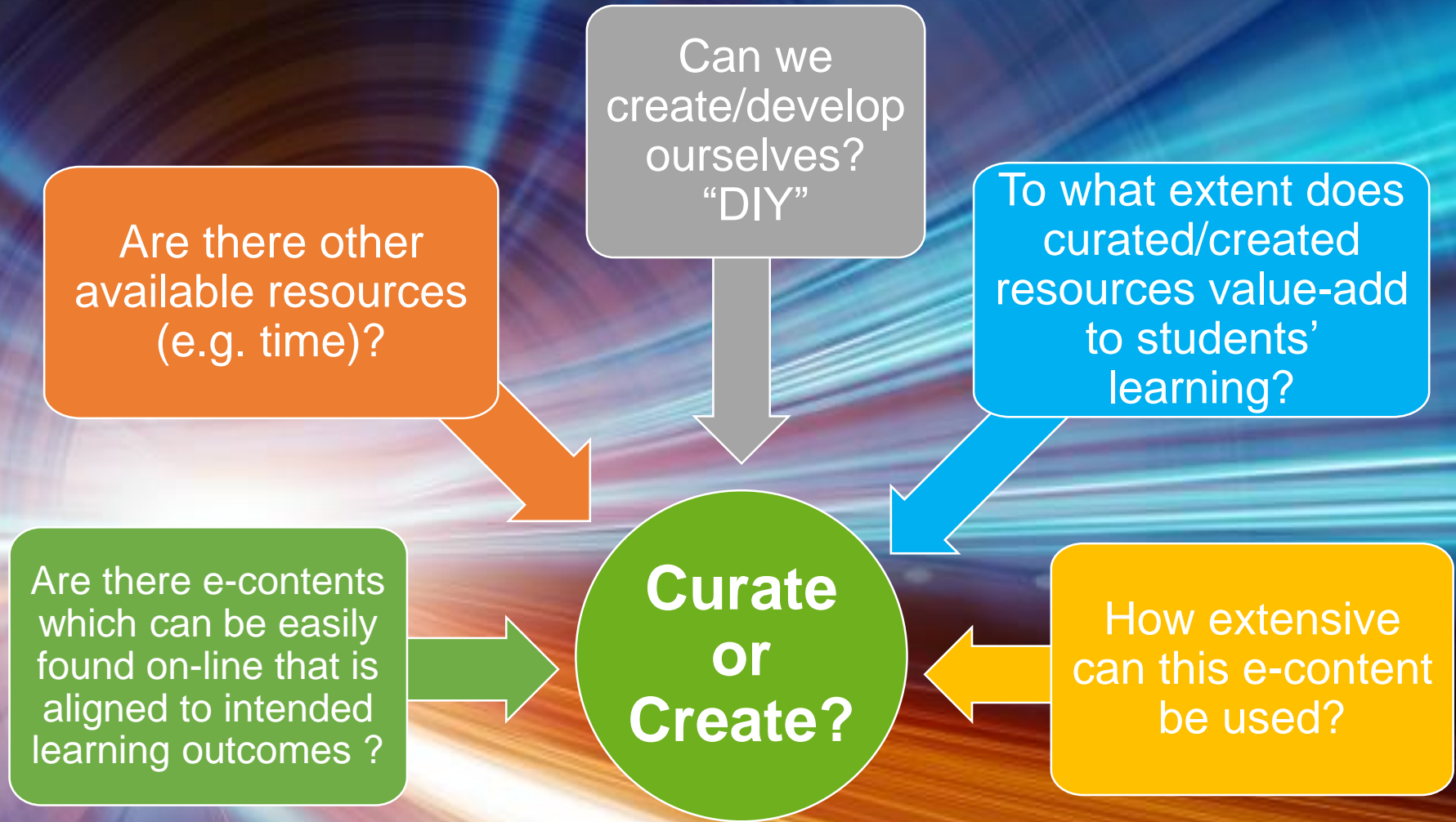
Content Curation

Process of gathering and organizing existing content materials that meets the intended learning objectives

FIND the BALANCE?



Content Curation vs Creation/Development



Example of a content created for self paced learning in Chemistry

Engage
(5 min)

Explain / Extend & Explore
(45 min)

Evaluate
(10 min)

Mole Concept and Stoichiometry II

Home

Trigger

Contents

Summary

Quiz

Welcome to Lesson 07 - Mole concept and stoichiometry II

In this lesson, you will be able to:

- Construct balanced chemical equations.
- Identify the stoichiometric relationships in balanced chemical equations.
- Perform stoichiometric calculations in balanced chemical equations.

Learning Objectives



Total: 60 min



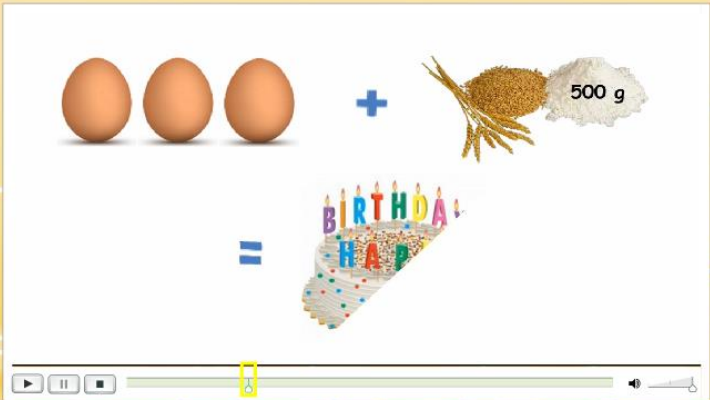
Engagement (5 min)

Phase	Time	Intended Objective	Activities
Engagement	5 min	Activate students' prior knowledge and trigger students' curiosity through questions	Topic trigger i.e. short video clip

- Topic trigger

Mole Concept and Stoichiometry II

Home Trigger Contents Summary Quiz




Trigger

When cooking, we usually follow a certain recipe. For example, 3 eggs have to be beaten with every 500 g of flour to bake a yummy cake.

Similarly, non-cooking scenarios like building a car also involves a certain fixed relationship. For example, 2 car bodies will usually be matched up with 8 wheels to build 2 complete cars.

If that's the case, how will reactions in Chemistry be represented? Would there also be a fixed recipe for each





Explanation / Extension & Exploration (45 min)

Phase	Time	Intended Objective	Activities
Explanation/ Extension & Exploration	45 min	Link to prior knowledge Introduce new concepts Extend understanding	Chunked contents, videos, activities, self-checks

- Bite-sized contents**

Mole Concept and Stoichiometry II

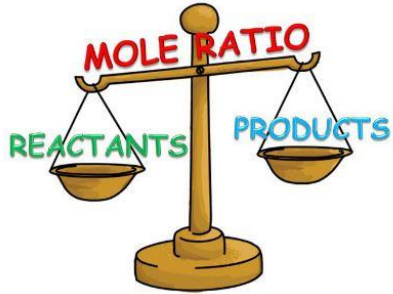
Home Trigger Contents Summary Quiz

Chemical Equations Stoichiometry in Chemical Equations

C1 **C2**

In this lesson segment, you will learn to:

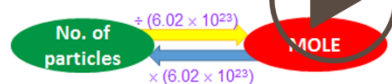
- Construct balanced chemical equations.
- Identify the stoichiometric relationships in balanced chemical equations.



Next ▷

Relationship: Mole and Number of Particles

6.02×10^{23} Al atoms will contain $(6.02 \times 10^{23}) / (6.02 \times 10^{23}) = 1$ mol of Al
 12.04×10^{23} Al atoms will contain $(12.04 \times 10^{23}) / (6.02 \times 10^{23}) = 2$ mol of Al

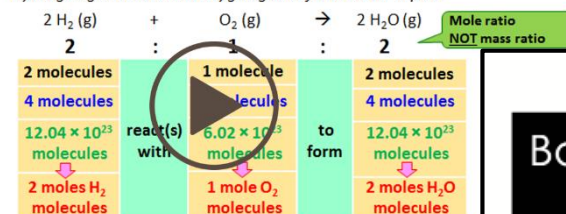


1 mol of Al will contain $1 \times (6.02 \times 10^{23})$ Al atoms
 2 mol of Al will contain $2 \times (6.02 \times 10^{23})$ Al atoms

Videos, activities and Self-checks

Stoichiometry in Chemical Equations

Hydrogen gas reacts with oxygen gas to form water vapour



Activity Time!

Balancing Chemical Equations

Mole Concept and Stoichiometry II

Home

Trigger

Contents

Summary

Quiz

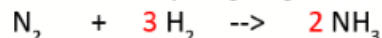
Chemical Equations

Stoichiometry in Chemical Equations

Self-Check

Question 2 of 2

Nitrogen gas reacts with hydrogen gas to form ammonia



Which of the following is TRUE?

- A. 3 moles of H_2 will produce 6 moles of NH_3
- B. 6 moles of H_2 will produce 6 moles of NH_3
- C. 9 moles of H_2 will produce 6 moles of NH_3

Incorrect. The ratio $\text{H}_2:\text{NH}_3$ is 3:2, not 1:2.
Hence, 4:8 is incorrect.

Incorrect. The ratio $\text{H}_2:\text{NH}_3$ is 3:2, not 1:1.
Hence, 6:6 is incorrect.

Correct! The ratio $\text{H}_2:\text{NH}_3$ 3:2.
Hence, the 9:6 is correct.



Evaluation (10 min)

Phase	Time	Intended Objective	Activities
Evaluate	10 min	Evaluate students' learning	Quiz (10 MCQs with hint and feedback)

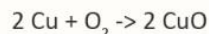
- Multiple Choice Questions (with hint and feedback)

Mole Concept and Stoichiometry II



Quiz

4. The following shows the balanced equation when copper metal reacts with oxygen to produce copper(II) oxide.



Which of the following statements below is

- ☐ A) 2 copper atoms will react with 1 oxygen atom
- ☐ B) 2 moles of copper will react with 1 mole of oxygen gas
- ☐ C) 2 g of copper will react with 1 g of oxygen
- ☐ D) None of the statements is true

Correct! - Click 'Next' to go to the next question

Hint: Obtain the molar masses of the reactants and products and use the coefficients of a balanced equation to calculate the masses.

Mole Concept and Stoichiometry II



Quiz Results

You Scored: 80
Maximum Score: 100
Correct Questions: 8
Total Questions: 10
Accuracy: 80%
Attempts: 1

Congratulations, you passed the quiz!

Review Quiz



Software and Tools

- Videoscribe

- Create animation video



- Screencast-O-Matic and iSpring

- Create contents video



- Audacity

- Edit voiceover audio files



- Microsoft Office

- Create PowerPoint slides and Word documents



- Adobe Captivate

- Convert to SCORM-compliant packages





Challenges Faced

NO...



*Something
new?*

Nehhh...!!



NO COPYRIGHT !
images



... in storyboarding

EXPERT

*... in animation and
e-learning authoring tools*

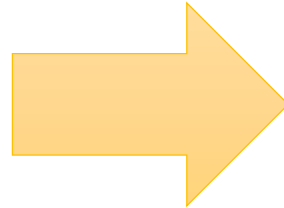




Content Development

(Man-hours per 1-hr Learning Package)

- Storyboarding
- Voiceover Script
- Voice recording
- Animations



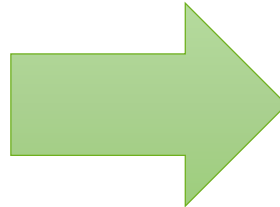
$$4 \times 3 \text{ hrs} = 12 \text{ hrs}$$

$$4 \times 2 \text{ hrs} = 8 \text{ hrs}$$

$$4 \times 1 \text{ hrs} = 4 \text{ hrs}$$

$$4 \times 1 \text{ hrs} = 40 \text{ hrs}$$

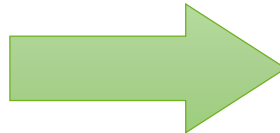
- Activity
- Quiz



$$1 \times 1 \text{ hrs} = 1 \text{ hrs}$$

$$1 \times 2 \text{ hrs} = 2 \text{ hrs}$$

- SCORM conversion



$$1 \times 4 \text{ hrs} = 4 \text{ hrs}$$

≈ 9 work days

Approx. 71 hrs

NOTE: Man-hours based on **steady-state content** development (i.e. excludes software familiarization/troubleshooting, user-interface development etc.)

Building Digital Competencies for Educators

Curriculum Design and Development

Design curriculum that helps learners achieve learning outcomes based on sound pedagogy

Identify and plan appropriate digital resources (e.g. YouTube) and tools that match learning preference and help achieve learning outcomes.

Facilitation of Learning

Facilitate ICT-enhanced interactions (e.g. learner-content, learner-learner or learner-lecturer interactions) to support engagement and learning, based on sound pedagogy.

Timely use of poll questions to determine learners' prior knowledge before using the discussion forum in LMS.

Assessment for and of learning

Use ICT to enhance assessment tasks appropriate to the learning outcomes.

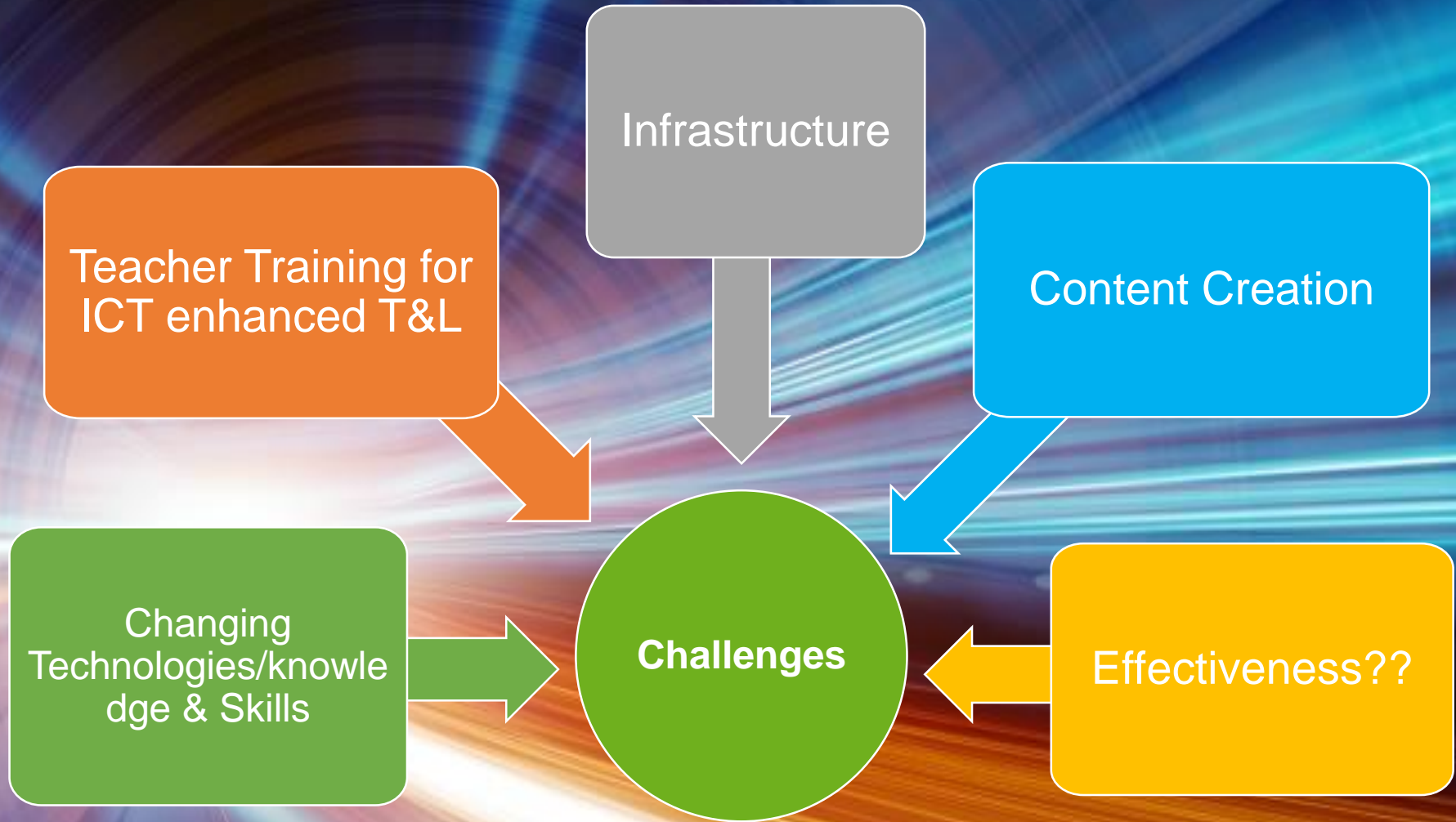
Set up and use auto-marking features in LMS and auto-plagiarism check for online assessment.

Reflective Practitioners

Engage in continuous professional development (PD) to develop IETL competencies.

Identify and participate in various PD related to specific domains (e.g. curriculum design) to deepen competencies.

For thoughts??





Thank You

