

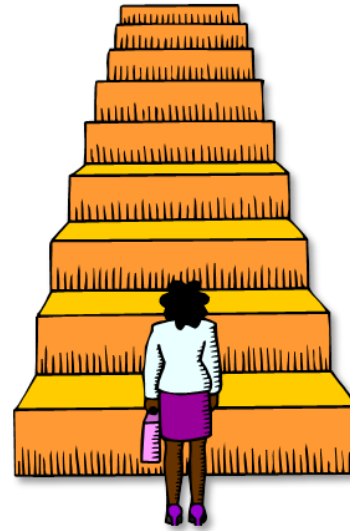


Design Principles and Emerging Technologies for E-content Design

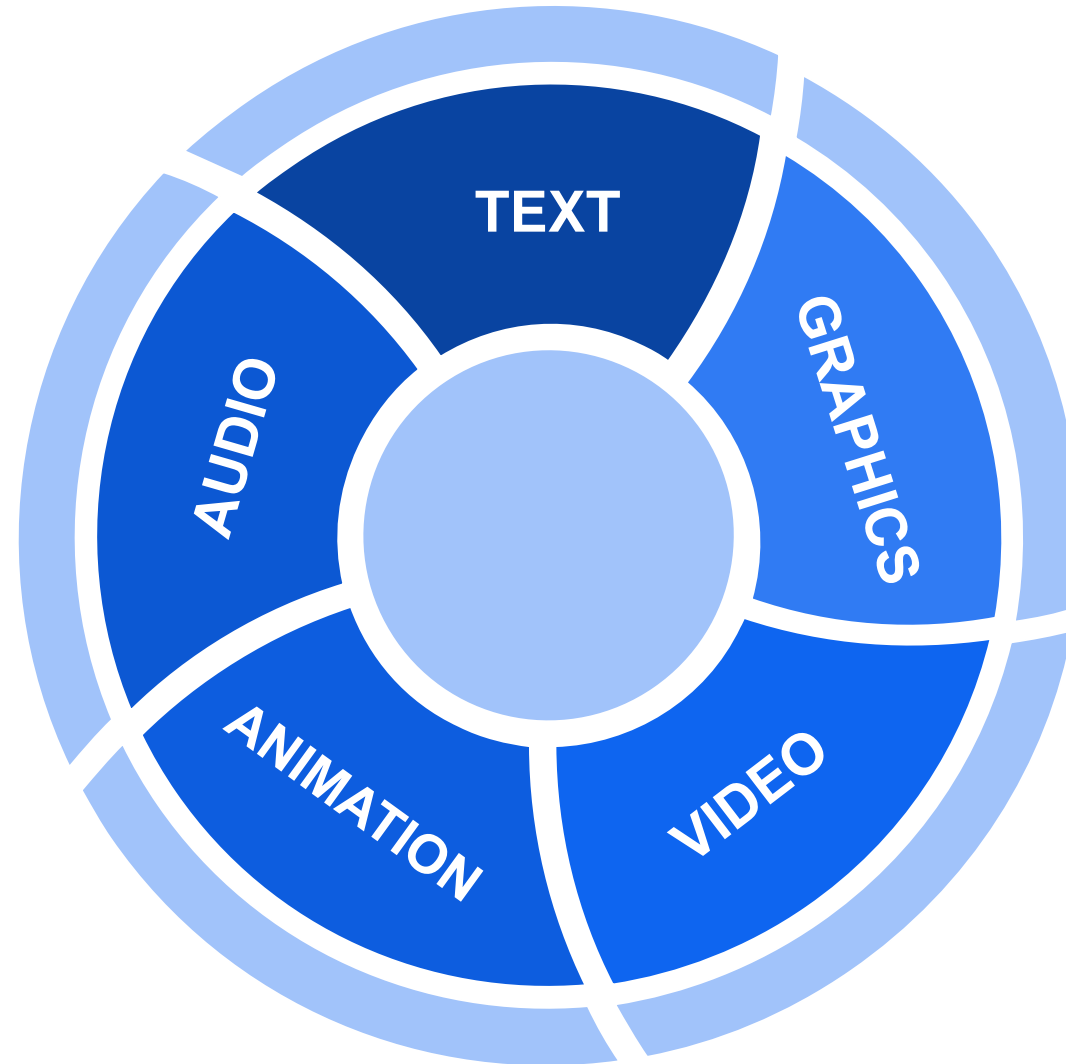
Dr. Kaushal Kumar Bhagat
Centre for Educational Technology
Indian Institute of Technology Kharagpur

Challenges

- Meaningful
- Joyful/Enjoyable
- Interactive
- Effective



What is Multimedia Learning?



Basic components

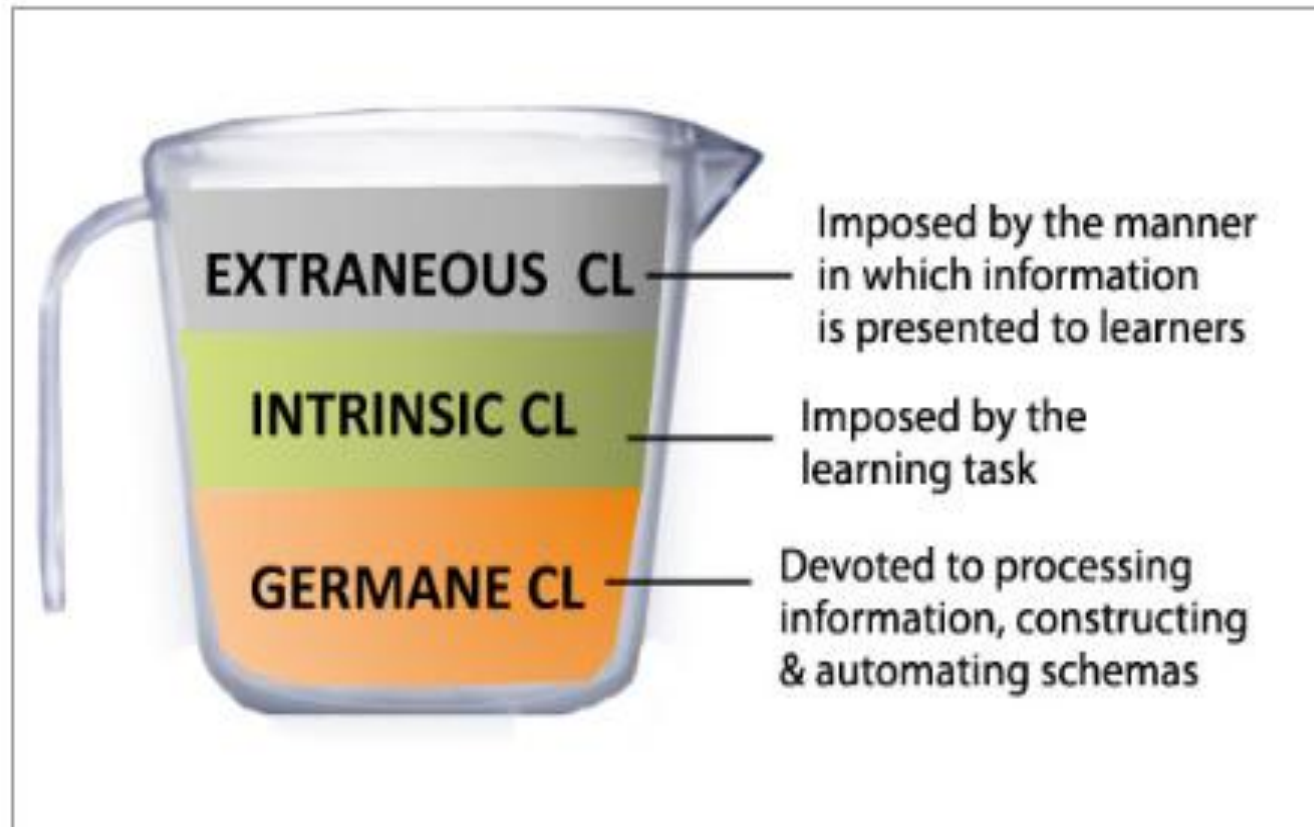
- Working memory: A cognitive system with a limited capacity that is responsible for temporarily holding information available for processing.
- Long-term memory: Place where informative knowledge is held indefinitely
- Cognitive load: the effort being used in the working memory to process the information

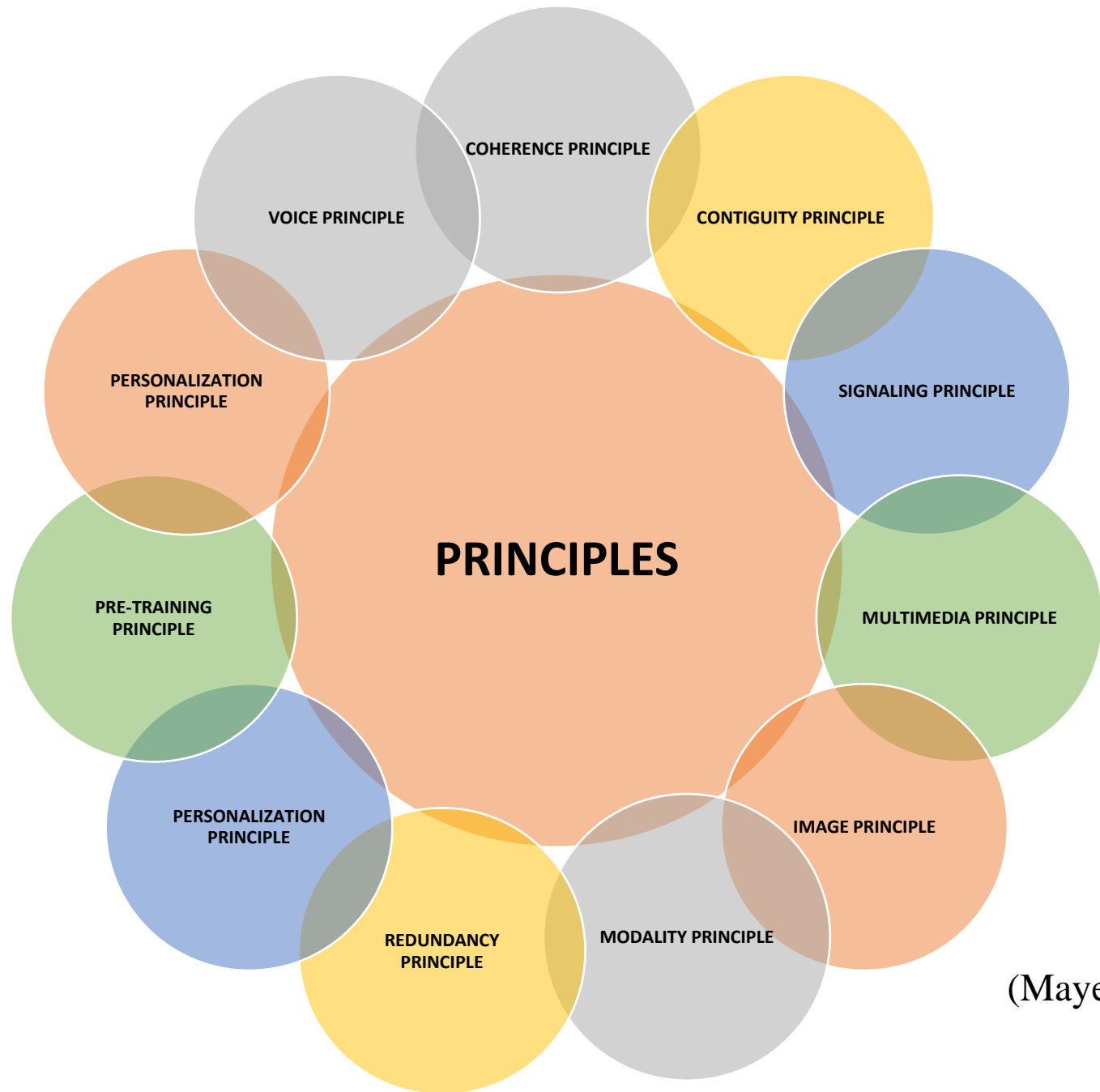
Types of cognitive load

- Intrinsic Cognitive Load (non-altered): those elements that must be processed simultaneously.
- Extraneous Cognitive Load (non-desirable): those elements that require additional mental processing but do not add to the learning experience.
- Germane Cognitive Load (desirable): those elements that help the learner transfer information from short-term memory into long-term memory and vice versa.

Types of cognitive load

The Good, the Bad and the Ugly



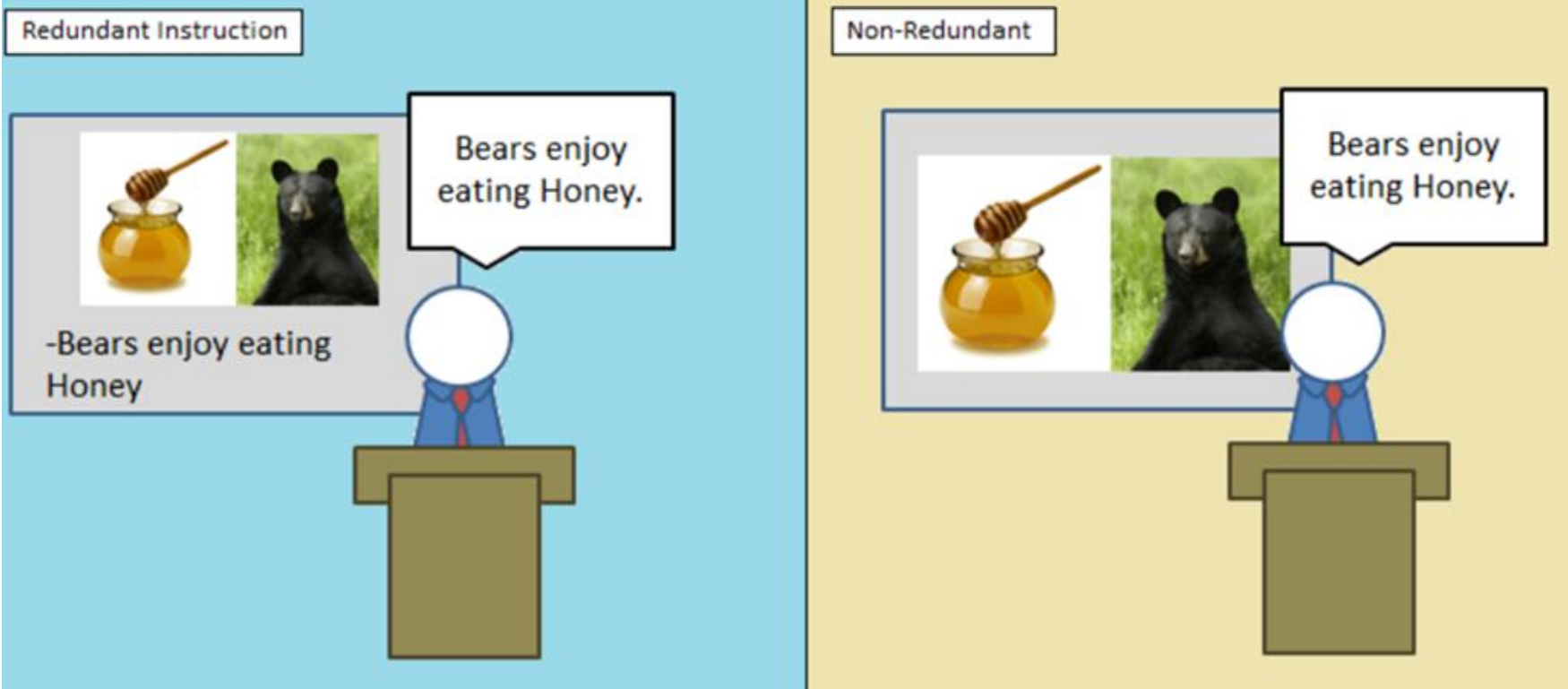


(Mayer, 2005)

Redundancy Principle

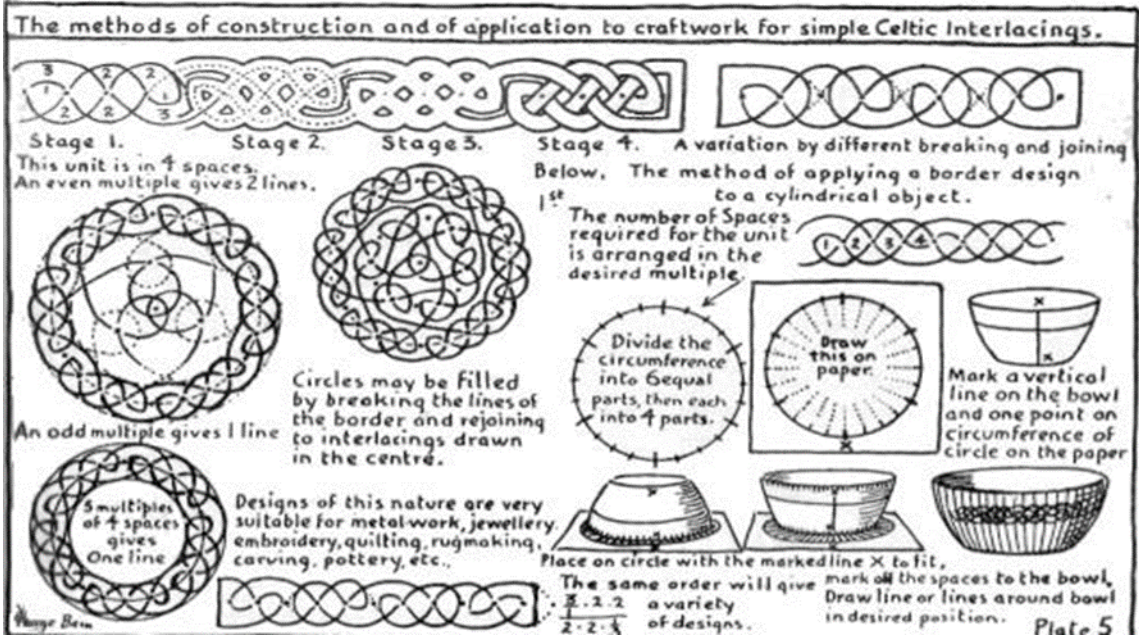
Animation + Narration

Animation + Narration + On-Screen Text (Redundant)



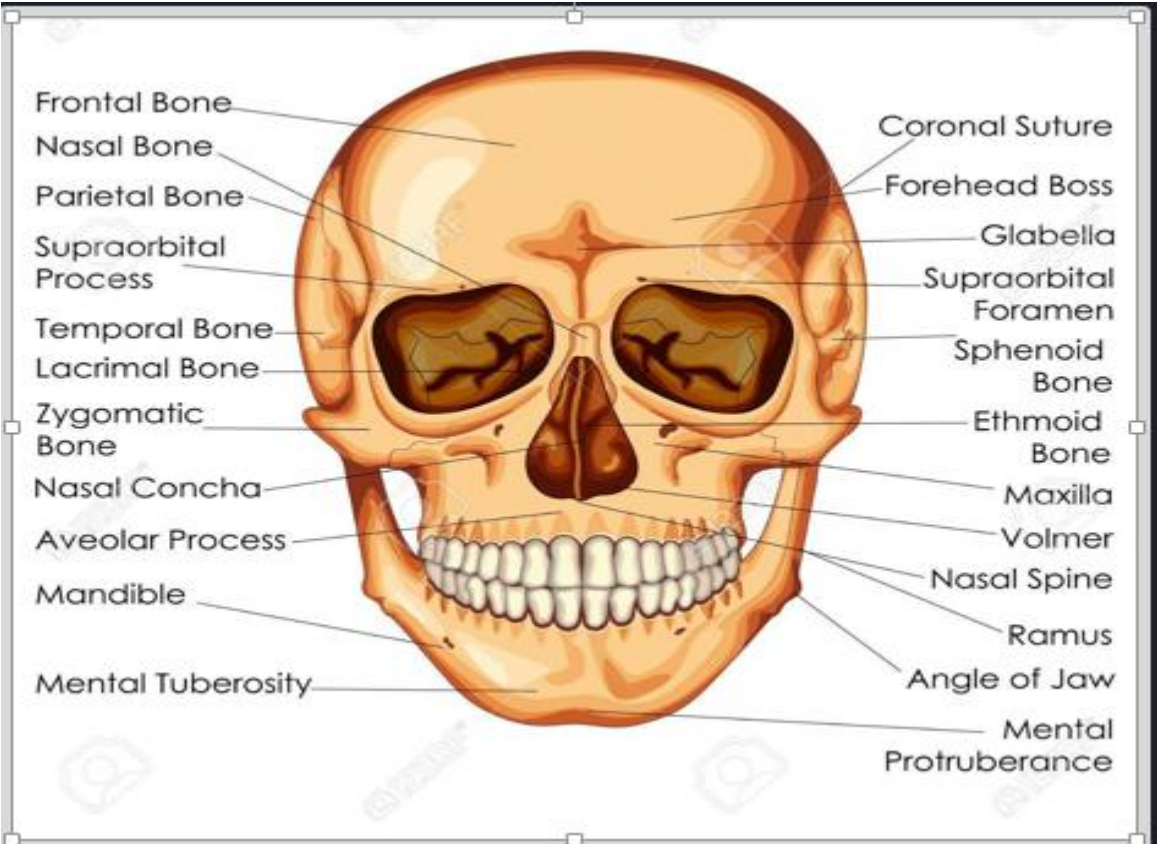
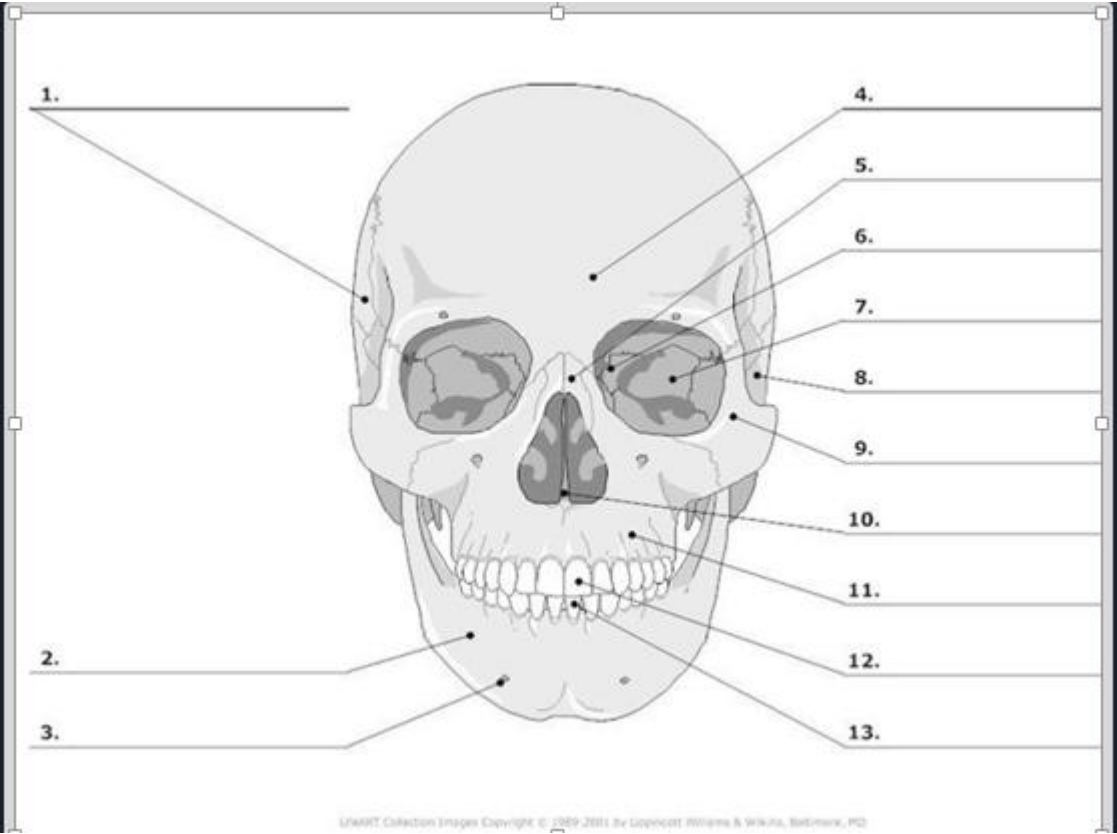
Coherence Principle

**Avoid unnecessary graphics, words and sounds from the lesson.
Less is More !!!**



Multimedia Principle

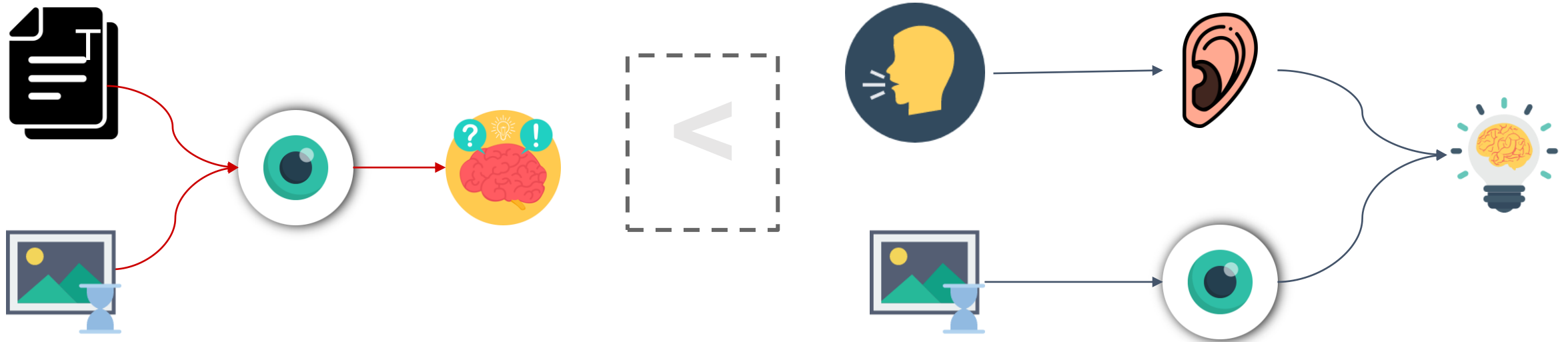
Pictures + Words



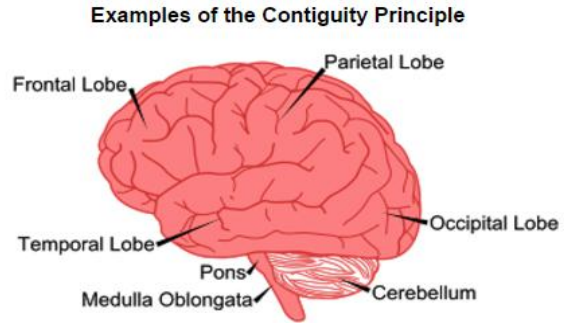
Modality Principle

- Students learn more deeply from animation & narration than from animation & on-screen text.

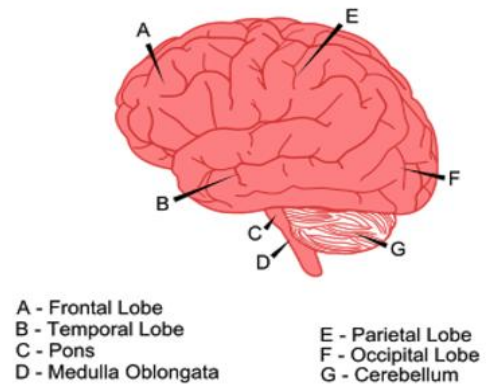
THEORETICAL RATIONALE



Contiguity Principle



In the above example, the contiguity principle is followed because the labels for the parts of the brain are placed physically near the parts of the brain to which they correspond.

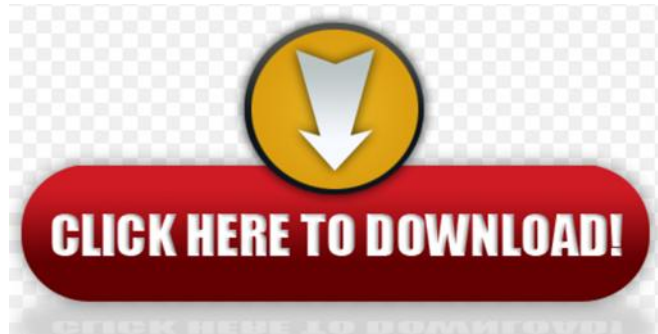


In the above example, the contiguity principle is **violated** because the labels indicating the parts of the brain are physically separated from the image of the brain.



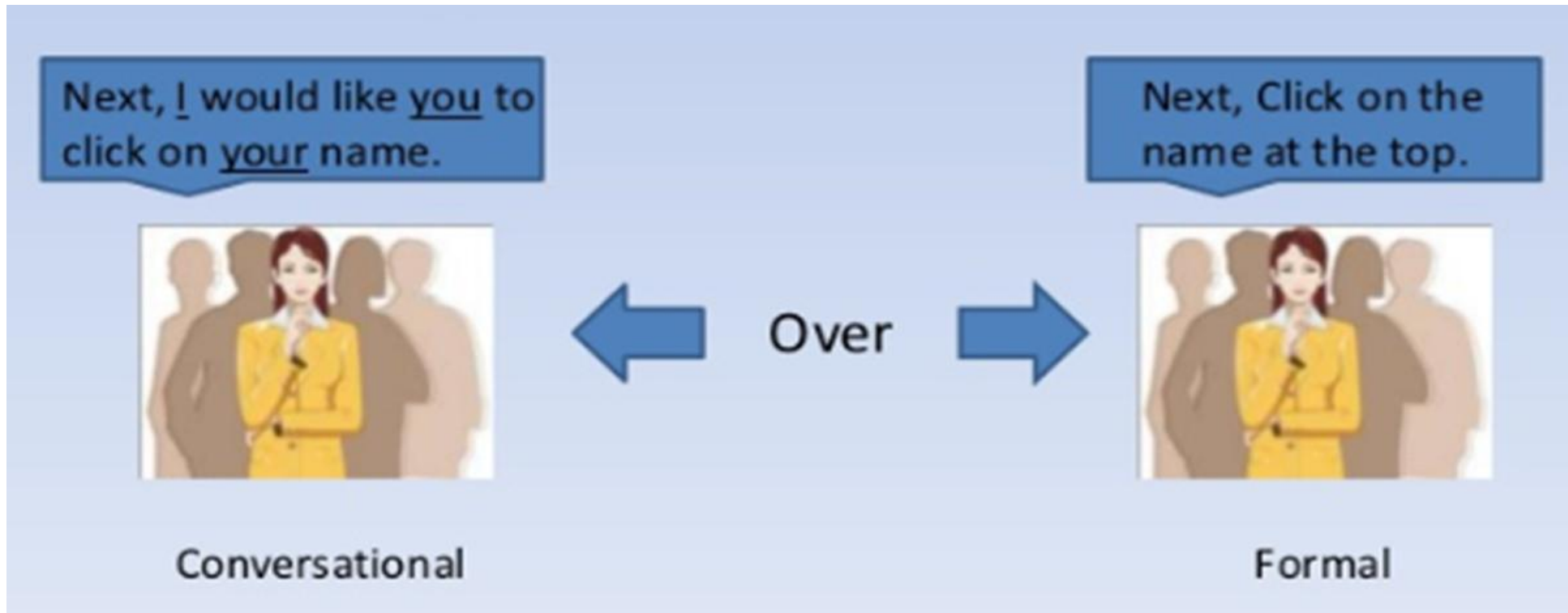
Signaling Principle

People learn more deeply from a multimedia message when cues are added that highlight the critical aspects of the presented information.



Personalization Principle

Students learn more deeply from animation and narration when the narration is in conversational rather than formal style

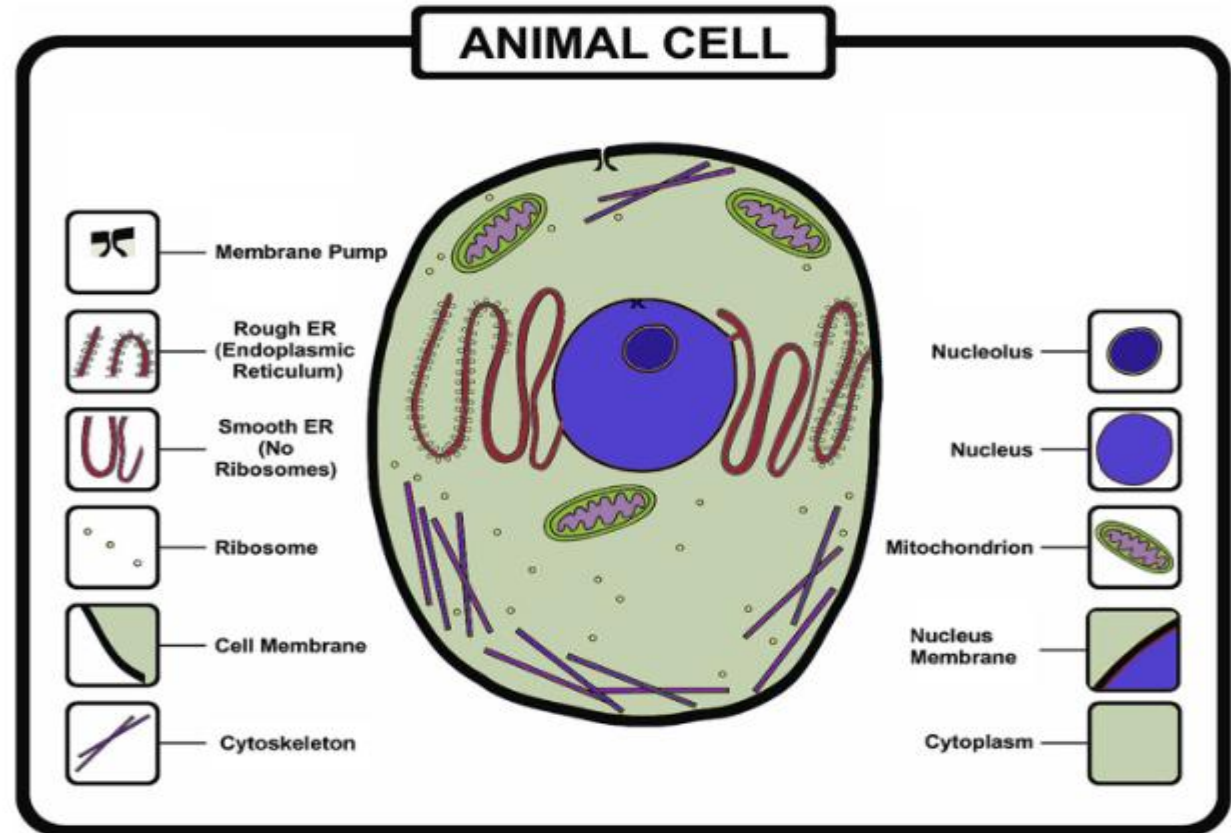


Pre-training Principle

Students learn more deeply from a multimedia when they know the names and characteristics of the main concepts



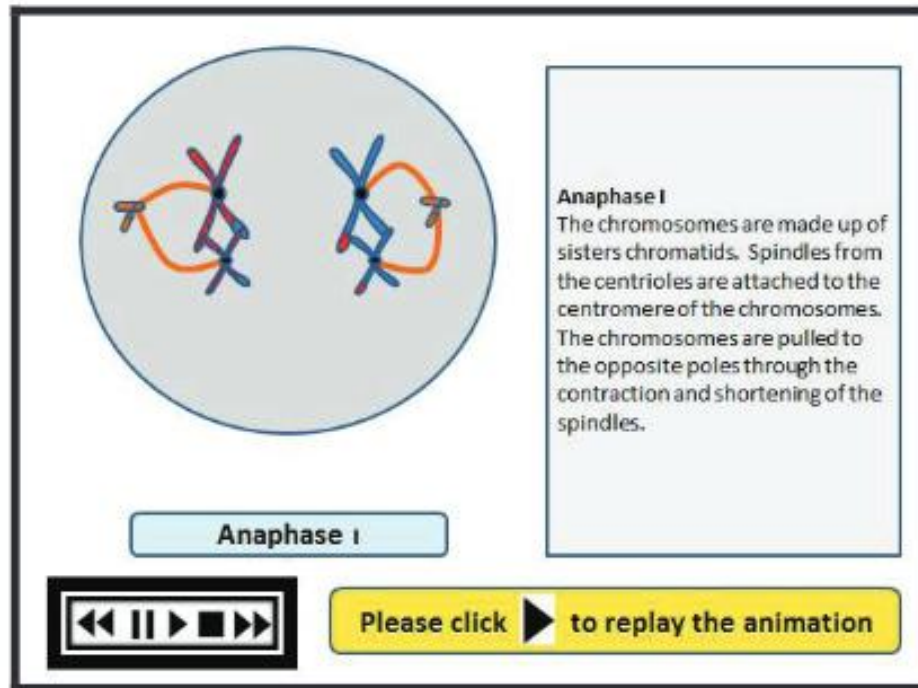
Body VR: Journey Inside a Cell



The pre-training material

Segmenting Principle

Students learn better when multimedia message is presented in user-paced segments than a continuous unit



Voice Principle

People learn better when narration is spoken in a human voice rather than a machine voice

Example

BEFORE

Treatment of Hypovolemic Shock

Fluid replacement

- (1) Crystalloids: 'Hypo, Hyper, Iso' Osmotic (NaCl, D5W, LR) → Interstitium
- (2) Colloids: Synthetic (Starch), Natural (blood products, Albumin) → Intravascular
- (3) Blood and blood products

4

AFTER

Treatment of Hypovolemic= fluid resuscitation



Interstitial

Intravascular

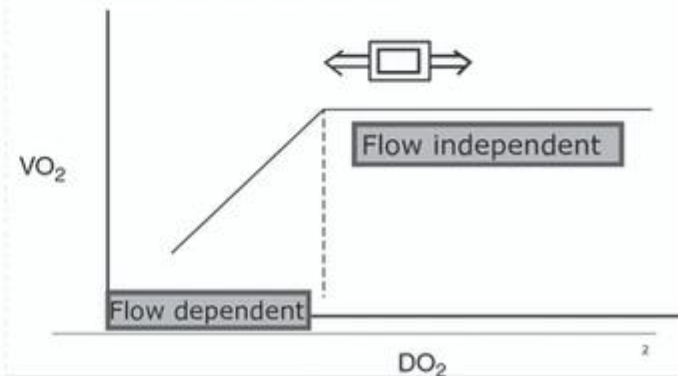
1

Oxygen Delivery vs. Consumption

- You can increase your delivery but you can not control your consumption as it is a function of tissue physiology
- You have to meet your tissue's requirements or else you will accelerate lactic acid production and tissue ischemia
- Critical DO₂ is that point where DO₂ meets VO₂ and tissues are utilizing aerobic metabolism
- Up till that point there is an inverse relation between DO₂ and VO₂ a state we call flow dependent

1

Relation between DO₂, VO₂ and O₂ extraction by tissues



2

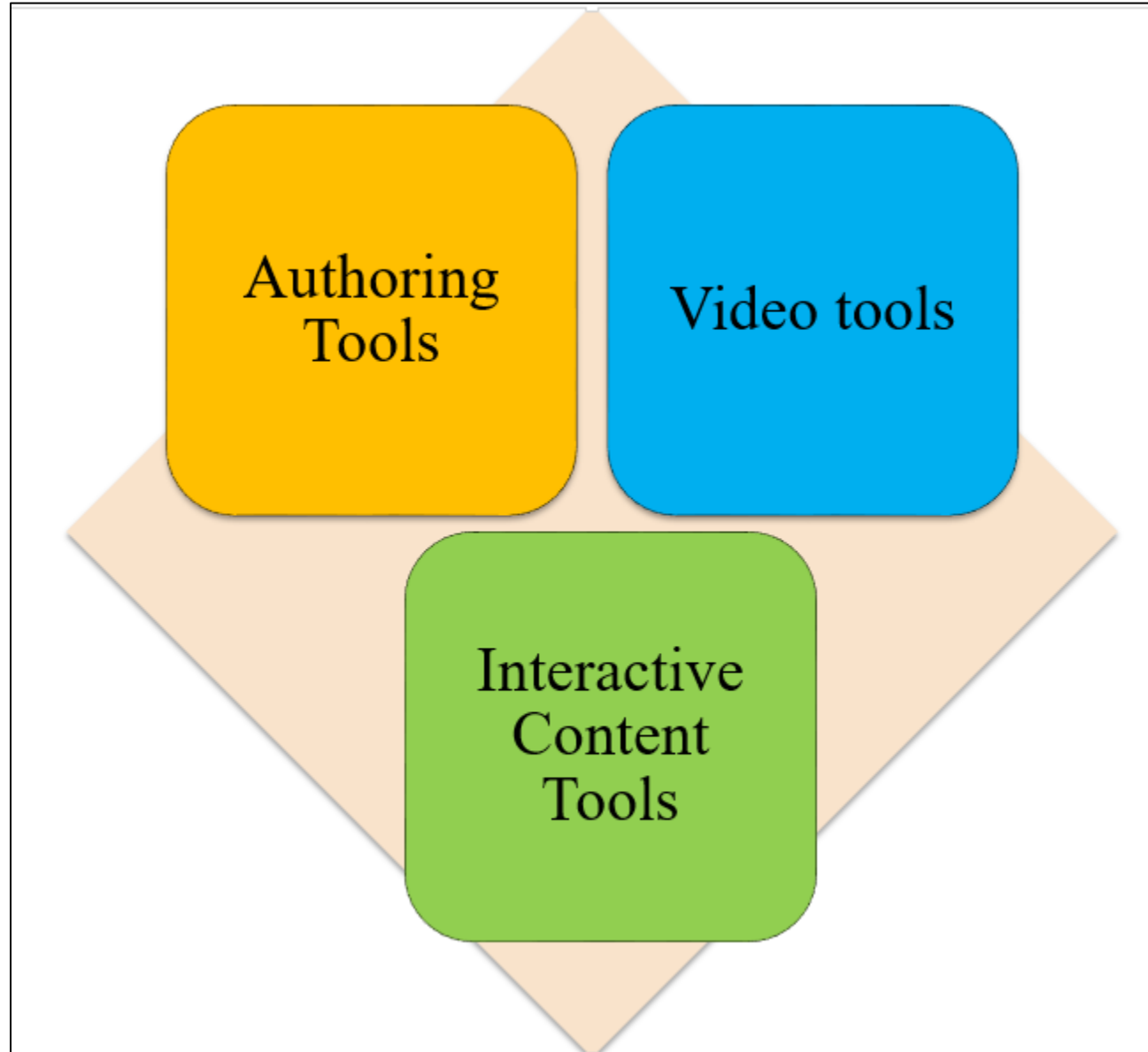
Principle	Corresponding Change
Multimedia Principle	Bulleted text replaced by pictures
Coherence Principle	All pictures and text directly not related to context deleted
Spatial Contiguity	Graphs and related text appeared contiguously on the screen
Signalling Principle	Important points highlighted by larger font and different colour scheme
Temporal Contiguity	Graphs and related/explanatory text presented in same slide
Modality Principle	Slides representing complex phenomena converted to pictures or graphs and explained through narration

“You are not designing for yourself”

Technologies for E-Content Development

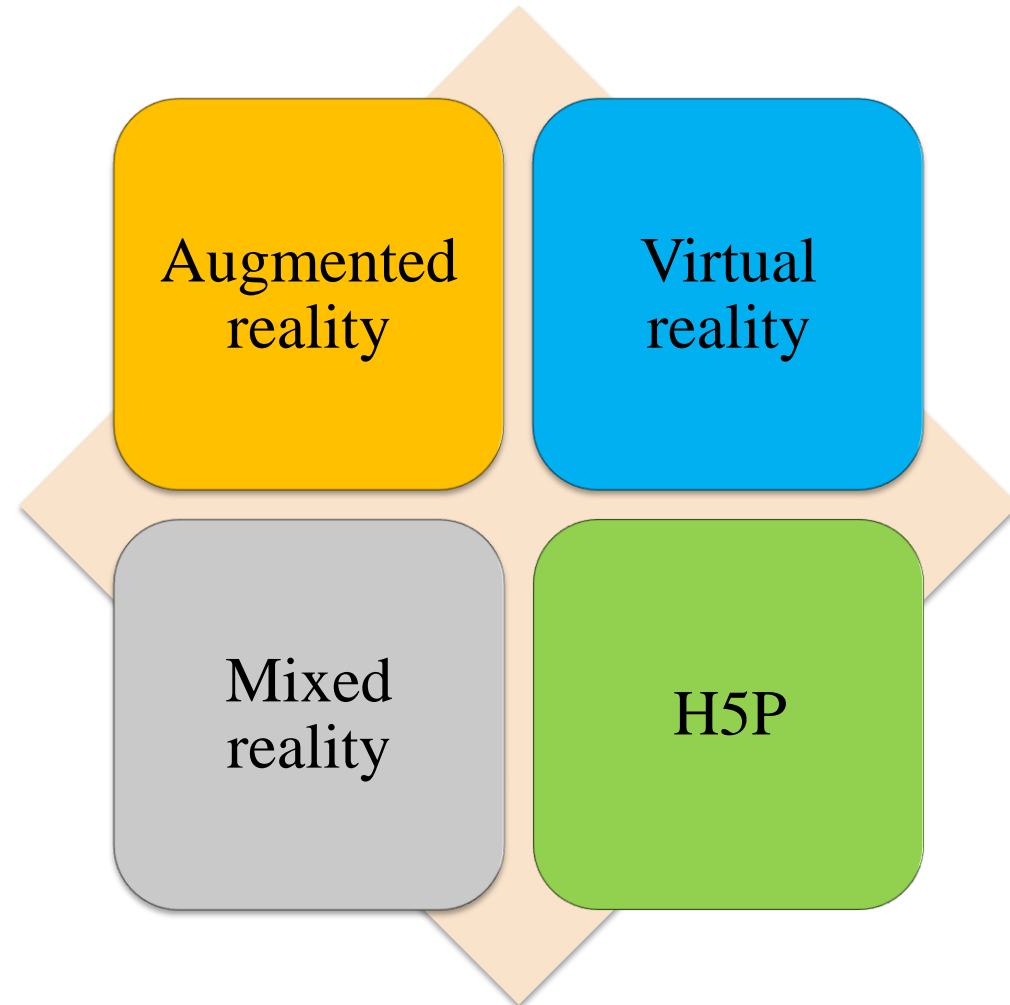


Tools for E-content designers



- **Course Authoring Software:** It enable Instructional Designers to put together different types of media to create engaging and interactive course content. Example: CourseLab, Glo Maker, etc.
- **Screen capture software:** It helps to capture/record any part of their screen, video calls, audio overlays, and also screencast.
Example: Open Broadcaster Software, CamStudio, etc.
- **Interactive Learning software:** To develop interacting games to teach some concepts or game-based assessments.
Example: Augmented reality, Virtual reality, etc.

Emerging Technologies in the 21st Century



What is Augmented Reality?

AR as a system having three basic characteristics:

- Combines reality with a virtual world
- Interactive in real time
- Supports 3-D visualization

Azuma (1997)

2016: The Year of Virtual Reality





DEC 23, 2016 @ 01:58 PM 1,729 VIEWS

China's Year Of Virtual Reality



Lisa Hanson, CONTRIBUTOR

I cover the PC, console and mobile games industry in Asia. [FULL BIO](#) ✓

Opinions expressed by Forbes Contributors are their own.



A woman uses a virtual reality device at MK2 VR in Paris on Wednesday. | AFP-JIJI

BUSINESS / TECH

2016 'year zero' of virtual reality revolution, filmmakers say

AFP-JIJI

THE JAPAN TIMES ST
THE JAPAN TIMES ON SUNDAY

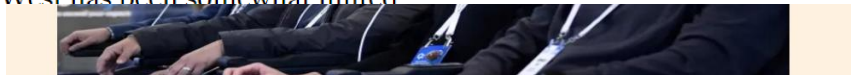
WHAT'S TRENDING NOW

- > Study explores deafening silence in Japan's English-language classes
- > Sayonara to the year that was
- > New year, new you: What to expect personally and professionally in the Year of the Rooster
- > Trump's rise spurs students in Japan to broach touchy subjects
- > Trump spokesman says there is 'zero evidence' Russian hacking swayed election; poll finds little confidence in president-elect
- > Misuzu Kaneko: A deeper empathy for the natural world
- > Over 1,000 Japanese firms to turn 100 years old in 2017
- > Japanese is affecting the English lexicon in new ways

BLOGS

JAPAN PULSE

2016 became "year one" of virtual reality in China, due to the fact that the sector finally truly started to grow. My company Niko Partners estimates China's VR hardware 2016 market size will hit \$300 million by the end of this month with mobile VR being the unequivocal leader in terms of hardware unit sales. Virtual reality overall has been embraced in China more than the West and Chinese consumers have shown a willingness to go out and purchase VR devices or experiences, whereas consumer interest in the West has been somewhat muted



The Year in Virtual Reality

Tech forecasters have long believed that video-gaming would be the gateway for virtual reality to eventually go mainstream. And 2016 was seen as the year the VR market might turn a corner. That's because long-awaited, high-end hardware from Oculus, HTC and Sony finally hit shelves. So did the debuts live up to the hype? Bloomberg's Kaitlin Meehan reports. (Source: Bloomberg)



Definition of VR

- Technological perspective: VR is a collection of diverse technologies with interactive means. VR integrates a set of multiple media in a three-dimensional environment such as audio, text, video, image, and so on.
- Psychological perspective: VR was defined as a particular type of experience instead of a technology. It is the psychological sense of “being there” in the environment generated by VR.

Main types and Characteristics of VR

3I Characteristics of VR

Immersion

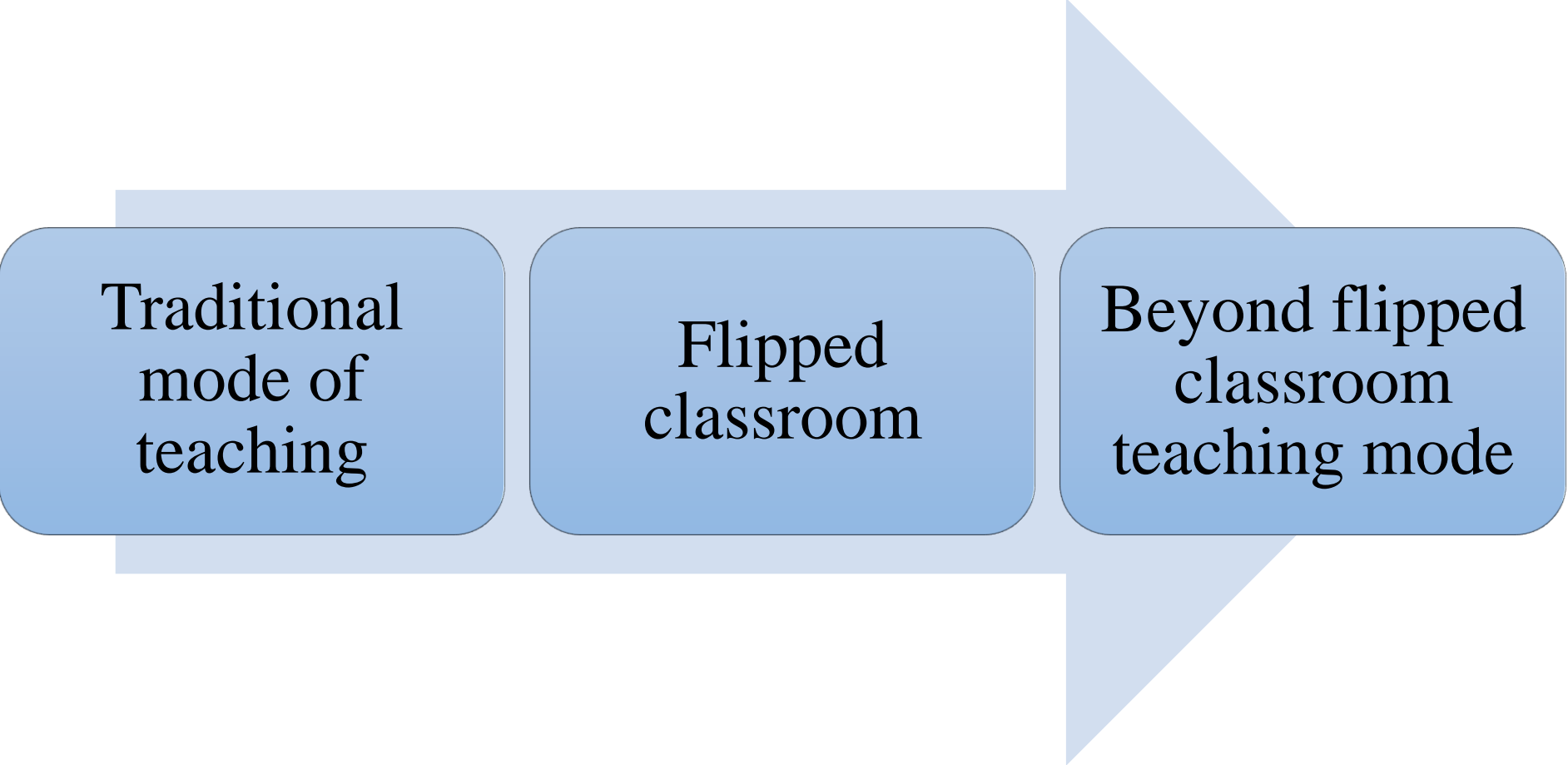
Interaction

Imagination

Advantages of AR over VR

- Multimedia and multisensory display
- Portable and Cost-effective
- User friendly (no sense of nausea/motion sickness/cybersickness)

Different modes of teaching



Traditional
mode of
teaching

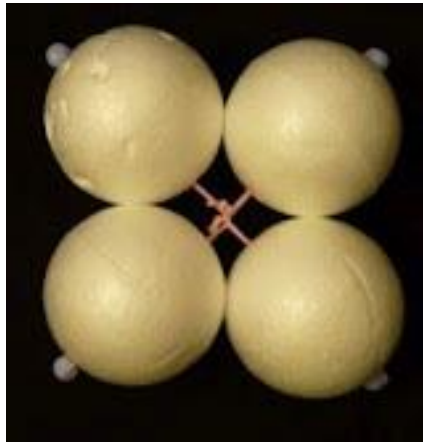
Flipped
classroom

Beyond flipped
classroom
teaching mode

Real models

Over the past decades

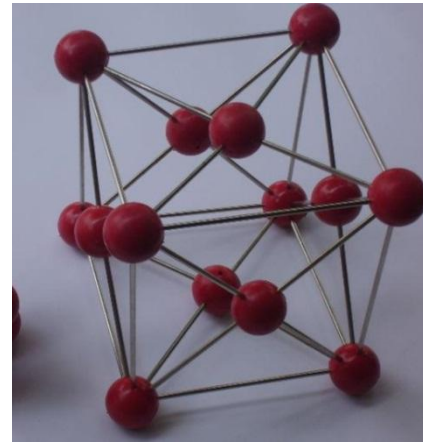
**Simple Cubic
(SC)**



**Body Centered
Cubic (BCC)**



**Face Centered
Cubic (FCC)**



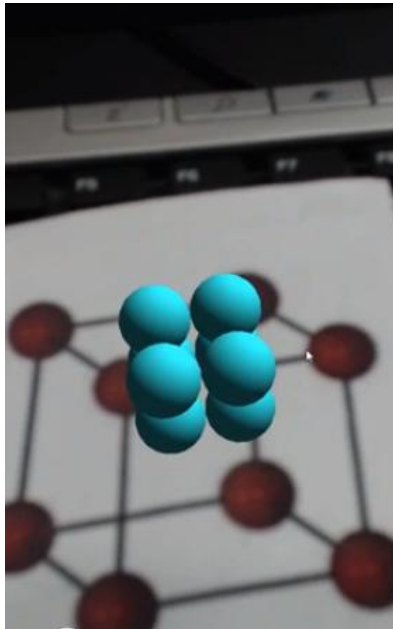
**Hexagonal
Close Packed
(HCP)**



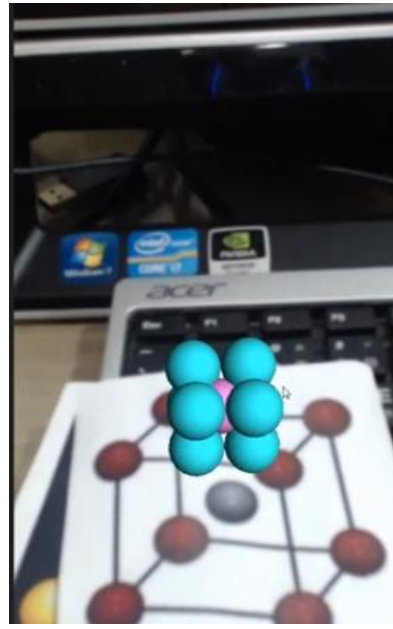
Augmented Reality (AR)

In this study

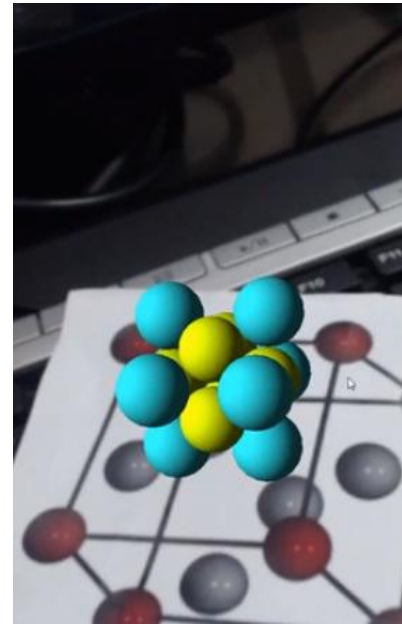
**Simple Cubic
(SC)**



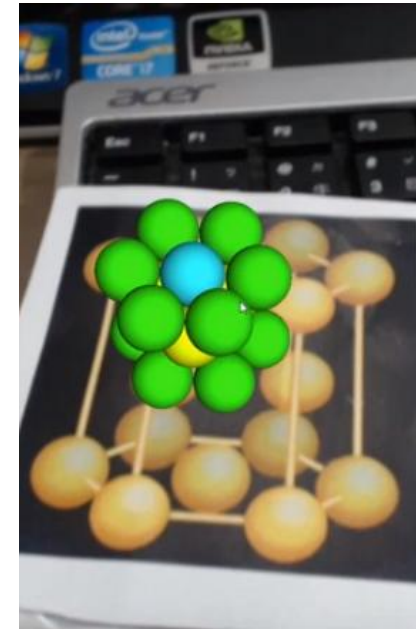
**Body Centered
Cubic (BCC)**



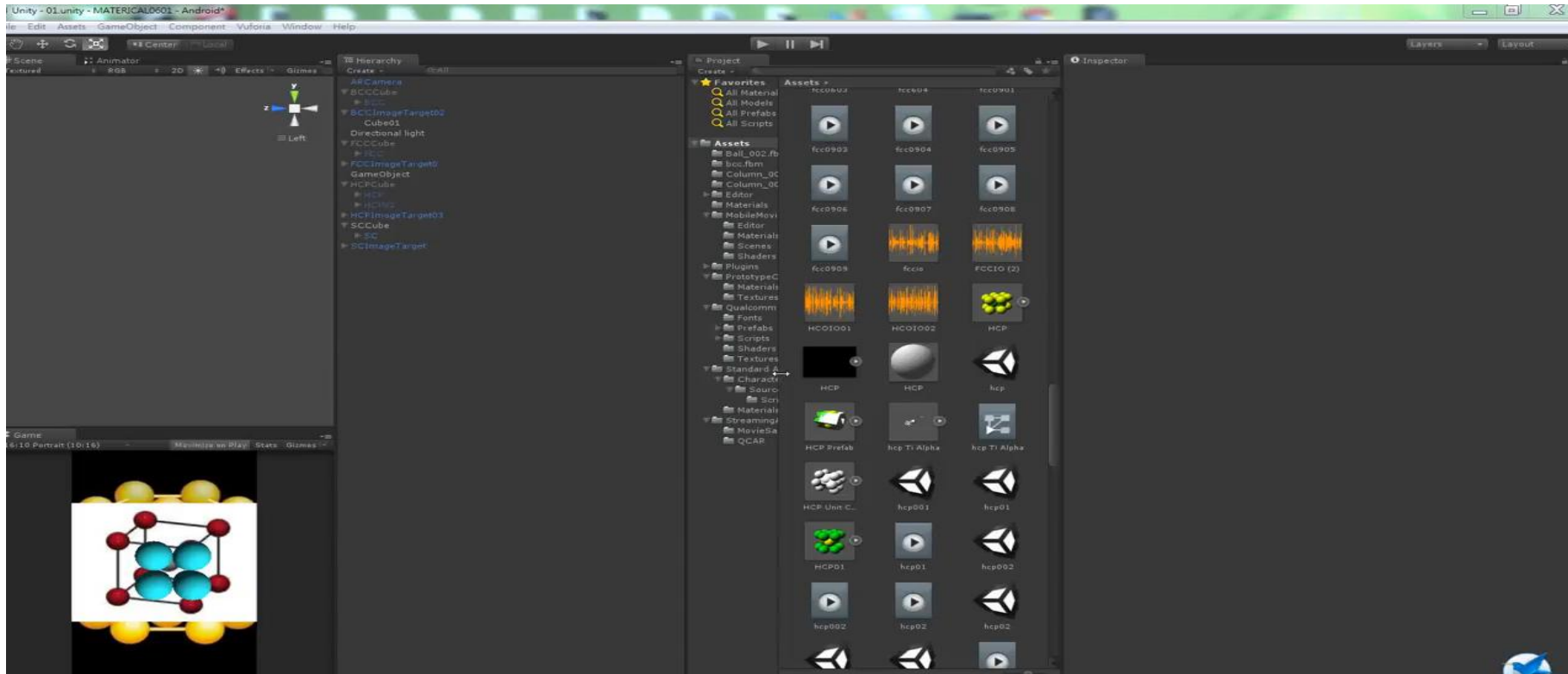
**Face Centered
Cubic (FCC)**

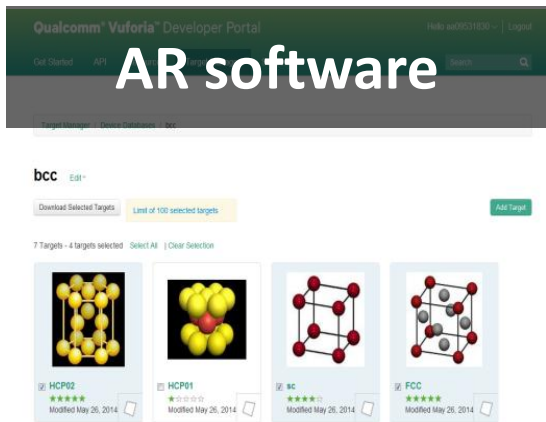


**Hexagonal
Close Packed
(HCP)**



Demo





Teacher



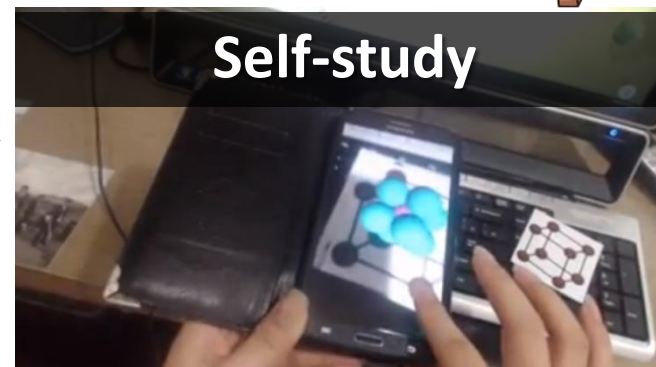
Student



Download by student



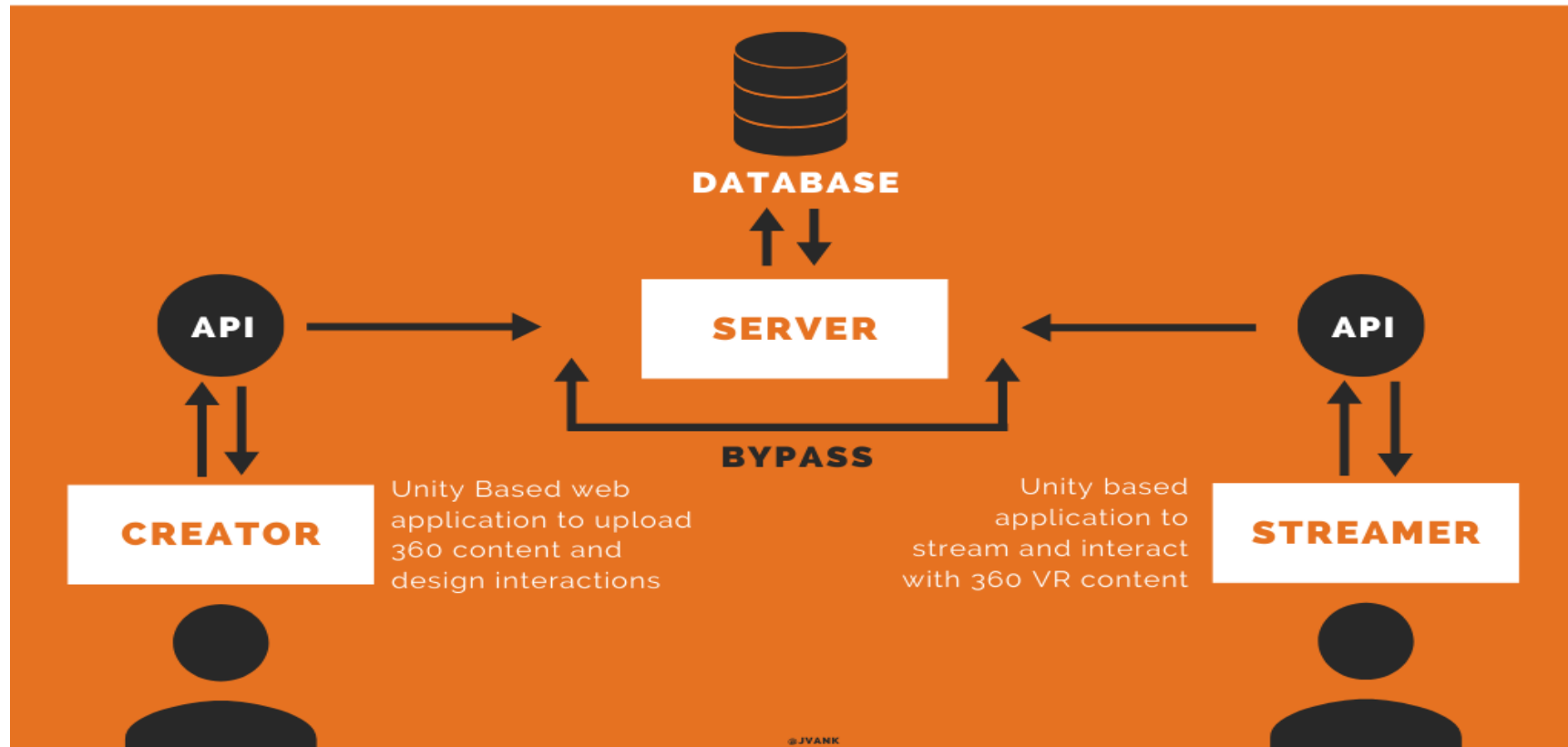
Set up in
Cell phone



Self-study

IMMERSIVE 360 VR

Software System



The idea is to give teachers a free platform for creating 360VR experiences. 360 images/videos with superimposed text and pictures

Features of Immersive 360 VR

Phase 1

- Teacher can upload content on the platform
- Teacher can create the story, organizes the videos and pictures based on some storyboard
- Teacher can export the experience for desktop-VR or another stand-alone device so that the student can receive it and use it

Features of Immersive 360 VR

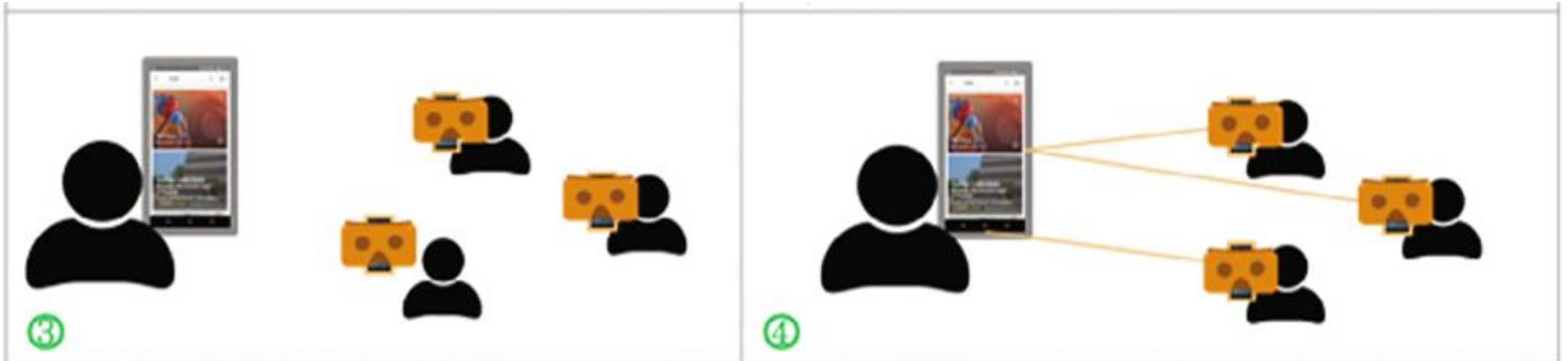
Phase 2

- Teacher can gamify the experience (gamified assessment being part of it).
- Basic feature: teachers allows the user to take a quiz before he moves on to the next scene in the experience
- A list of gamification features can be implemented: Glossary, HotPot, Badges etc.

Features of Immersive 360 VR

Phase 3

- A feature for a guided tour, where a teacher is connected to the student's devices and directs attention on specific points through the system.



Open Source Tools and Platforms for E-Content Development



VirtualDub

- Open source tool to record, process and watch video
- Not only making video and audio records but also can edit different parameters of both audio and video files

Blender

- Open source for 3D creation
- Modeling, rigging, animation, simulation, rendering, compositing and motion tracking, video editing and 2D animation

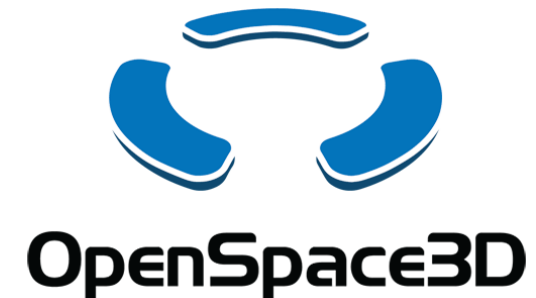
Open Source Simulation platform

- AnyLogic (<https://www.anylogic.com/s/download-free-simulation-software-for-education/>)
- PhET (<https://phet.colorado.edu/>)
- WISE (<https://wise.berkeley.edu/about>)
- GeoGebra (<https://www.geogebra.org/>)
- CoSci (<https://cosci.tw/>)

Software for AR/VR interactive content development



The screenshot shows the DroidAR project page. At the top, the text "DroidAR" is written in a white, handwritten-style font. Below it, the subtitle "DroidAR Mobile Locationbased Augmented Reality Framework for Android" is displayed in a smaller, white, handwritten-style font. In the top right corner, there is a button with the GitHub logo and the text "View project on GitHub". Below the header, the text "DroidAR" is repeated in a larger, white, handwritten-style font. Underneath, a paragraph of text describes the framework: "DroidAR is a framework for Augmented Reality on Android. Location based AR and marker based AR are both possible. Also read the [wiki articles](#) (or the [FAQ](#)) for more detailed information about DroidAR." Below this, another paragraph states: "This framework can be used for many different scenarios, there are already some demo applications available (check the videos below). For the latest news about DroidAR also visit our [blog](#)." On the right side, there are two blue buttons: "Download .zip file" and "Download .tar.gz file", each with a white icon of a document with a download arrow.



Copyright Licenses and Open Educational Resources



What is copyright?

- Legal rights of the owner of intellectual property.
- Intellectual property for example: includes recorded audio/video, written article, snapped photograph
- Other people can not reuse or edit your work without your permission

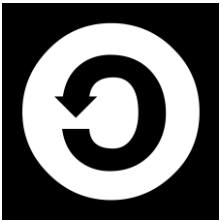
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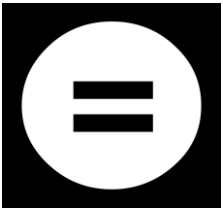
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Different types of Licenses



Open Educational Resources

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List of OER platforms

- OER Commons (<https://www.oercommons.org/>)
- OASIS (<https://oasis.geneseo.edu/>)
- National Digital Library (<https://ndl.iitkgp.ac.in/>)
- Open Source Physics (<https://www.compadre.org/osp/>?)

Comments and Questions?

