IB AFRICA, EUROPE & MIDDLE EAST REGIONAL CONFERENCE 2013

THE HAGUE 24TH - 27TH OCTOBER
Effective and creative instructional strategies in delivering knowledge in Science

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Objectives

1. Definition of creativity
2. What causes teaching effective? 3 components of successful teaching
3. How can we effectively deliver knowledge in Science?
   2.1. Note taking
   2.2. Non–linguistic representations
   2.3. Drama and physical movement in Science
   2.4. Collaboration – some creative examples
4. Conclusion and discussion
Three elements of effective pedagogy
(Marzano 2001)

Instructional strategies
Management techniques
Curriculum design
“I expect you all to be independent, innovative, critical thinkers who will do exactly as I say!”
Creativity is characterised by being imaginative, showing inventiveness and originality of thought.

Riley (2006)

Creative lessons should encourage students to ‘think outside the box’ and come up with off-the-wall ideas.

Longshaw (2009)
Creative teaching done right, will move you beyond such comfort zones into areas of teaching that are far more rewarding for you and your pupils alike.

Starbuck (2006)

A creative attitude says that exploring towards the answer is more valuable than finding the answer itself. The learning is in the journey.

Bowkett (2006)
Notes taking can be fun and creative!

Research and theory:
1. It is advisable to present students with a variety of note formats
2. Notes should include graphical organizers
   (Nye, Crooks, Powlie and Tripp 1994)

http://www.mindtools.com/pages/article/newISS_01.htm
Note-Taking

- Notecards
  - Source cards
  - Flexible
  - Switch around
  - Quiz yourself
  - gotta keep from losing them!

- Cornell Method
  - "blah blah blah..."
  - clean & organized
  - cueing
  - Summarize
  - IN OWN WORDS

- Webbing
  - Takes time
  - visual
  - fun
  - connections
  - relationships

- Informal Outline
  - linear
  - bullets
  - indentations
  - details & examples
Benzene reactions

http://dasariramkrishna.blogspot.com/2013/03/some-mind-map-pictures-on-organic.html
Why not a cartoon?

Hi there! I'm Insulin, a hormone that is found in your body.

I am produced in the pancreas and travel in the bloodstream to the liver. I have a very important role in your body.

In order to ensure that enough of me is produced, you should take lots of exercise.

If not enough of me is produced, the body cannot store glucose as glycogen. This is a disease known as diabetes. There is no known cure.

Too much glucose can be toxic!

...and eat foods with low levels of fats and sugars.

Remember, look after me and I'll look after you!

http://embrethil.deviantart.com/art/Biology-cartoon-30040407
Our story begins with a sore throat, the kind that is red and hurts to swallow. The attack started as a single virus that multiplied in the body to become an invading army. Left alone, they would take over and destroy every cell.

It is up to some key defense systems to battle and defeat these forces. Let’s see how these specialized cells that are part of the immune system work together to return our bodies to working order.

Our body has many types of cells. One type is called the epithelial cell. The epithelial cell is nice and happy, but not for long...

At first, the virus is inside just a few cells in the throat, but causing too much harm. The body doesn’t even notice. The virus just goes into the next cell. This isn’t so bad...

I’m going to need some help...

I don’t feel good...

Help! Help! Help!
Give your page a heading.

Here is where you take notes like you normally would.

Here you write down key words and questions.

Summarize the page here.

Cornell Method

http://learningcommons.ubc.ca/
Photosynthesis is divided into 2 stages: light dependent and independent reaction (Calvin cycle)
Calvin cycle is a process of CO$_2$ fixation and producing a triose…

Conclusions/ Daily journal

http://www.jayhosler.com/jshblog/?p=1108
Non – linguistic forms

Research and theory

- Knowledge is stored in two forms (linguistic and non-linguistic);

- Imagery mode is expressed as mental pictures or physical sensations;

- Engaging students in the creation of non-linguistic representations stimulates and increases activity of the brain (Gerlic & Jausovec 1999);

- Nonlinguistic representations should be presented after linguistic form (Pressley, Symons, McDaniel, Synder 1988, Wood and Pressley 1990)
Types of non-linguistic representations

- Graphic representations
- Physical models
- Drawing pictures and pictograms
- Kinesthetic activity
Generating mental pictures

The most direct way to generate non-linguistic representations is to simply construct models and pictures of knowledge being learned.

http://www.nuffieldfoundation.org/
Introduction to new terminology Frayer model

- produces covered seeds
- produces flowers
- produces fruit

- color of flower
- number of seeds
- kind of fruit

- peas
- coleus
- grass
- roses
- maple trees

- pine
- cedar
- moss
- fern

Definition
Characteristics
Examples
Non-examples

http://www.muskingum.edu/
Art and movement in Science

Research and theory:
✓ Several studies have found that as teachers become more experienced, they improvise more
  (Berliner & Tikunoff, 1976; Borko & Livingston, 1989; Moore, 1993; Yinger, 1987)

✓ Kinesthetic activities are those that involve physical movement associated with a specific knowledge

✓ Most children find this both a natural and enjoyable way to express their knowledge (Marzano 2001)
✓ Sketch and performance (body performance – mitosis or meiosis, atom structure – students performing processes, reactions)

✓ Songs/Rap (photosynthesis songs)

✓ Designing board games (digestive system, nervous system board game)
✓ **Trail court** (Darwin as an accused person, in-vitro followers versus opponents)

✓ **Students as doctors/detectives (role playing)** analyzing blood tests/criminal evidences/X-rays images

✓ **Story telling** (students designing a short science-fiction/horror story about a process/reaction)
Exercise 1. Using the ranges of blood components listed above analyze the blood test of 5 patients giving feedback. In your diagnosis you should include:

- Which components have too high or too low values?
- Is patient healthy or she/he needs a further consultation?
- Can you diagnose any symptoms of diseases?
- What are your recommendations for examined patients?

Patient 1 age: 25 year-old, weight: 120 kg Gender: Man

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ph</td>
<td>6.5</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>1.2</td>
</tr>
<tr>
<td>Glucose</td>
<td>140</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>43</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>314</td>
</tr>
<tr>
<td>Platelet count</td>
<td>190 000</td>
</tr>
<tr>
<td>RBC</td>
<td>4.7</td>
</tr>
<tr>
<td>WBC</td>
<td>7600</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>55%</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>1%</td>
</tr>
<tr>
<td>Basophils</td>
<td>0.2%</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>26%</td>
</tr>
<tr>
<td>Monocytes</td>
<td>5%</td>
</tr>
</tbody>
</table>

Author: Piotr Mazowiecki-Kocyk
Who is lying? Who is a murderer? Evolution at the scene of the crime

Students prepare a report to Police based on a description and materials given by a teacher. They use a prepared form to give an answer.

http://evolution.berkeley.edu/evolibrary/news/060301_crime
Why cooperative learning is important?

Positive interdependence

Group processing

Face to face promotive interaction

Group skills

Individual accountability
'Snowball game’ – students teaching students
1. A new word with a brief description is given to every student;
2. Students move in a classroom and teach each other new words;
3. After every mini-lesson with a classmate, they exchange their words and continue the game till they get their first word back.
'Interview with the blood cell’

One student from each pair is a journalist who has to guess the name of a cell. Before the interview journalists collect key words related to functions, features, properties of cells. They are allowed to ask about places, jobs, size, life span of the cell.

'Cells’ receive only their names.
Pairs can swap after journalists identify cells.
Designing flashcards’

1. Each student in the group prepares 20 key words on the slip of paper
2. The flashcards are given to another student
3. All students have to write definitions for the given key words
4. The flashcards are given to another student
5. Each student checks definitions. If something is wrong, he/she corrects mistakes
6. The flashcards are given to another student
7. All students are asked to draw a picture next to the key word
8. The flashcards are given back to the student who had listed the key words
'Learning wall'
A learning wall can be used throughout the learning of a topic as a place where students are allowed to reflect on their learning process.
Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.

A. Einstein
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2. Bowkett. 2006. 100+ ideas for teaching creativity.