Exploit All Mental Abilities of Students

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**Learning:** Gaining knowledge

**Teaching:** Make the other minds learn by providing best learning conditions; internal and external (among others, e-learning);

**Knowledge:** Justified true belief; processed information.

Knowledge as ‘processed information’ involves long-term memory, short-term memory and retrieval systems, transformation and the like. To enter and be stored in the long-term memory, the material of learning must be encoded. It has to be transformed into semantic, or meaningful. By encoding, the incoming information is transformed into learned and memorable capabilities (Gagne, 1985).

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Objective v.s. Subjective Knowledge

Figure 1. A schematic representation of representational mind

HS = Human Subject
HO = Human Object
\\\\ = Information processing

Guney, A. (2011)
According to some sources, there are three sorts of knowledge (Stillings et al, 1998):

1- **Declarative knowledge** (knowing what), which has two sub sorts: 
   a- language like representations, 
   b- image like representations,

2- **Procedural knowledge** (knowing how),

3- **Tacit knowledge** (a kind of implicit knowledge which might not be represented verbally or explicitly).

Although declarative knowledge has some static properties, yet they have relations within their domain.
Using All Mental Abilities

Education system should use all these above mentioned sorts of knowledge to exploit students’ abilities in all possible ways.

Educators should not give up so easily that some learners can not give immediate satisfactory answer to questions. They should, instead, stimulate students to use their other talents to take over the function for weak part (Motloch, 2001); luckily human brain can catch up with these problems by well education and training.
Learning environment, including capacity by birth, is the prerequisite condition to activate, support and maintain the internal mental processing that constitutes each learning event (Gagne, 1965).

Theoretically, we can put that two minds with the same capacity, mental state within the same conditions could achieve similar quality of ‘creative’ solutions.

This implies, a practical application to education should take care of three constraints: mental health, capacity and learning environment.
Mental structure of creativity, intelligence and talent have a lot in common; they can yield fruitful solutions at similar level, but may be on different matters.

Creativity may use more of image-like representations and intelligence more of language-like, propositional ones. Ultimately, operationally, mechanisms exhibit similarities.

Talent seems to me, partly, and innate ability to act creatively on certain issues, and can be improved to some extent.
Creativity or Intelligence

**Problem solving:** to reach a solution by using all mental abilities; mental leaps, analogy, reasoning, intuition, explicit (declarative-procedural) and implicit (tacit) knowledge, etc.

**Creativity:** To find out a set of direct relevancies and to combine them in order to reach a noble end again by using all mental abilities.

**Intuitive:** 1 : knowing or perceiving by intuition : capable of knowing by direct insight or cognition. 2 a: acquired, known, arrived at, or perceived by intuition (M.W.Unabridged)
Figure 2 represents a sketch of my understanding of creativity, although aesthetic judgement plays a major role in it besides analogy.
Making analogy is not, of course, always so easy. Nevertheless, if we make a correct analogy, it helps us to find out the hidden suppositions which may not be seen when we look at superficially.

Analogy helps new and more abstract concepts which help us to use our cognitive devise efficiently.

The full power of human thinking depends on its capacity to combine concepts to create even more complex structures (Holyoak & Tagard, 1996).
To lessen the possible impair, it seems to me more fruitful to help students free their minds from the blocking prejudgments and fear of failure to exploit their entire capacity.

Educators should have sympathy and compassion for students that speaks for itself; more over, teachers should have sufficient empathy with learners to grasp what they really understand.

Emotions, of course, play an important role in learning; but then there should be some serious analysis of the cognitive structure which underlies emotions.
Education system should establish conditions to stimulate students’ curiosity for learning and teachers’ motivations to define and to represent the questions well enough since clarity is half way to understand and solve the problem.

Educators should develop well defined methods to clarify learners’ minds to support teachers’ empathy for students.
Before presenting some methods for design and analysis, let us look at what analysis and synthesis might mean:

**Analysis:** it is a kind of representation of breaking up a whole into its components on such a way that the elements do not have to be broken down into more ‘unnecessary’ (in accordance with some criteria) details; besides, the structural (syntactic) and semantic relations between components must be preserved and exposed. This “… unnecessary details…” will lead us to the term ‘**morpheme (smallest meaningful unit of a design domain)**’ in morphological analysis of *(architectural)* design (Guney, 2008).

**Synthesis:** bringing the ‘undividable’ (in accordance with some criteria-*morpheme*) components into a possible whole(s) within their mutual structural (syntactic) and semantic relationships. This is, of course, a very short explanation of synthesis in general. Later on I will, further, explain what possible combinable mutual structure and semantic are in *(architectural)* compositions through their components or **morphemes** /and or: combination of **morphemes** (objects) (Guney, 2008).
Theoretically, it seems possible to assume this twin to be exactly the opposite of each other; yet they may vary concerning instances since a party may yield a set of parametric alternatives.

(Guney, 2008)
A possible cognitive structure of (architectural) precedent analysis. It is shown how to we analyze a precedent through its form-operation-performance.

(Guney, 2008)
We use four methods for analyzing precedents at TUDelft. We call it “Four Ways to Analysis”. These are:

1- Method Ching,

2- Method Clark and Pause,

3- Method Steadman,

4- FOP (Guney).

Finding out the spatial relationships of precedents is the prerequisite for all these methods.
Spatial relationships are organized and represented as a semantic network.

There are of course many aspects of its form, but I think it is useful, first of all, to find out its basic units and their relationships beside organizational sorts of it since otherwise we would have been lost within unnecessary details; we would not see the hidden principles of precedents at hand to be analyzed.

Objects are mostly not the same as they seem to be.
A schematic representation of the major units. This delineates briefly, how ‘A Building Complex’ is abstractly represented within a 'Semantic Net' which explains itself.
A schematic representation of the minor units. This delineates briefly, how ‘Space Divisions Of A Building Complex’ is abstractly represented within a ‘Semantic Net’ which explains itself.

(Guney, 2008)
To prevent confusion between shape and form we use this example since precedents have shape and form.
An example of Precedent Analysis of Some Students
Oeuvre

Dominus Winery, Yountville, California 1996 - 1998
Maintheme: Context

Main Signal Tower, Bascl, Switzerland 1998 - 1999
Maintheme: Context

New de Young Museum, Golden Gate Park, San Francisco 2002 - 2004
Maintheme: Routing

Philharmonie, Hamburg, Germany 2003 ...
Maintheme: Waves
CHING:

1. spatial relationships
2. spatial organizations
3. circulation elements
4. form compositions
Clark & Pause:

1. balance
2. repetitive to unique
3. circulation
4. natural light
5. structure
6. hierarchy
7. parti
Figure 10.10. All rectangular dissections for $n = 4$, with their weak dual adjacency graphs. There are four distinct graphs, labelled (a) to (d) for reference in table 10.1.
Steadman:

*Topological representations*
Method FOP

Esthetic quality: The facade is totally transaprant with a blue/grey layer which embodies the sky. The form refers to a amoeba, which is totally round shaped; the elements within the building, which are also round shaped, agree with the curved facade.

Space quality: Floors hang over each other to create large high and open spaces. The floors have a flexible set up for the bookcases. The IKMZ is the centre, the heart of campus BTU.

Site quality: IKMZ stands on a site with a slope. This gives the direction to the entrance. IKMZ is a contradiction to the context, curved building vs. rigid context. From everywhere in the building, one can see the site. On the top floors, one can see the whole campus BTU.
Education in Design and Analysis

A possible cognitive structure of (architectural) design mechanism.

(Guney, 2008)
Some possible design phases:

All the phases include different scales and a bit different kind of information. Yet, the cognitive process in each one remains unchanged.

Parti: dominant underlying, characteristic idea

Concept: program of requirements + context + background knowledge (precedents)

Design strategies

Precedents; types, a set of sub-types

Pre-parametric design

Recursive and iterative process

Parametric alternatives

Definitive design

This is, of course, not a linear process; only a sketch of it and architects break the rules sometimes. Besides, it includes recursive and
F(m)OP vs POF(m)
Finally, educators should let, teach and train students to use all their mental abilities to reach creative design solutions in relation to given ends/performances; but again by helping them not to be lost in the sea of unnecessary irrelevant details.

Students should think freely but should be trained in finding creative solutions within constraints.

“Design education, then, is a delicate balance indeed between directing the student to acquire this knowledge and experience, and yet not mechanizing his or her thought processes to the point of preventing the emergence of original ideas.” (Lawson, 2006)

Creative design solution, in a way, is using all mental abilities within the constrains of the possible solutions in relation to the problem at hand.


