The Nature of Problems – Complexity

Didactic Suggestions (1)

These are only suggestions, any group of learners is free to experiment with the use of the micro-module. The types, number and order of use of the elements in the micro-module are open to choice. Depending on the learning strategy adopted, elements can be also eliminated or added. For this purpose, the micro-modules can be copied and modified.

(Ia) Try to start by connecting with the current state of knowledge and experience of the individual in the group/s.

(1) Organize students into group/s of 4 or 5

(2) Ask the participants in the group/s to identify:
(a) 2 problems they think are **simple**, and
(b) 2 problems they think are **complex**.

(3) Ask them to reflect: Why do they think the first 2 problems are **simple** and the second 2 problems are **complex**? What is it that differentiates them?

(4) Ask the the groups to convene and share their results by selecting and presenting 2 "**simple problems**" and 2 "**complex problems**" per group. Then, they present their conclusions regarding "Why a problem is **simple**? and Why a problem is **complex**"

Didactic Suggestions (2)

(IIa) Use the micro-module "Nature of Problems - Complexity" to reinforce and deepen the understanding of the concept of Complexity in "Nature of Problems."

(1) Introduce the micro-module "**Nature of Problems – Complexity**" to the participants, explaining its multimedia, multi-dimensional, multi-role, multi-didactic intention. Explain that this is a more complex micro-module made up of several concepts.

(2) Ask the participants in the group/s to explore individually the micro-module searching, focusing their attention and reflecting on those elements they find most effective in reinforcing and deepening their understanding of the concept of "**Complexity**" in the "**Nature of Problems**."

(1) The participants tell their groups about their first 3 choices of "most effective elements" and explain why they have selected them. The participants reflect collectively about their choices and their reasons. If some participants do not find the types of elements most appropriate to them, they can tell about those element and, even better, find them and contribute them to the micro-module.

Didactic Suggestions (3)

(IIb) Use the micro-module "Nature of the Problems" to reinforce and deepen the understanding of the concept of Complexity in "Nature of Problems."

(4) Ask the participants in each group to return to the 2 **simple** and the 2 **complex** problems they identified in the first part of the activity and assess them individually using the instrument provided in the micro-module. Use one copy of the instrument per problem. The participants compare their individual assessments with those of the other members of the group. They discuss the reasons for the differences and agree on a group assessment, again using one copy of the instrument per problem.

(5) The groups convene and share their results, first, by selecting and presenting 3 choices of "most effective elements" per group, along with their conclusions as to why different people may have different preferences regarding elements and ways of learning; second, by presenting their collective assessment of the **complexity** of their selected problems and the reasons for this assessment. The groups discuss to see whether they arrive to a general agreement or a diversity of opinions prevails.

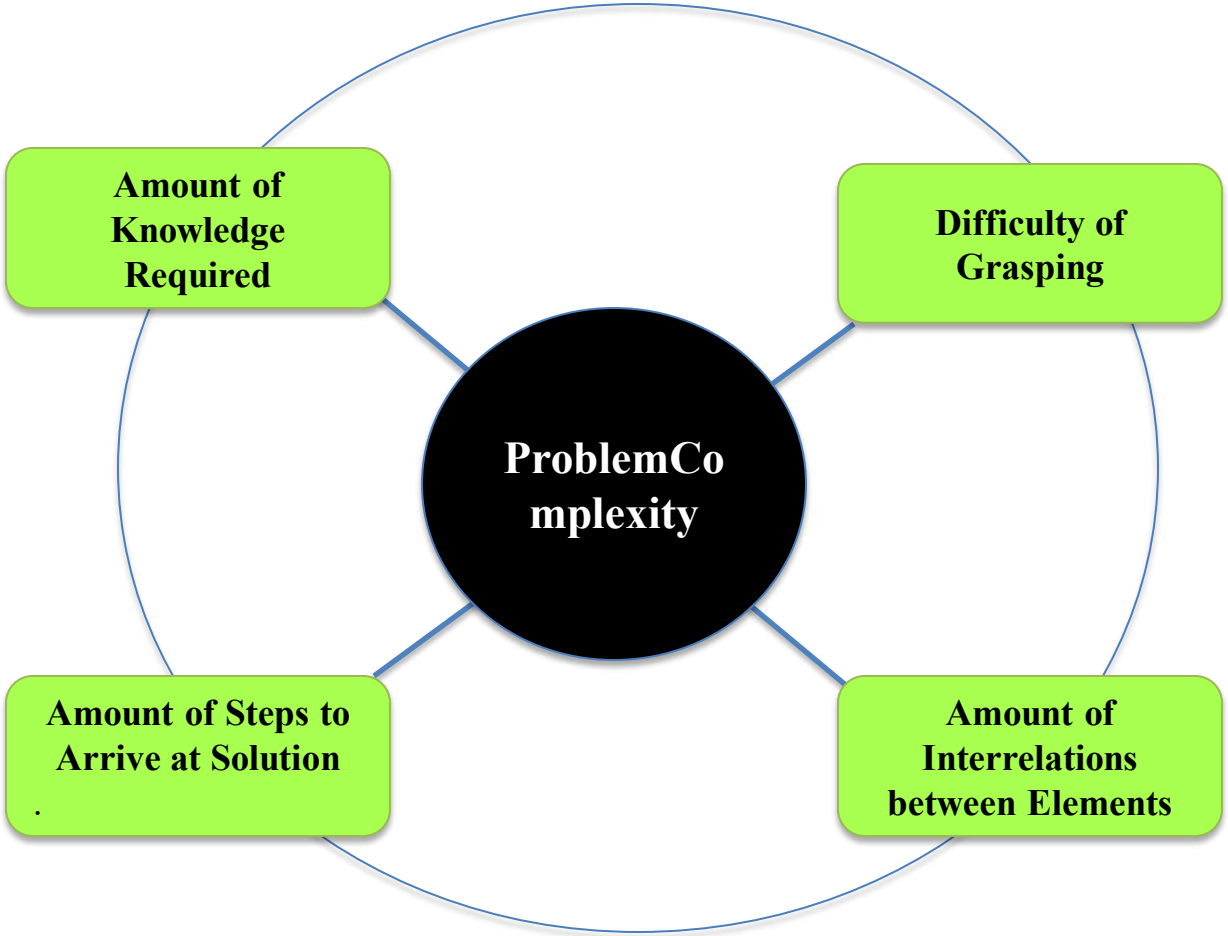
(6) Participants fill in the brief questionnaire about their preferences regarding the elements in the micro-module.

Nature of Problems

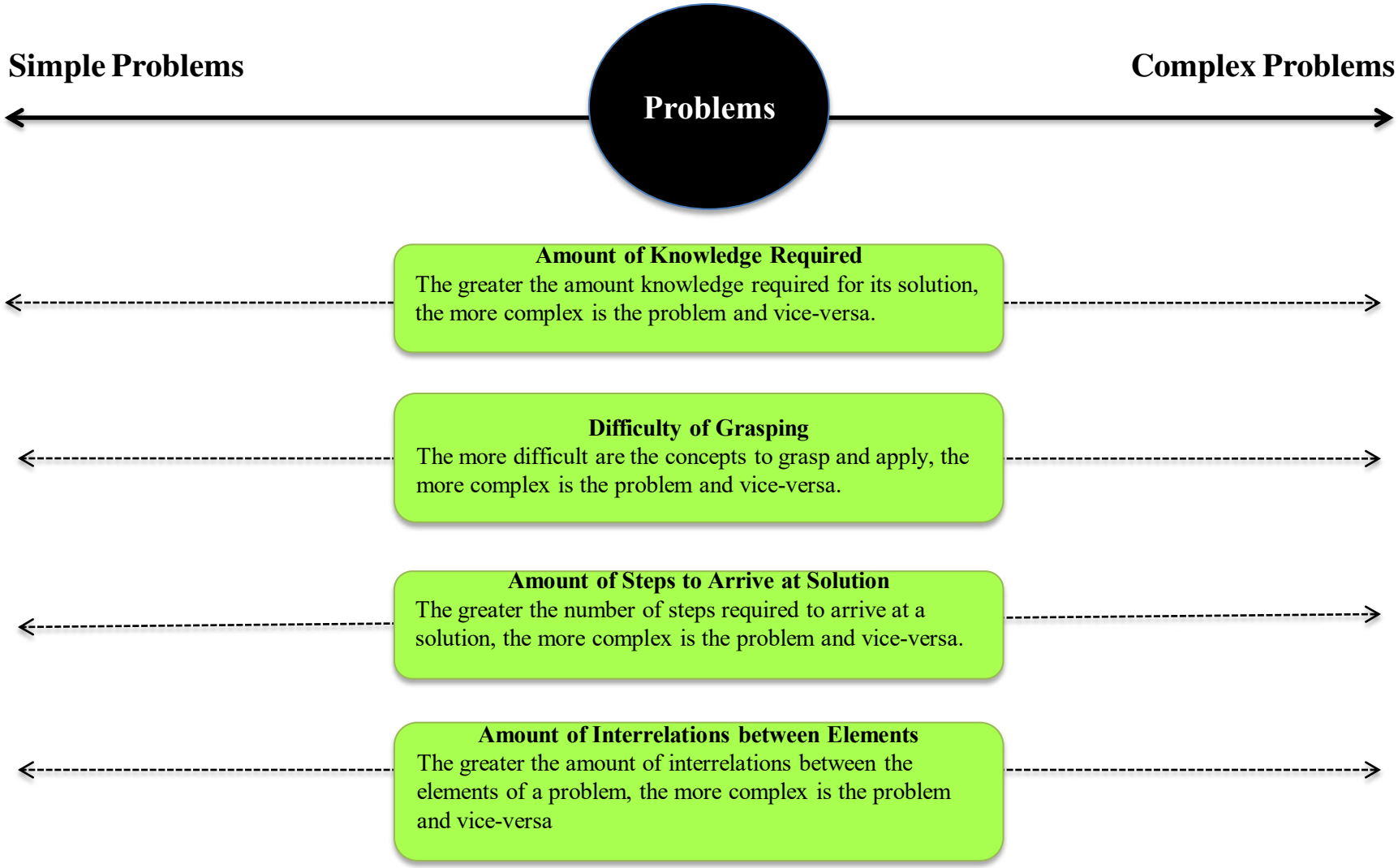
COMPLEXITY

Nature of Problems - COMPLEXITY

The COMPLEXITY of a problem is defined by the combination of 4 dimensions:



Nature of Problems
Problems can vary in COMPLEXITY



Nature of Problems

Problems can vary in COMPLEXITY

Simple ← Complexity → Complex

SIMPLE PROBLEM

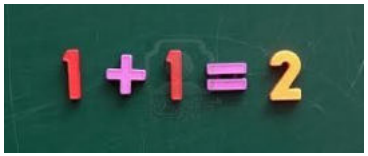
A problem is simple when its solution requires:

(a) little knowledge or skills,

(b) concept is simple to grasp,

(c) small number of steps,

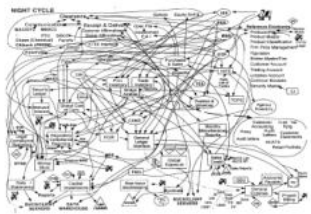
(d) little interrelations between elements.



Nature of Problems
Problems can vary in COMPLEXITY

Simple ← **Complexity** → **Complex**

$$D = \frac{1}{\frac{1}{4\pi}\int_0^{2\pi}\int_0^{\pi}|F(\theta,\phi)|^2 \sin\theta d\theta d\phi}$$



COMPLEX PROBLEM

A problem is COMPLEX when its solution requires:

(a) a wide amount of general and specific knowledge or skills (i.e., breath of knowledge),

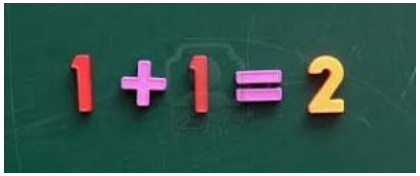
(b) concepts are difficult to grasp and apply (i.e., attainment level of domain knowledge),

(c) a large number of steps, many of them complicated (i.e., intricacy of solution),

(d) large number of interrelations to be understood and processed (i.e., interrelatedned)

Nature of Problems

Problems can vary in the amount of knowledge or skills they require for solution



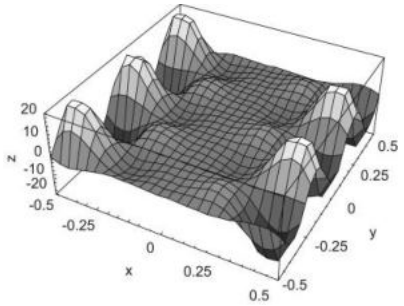
Little

Amount of Knowledgee

Lots

Nature of Problems

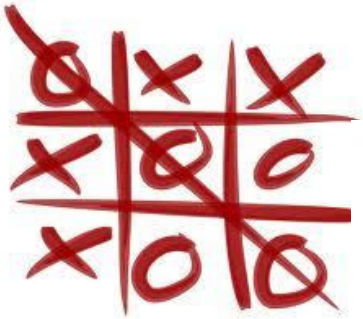
Problems can vary in the level of difficulty presented by their knowledge area – easy or difficult to grasp



Easy to grasp

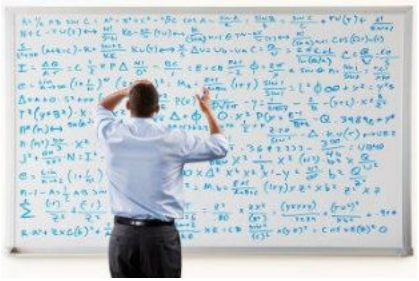
Difficulty of grasping

Difficult to grasp

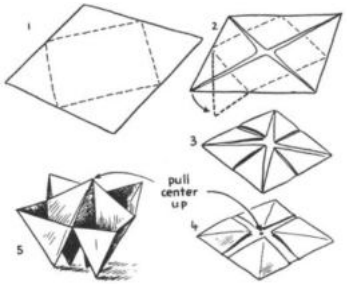


Nature of Problems

Problems can vary in the amount of steps required for their solution - level of intricacy



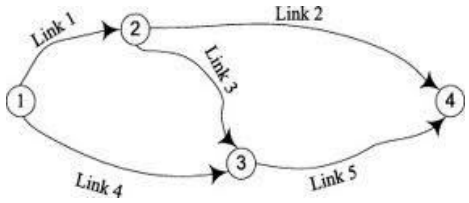
Few Steps ← **Amount of Steps** → **Multiple Steps**

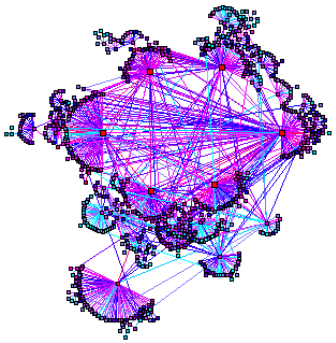


"Damn, Toto! We're back in Kansas!"

Nature of Problems

Problems can vary in the amount of interrelations between their components (variables) - level of interrelatedness

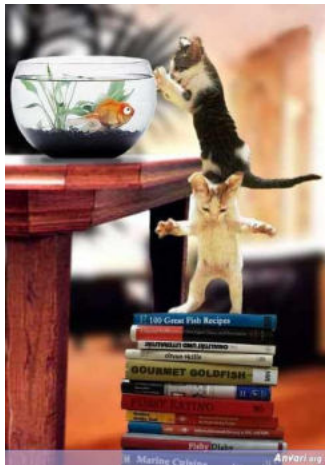


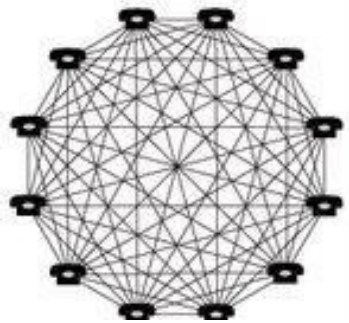


Few Relations

Amount of Interrelations

Multiple Interrelations





Complex Problem - Wisdom

No matter how complicated a problem is, it usually can be reduced to a simple, comprehensible form which is often the best solution.
An Wang (BrainyQuotes)

My mind rebels at stagnation. Give me problems, give me work, give me the most abstruse cryptogram, or the most intricate analysis, and I am in my own proper atmosphere. But I abhor the dull routine of existence. I crave for mental exaltation.
Sir Arthur Conan Doyle

If you break your neck, if you have nothing to eat, if your house is on fire, then you got a problem. Everything else is inconvenience.
Robert Fulghum

The future will present insurmountable problems - only when we consider them insurmountable.
Thomas S. Monson,

For every complex problem, there is a solution that is simple, neat, and wrong.
Henry Louis Mencken

We are continually faced by great opportunities brilliantly disguised as insoluable problems.
Lee Iacocca

Nature of Problems – Complexity

- Poetry

World Problems – Circumspection

When I look in the world There are some things that trouble me whether it be steroids, Facebook, or Twitter President Obama or the many wars. The world is in disarray from China, to England, and even the U.S. Everyone is trying to relieve the stress Every day is a struggle to get out of the problems

Nick Thomas

Nature of Problems

Instrument to Assess the COMPLEXITY of a Problem

Degree of Problem Simplicity / Complexity

Little knowledge — **Breath of Knowledge** — Lots of knowledge

1	2	3	4	5	6	7	8	9	10	

Simple to grasp — **Difficulty (Attainment) of Knowledge** — Very difficult to grasp

1	2	3	4	5	6	7	8	9	10	

Small number of steps — **Intricacy** — Lots of complicated steps

1	2	3	4	5	6	7	8	9	10	

Few interrelations — **Interrelatedness** — Lots of interrelations

1	2	3	4	5	6	7	8	9	10	

Total:

Simple — **Problem Complexity = Total / 4** — **Highly complex**

1	2	3	4	5	6	7	8	9	10

Brief Questionnaire

How do you rate the usefulness of the following elements for your learning?					
	Very Low	Low	Moderate	High	Very High
Definition					
Wisdom					
Fun					
Poetry					
Assessment Instrument					

What other elements would you like to see in the micro-module?

Acknowledgements

Developed by
Alfonso Molina

Sources
Various works by David Jonassen
Various Quotation Websites
Various Poetry Websites
Various websites with images relating to the concept of Problem