

# CONCEPTUAL MAPPING & CRITICAL THINKING

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## Abstract

Conceptual maps are graphical tools for organizing and representing knowledge. They include concepts, usually enclosed in circles or boxes of some kind, and relationships between concepts indicated by a connecting line linking two concepts. Participants will learn how this tool can be used with the topic of critical thinking and incorporated into their specific area of instruction.

The presentation will include instructions on how to use Cmap Tools, a powerful software from the Institute for Human and Machine Cognition which is available on line and free to educators.

I will use examples on how I use conceptual maps in my Probability and Statistics classes, but the principle of conceptual mapping can apply to any Mathematical content.

Participants will learn to develop conceptual maps, will reflect on how conceptual maps can help them teach curriculum contents and help their students develop a higher conceptual understanding of the material taught as well as improve their critical thinking skills in general. Participants will learn some ways to incorporate conceptual mapping in their classroom activities, homework assignments or project activities.

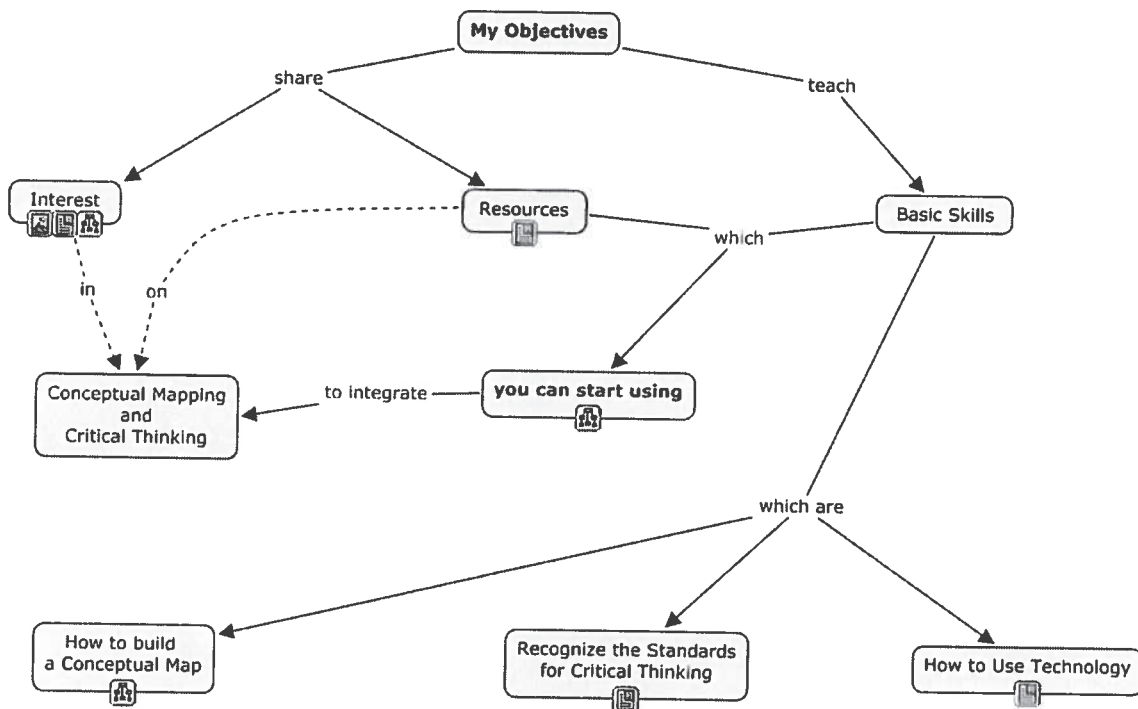
## Steps to follow in order to download Cmap Tools and install the program:

- 1) Go to the site of the Institute for Human and Machine Cognition (IHMC):  
<http://cmap.ihmc.us/conceptmap.html>
- 2) At the bottom of the map click on the link "Downloaded" and register with IHMC.
- 3) Choose a platform at the bottom of the page and download Cmaps Tools.
- 4) Register your software version and follow the instructions.

Steps to follow in order to access the material viewed during the presentation:

- 1) Once the program installed, open Cmaps Tools and click on “Shared Cmaps in Places”
- 2) Expand the folder “IHMC Public Cmaps” and look for the folder “GTC Conceptual Mapping and Critical Thinking Workshop”
- 3) Open the map “Cmaps Workshop Objectives” or any other document.

I developed this presentation using Cmaps Tools. The interactive functions of the maps do not show on a hard copy or even an electronic document. One must install and use Cmaps Tools in order to understand fully the functionalities of this presentation. I will try to give a brief overview of some of the functions of the Cmaps Tools program as well as a brief description of the ideas discussed during the presentation.



My objectives are to share my interest in Conceptual Mapping and Critical Thinking, to share some resources on Conceptual Mapping and Critical Thinking, as well as to teach you some basic skills about conceptual mapping; skills which you can start using to integrate Conceptual Mapping and Critical Thinking in the classroom.

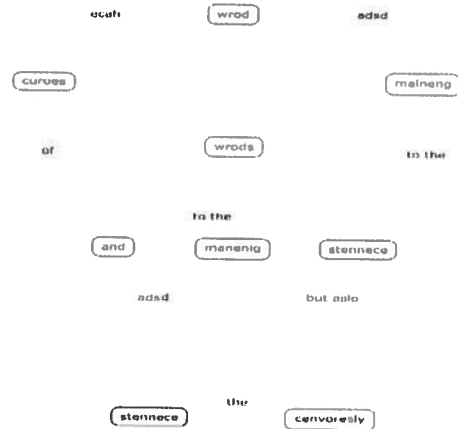
When you click on the icons under the Conceptual Object “Interest”, you can access different documents such as other maps, pictures, electronic documents and web links. Here I put some examples of conceptual maps, links to some interesting conceptual maps

available on line, and an activity using a map which I developed based on a research done at Cambridge University. The source of the research is not clear. Some have connected it to the works done by Richard Shillcock & Padraic Monaghan, University of Edinburgh, and the work done by Kouros Saberi at UC Irvine and David R. Perrott at Cal State Los Angeles.

Activity 1 Part 1: Can you read and understand the following paragraph? The penohnemal pewor of the biran: Adincorg to a rareseh dneo at Cimbragde Unevisitry, The odrer in wchih the lestter of a wrod are, has liltle imtanporce as Inog as the frist and lsat letetrs of the wrod are in tehir cerorct pisotoins. The roesan benign, taht the hamun biran deos not raed scenentes and wrods as a cotellicon of senentquial wrods or letetrs, but rhatr as a cotellicon of gablol cenpocets.

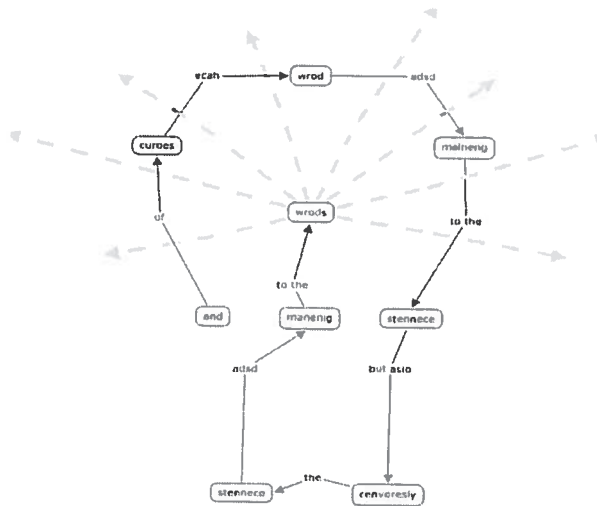
Activity 1 Part 2a: Can you read and understand the following?

Click on the picture in order to enlarge it so you can read the words and try to understand the meaning of this message.



Activity 1 Part 2b: Can you read and understand the following?

“And of course, each word adds meaning to the sentence, but also conversely the sentence adds meaning to the words” Each word is a conceptual object that that may encompass various meanings; it is the connections between the concepts that clarify the specific and contextual meaning of the once isolated concepts.



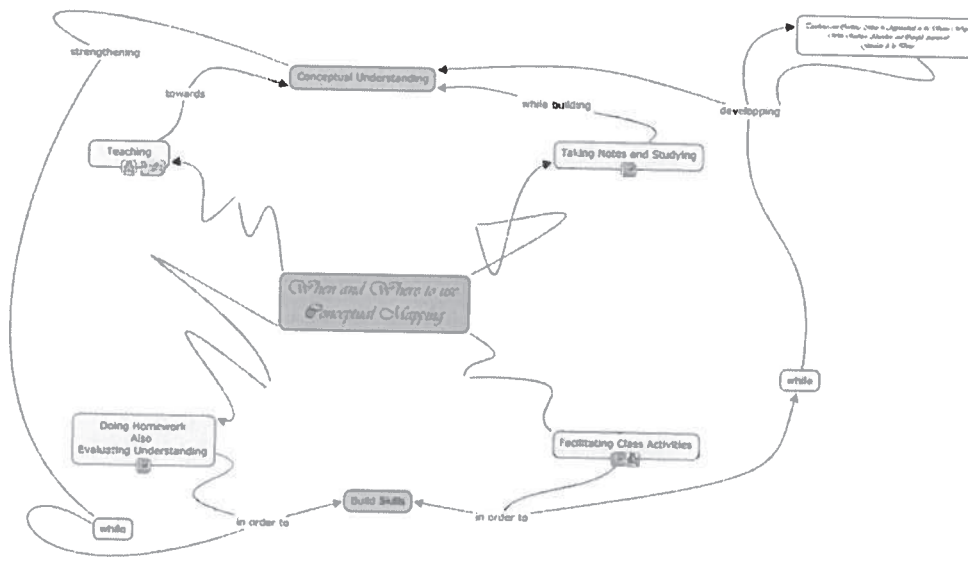
**In order to fully understand the parts, students need to learn the parts in constant awareness of the whole.**

**What does it mean for the teacher?**

We need to constantly require that students reflect on how what they are learning relates to the bigger pictures. We need to constantly require that students think critically about what they are learning/doing in relation to their mathematical world, their physical and spiritual world. We need to teach the part in constant awareness of the whole. We need to teach the whole subject not just some parts of it; we need to teach the whole being not just a college student. Students learn by doing when they connect to the activities by taking the time to reflect on the consequences of their actions and beliefs. Technology cannot replace the human brain, but when used meaningfully and appropriately, it can promote learning and growing. It is becoming a more and more powerful tool for teaching mathematics and should be integrated in the classroom to enhance explorations and students' reflection and not just as a tool for calculating expressions and values. Conceptual maps technology can be used to this effect.

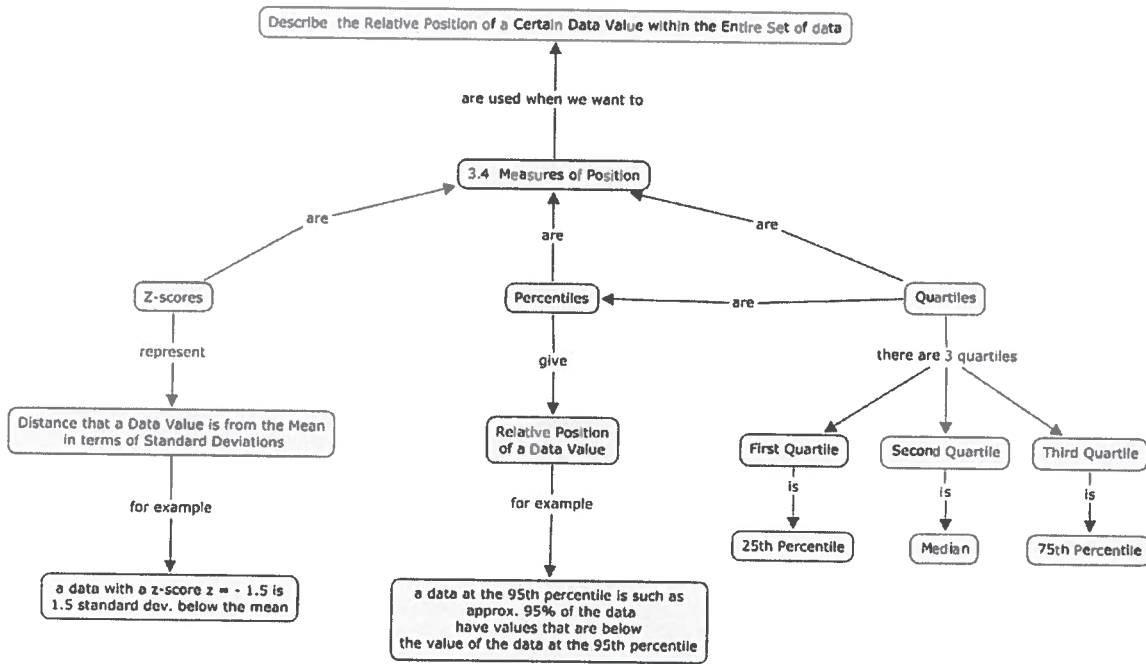
Teachers can use the Cmaps technology to enhance their class discussions, to prepare explorative activities as well as summarizing/reflective activities and evaluate students' understanding. Teachers can use conceptual maps to maintain a constant awareness of the bigger pictures (i.e. the mathematical or/and the physical world) while guiding the students through their discoveries and learning of the parts. Students can use conceptual maps as a framework for note taking, practice, and chapter reviews.

If you click on the icon under the conceptual object "you can start using", you will open another map which shows some of the ways I have used conceptual maps in my Statistics and Probability classes.



It is a cooking pot: Teaching and cooking must be approached in the same ways, with reckless abandon and careful attention...

An example of a map I used for classroom discussion: Students may be asked to just read and discuss part of the map or the whole map; some parts of the map (conceptual objects or links between concepts) may be left blank for the students to complete.



An example of a map constructed by students as a homework assignment using the map capabilities of words: This map shows some good understanding through interesting creative effects.

