

Mobile Knowledge Tool-kit to Create a Paradigm Shift in Higher Education

Nader Nada, Mohamed Kholief, Shehab Tawfik and Noha Metwally
AAST, College of Computing and IT, Alexandria, Egypt

Dr.Nader@aat.edu

Kholief@aat.edu

Shehab_eldin@yahoo.com

Noha_Metwally@hotmail.com

Abstract: One of the main objective of educators is to identifying inspiring and interactive approach to learning, and to encourage students to be more receptive and co-operative in the classroom. To help educators in achieving these goals we employed constructivist epistemology and constructivist cognitive psychology, together with the use of Mind Maps and Mobile Knowledge (M-K) Toolkit. The toolkit can serve as the foundation for a new kind of integration of Internet resources and all classroom, laboratory, field experiences, and when used with "expert skeletal" Mind Maps to scaffold learning. It is our thesis that good theory-based use of the appropriate technology can increase the benefits of using Mind Maps in education and lead to dramatically improved education. In this paper we first explored the Mind Maps Concept, then we presented and explained the advantages of M-K toolkit and how this can support mind mapping and integration of a whole array of learning experiences. In the last section we presented two case studies to provide the evidence of how the M-K toolkit and Mind Maps can lead to education paradigm shift and enhance the outcome of the learning experience in higher education.

Keywords: mind map, higher education, mobile knowledge, m-k toolkit

1. Introduction

Visual learning is a proven teaching method in which diagrams such as concept maps, mind maps, tree diagrams, organization charts and spider diagrams are used to help students of all ages think and learn more effectively. They are all used for storing, processing, organizing and presenting information graphically. These techniques are used across the curriculum and at all Key Stages in the UK. The most popular is Mind Mapping.

The use of visual learning techniques, such as mind mapping, is achieving growing recognition in education. Whether we believe that the mind is organized into left and right-hand sides, or whether it is a less organized structure of various skills, mapping utilizes a greater part of the brain, resulting in more effective thinking. Imagination and association are the keys to high-level memory and creative thinking and mapping supports this. With many students being visual or kinaesthetic learners, this approach makes the teaching more enjoyable and effective and the learning more successful and fun. It is an educational win-win that multiplies its benefits over time and with use.

Concept maps and mind maps are quick to review and it is easy to refresh information in the mind just by glancing at one. Remembering the shape and structure of a visual diagram can provide cues necessary to remember the information within it. They engage much more of the brain in the process of assimilation and connecting facts than conventional notes or summaries.

Mind maps have been used in all facets of education, training and business. With the fundamental goal of fostering learning they have been shown to be an effective tool for displaying students' prior knowledge, summarizing what has been learned, note taking, aiding study, planning, scaffolding for understanding, consolidating educational experiences, improving affective conditions for learning, teaching critical thinking, supporting cooperation and collaboration, and organizing unstructured knowledge content. There is today almost a universal agreement that every learner must construct her/his own knowledge structure, or cognitive structure, through her/his own efforts. The commitment to building a powerful knowledge structure must be the learner's commitment. There is less universal recognition that knowledge structures are built primarily through meaningful learning, and by contrast, rote learning or simply memorizing information contributes little to building a person's knowledge structure. (Novak 1993)

Vygotsky's studies showed that there was a level of cognitive development that allowed a learner to advance in understanding of a given domain of knowledge without coaching and a higher level of understanding beyond which the learner cannot advance without coaching. He called this range of understanding the zone of proximal development. (Vygotsky 1978)

Mind maps have many applications in educational, and business situations, including notetaking, brainstorming (wherein ideas are inserted into the map radially around the center node, without the implicit prioritization that comes from hierarchy or sequential arrangements, and wherein grouping and organizing is reserved for later stages), summarizing, revising, and general clarifying of thoughts. One could listen to a lecture, for example, and take down notes using mind maps for the most important points or keywords. One can also use mind maps as a mnemonic technique or to sort out a complicated idea. Mind maps are also promoted as a way to collaborate in color pen creativity sessions. (Farrand 2002)

Software and learning technique research have concluded that students find the techniques of Mind Mapping to be useful, being better able to retain information and ideas than by using traditional 'linear' note taking methods. (Pressley 1998)

2. The mind map concept

A mind map is a diagram used to represent words, ideas, tasks, or other items linked to and arranged radially around a central key word or idea. It is used to generate, visualize, structure, and classify ideas, and as an aid in study, organization, problem solving, decision making, and writing. It is an image-centered diagram that represents semantic or other connections between portions of information. By presenting these connections in a radial, non-linear graphical manner, it encourages a brainstorming approach to any given organizational task, eliminating the hurdle of initially establishing an intrinsically appropriate or relevant conceptual framework to work within. (Buzan 1991)

Mind maps (or similar concepts) have been used for centuries for learning, brainstorming, memory, visual thinking, and problem solving by educators, engineers, psychologists, and people in general. Some of the earliest examples of mind maps were developed by Porphyry of Tyros, a noted thinker of the 3rd century, as he graphically visualized the concept categories of Aristotle. Ramon Llull also used these structures of the mind map form. (Buzan 2000)

The semantic network was developed as a theory to understand human learning and developed into mind maps by Dr. Allan Collins and M. Ross Quillian during the early 1960s. Due to his commitment and published research, and his work with learning, creativity, and graphical thinking, Dr. Allan Collins can be considered the father of the modern mind map.

The mind map continues to be used in various forms, and for various applications including learning and education (where it is often taught as 'Webs', 'Mind webs', or 'Webbing'), planning, and in engineering diagramming. (Nast 2006) When compared with the earlier original concept map (which was developed by learning experts in the 1960s) the structure of a mind map is a similar, but simplified, radial by having one central key word. A mind map is similar to a semantic network or cognitive map but there are no formal restrictions on the kinds of links used. (Buzan 2000)

The elements are arranged intuitively according to the importance of the concepts and they are organized into groupings, branches, or areas. The uniform graphic formulation of the semantic structure of information on the method of gathering knowledge, may aid recall of existing memories. Mind Map reinforces teaching strategies that encourage learning through multiple intelligences. The use of strong imagery, keywords and topic interlinking supports visual, linguistic, logical and auditory learning and the activity involved in producing Mind Maps strengthens kinaesthetic learning.

The nature of Mind Mapping is skill based rather than content driven which encourages the development of cross-curricular skills such as creativity and problem solving in addition to subject specific knowledge. In this manner, learning becomes more dynamic and enriching when Mind Map is used to supplement traditional classroom delivery methods. (Williams 2000)

3. The M-K toolkit

As mobile technology has become very common, it is no surprise that personal computing has become a vital learning tool by this time. Educational institutes have commenced a trend of

integrating PDAs into their teaching practices (mobile learning). With the capabilities of PDAs, teachers are now able to provide a collaborative learning experience for their students. They are also preparing their students for possible practical uses of mobile computing upon their graduation. PDAs and handheld devices have recently allowed for digital note taking. This has increased student's productivity by allowing individuals to quickly spell-check, modify, and amend their class notes or e-notes.

Educators are currently able to distribute course material through the use of the internet connectivity or infrared/Bluetooth file sharing functions of the PDA. With concerns to class material, textbook publishers have begun to release e-books, or electronic textbooks, which can be uploaded directly to a PDA. This then lessens the effort of carrying multiple textbooks at one time.

Several mobile Mind Maps packages have been developed specially for PDA devices, but the lack of Buzan's concept has been noticed. Our proposed system suggests a free hand tool using the stylus not based on menus or tree architecture.

The toolkit study technique improves ability to learn and help students clarify thought processes. Utilizing the mind's ability to understand and remember visual information is a key element in the mind mapping technique.

By actively inspiring students through a brain-friendly, interactive approach to learning, Mind Map encourages them to be more receptive and co-operative in the classroom. It can also make lessons more spontaneous, creative and enjoyable, both for the educator and the students.

Note taking is generally the initial step in a study process and, k-m toolkit provides a graphical user interface that combines flexibility with structure. Students add new information elements to a map as, knowledge of a chosen subject increases.

Making presentations and working in groups is an expected part of group or team studies. Being able to logically and easily present and distribute insights to others increases a student's overall study efficiency. The K-M toolkit helps students to:

- Improve note taking
- Structure thinking processes
- Aggregate and process information
- Logically present findings and summaries to others
- Knowledge sharing
- Collaboration

The M-K toolkit has been designed with the objective of supporting collaboration and sharing. The client-server architecture, together with a server where any Internet user can create a folder and construct, copy or publish their Mind Maps, facilitates the sharing of Mind Maps and collaboration during Mind Map construction (Cañas 2003). Additionally, a Mind Map Server can easily be installed in a classroom or school to facilitate collaboration locally.

Collaboration is supported at several levels. If two or more users attempt to edit the same Mind Map at the same time, the program will –with the consent of the users–establish a *synchronous* collaboration session where the users can concurrently modify the map and communicate via a chat window. Peer review and collaboration are facilitated through annotations (post-it notes) that can be added to map after selecting the portion of the map to be annotated, and through discussion threads.

The M-K toolkit supports the construction of "knowledge models": sets of Mind Maps and associated resources about a particular topic (Cañas 2003). Through simple drag-and-drop operations students can link all types of media (images, videos, text, web pages, documents, presentations, etc.) and Mind Maps, whether theirs or constructed by others, to their Maps. These resources can be located anywhere on the Internet. Novak and Gowin (Novak 1984) have depicted the act of mapping as a creative activity, in which the learner must exert effort to clarify meanings, by identifying important concepts, relationships, and structure within a specified domain of knowledge. Knowledge creation

requires a high level of *meaningful learning*, and Mind Maps facilitate the process of knowledge creation for individuals and for scholars in a discipline (Novak, 1993).

4. Case studies

Case Study 1: The curriculum of the Faculty of Medicine, University of Colombo, Sri Lanka emphasizes the need for self-directed learning and deep learning. The objective was to evaluate the effectiveness of using mind maps as a self-learning method for the new entrants to the Faculty. Seventy-four new entry medical students were randomly selected and assigned to two equal groups based on their high school performance. (Mind map vs. self-selected study technique). A text on iron deficiency anaemia was selected as self-study material. The mind map group was given a 30-minute lesson in the technique. Both groups were exposed to the study text for a 45-minute period and were requested to answer four structured essay questions based on the study text. The average mark of the entire group was 34.4%. Majority (97.1%, N=34) from the mind map group felt that it is useful to summarize information and 87.9% want to study further about mind mapping.

Case Study 2: Mind Map can assess patient and staff understanding of key concepts. This evaluation method was implemented with a group of eight nursing students in a home healthcare agency. Adapting environmental assessment criteria identified by Narayan and Tennant (Narayan 1997), students gathered data for a mapping assignment. Mapping techniques were individualized to match client needs, Students presented their completed maps to their peers, using the map to illustrate and discuss their assessment data, the relations among the data, and its effect on the health and wellbeing of the client.

In Figure 1, the central image is the integument, with axons (branches) representing concepts to be addressed when teaching staff/caregivers essential information needed to maintain healthy skin. Arrows are used to show a relation among concepts, and in this case the arrows are drawn to connect circulation and repositioning, and repositioning and shearing of skin, designating a connection, association, or relation among these critical concepts in healthy skin.

Figure 2 illustrates a Mind Map designed to teach community concepts to orientees or student learning about home and community concepts. When describing the community, the educator uses arrows to identify relations among health and educational status, economics, age, and safety. Symbols are used in Figure 2 to cue the staff educator to emphasize critical content.

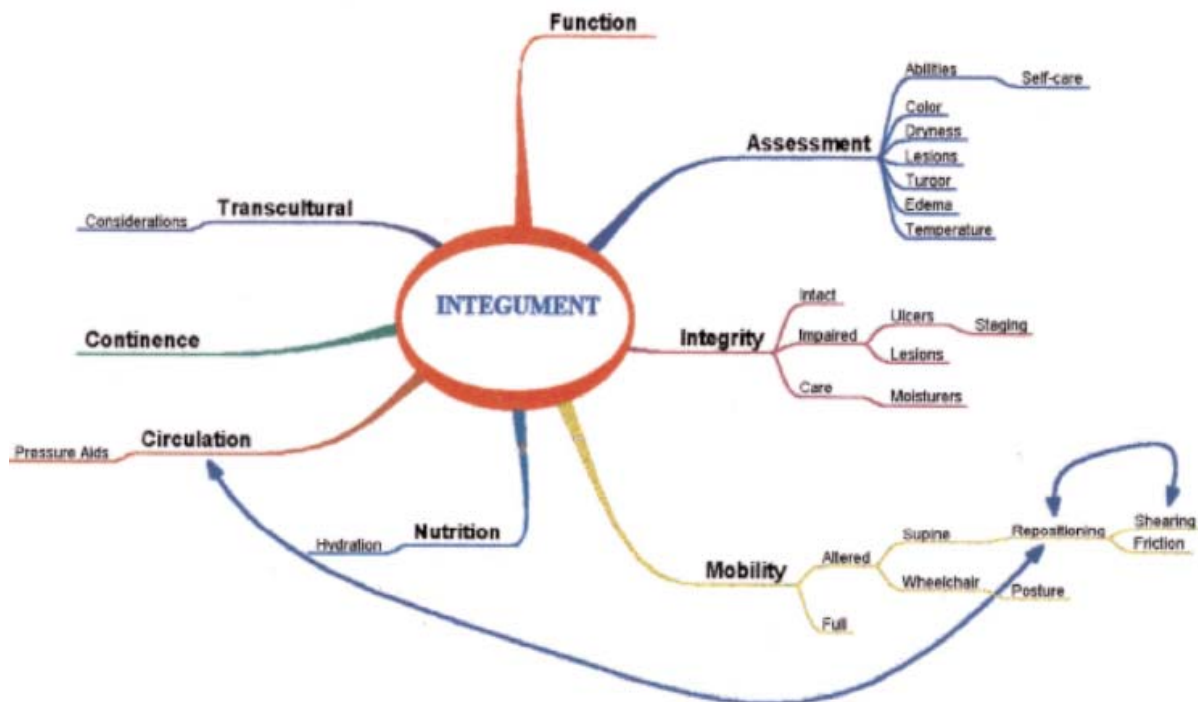


Figure 1: Mapping of teaching content of the body's integument including the relation between circulation and repositioning and repositioning and shearing of the skin

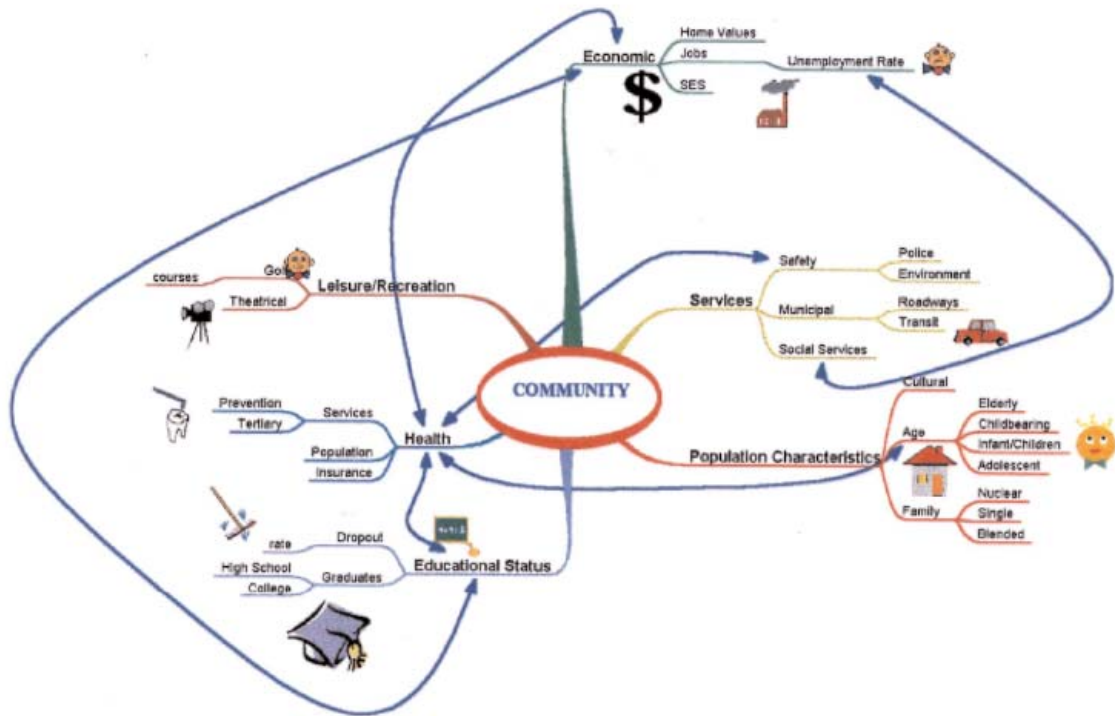


Figure 2: Health in the community is shown as having a relation among age, safety, educational status, and economics

Figure 4 shows an example of a mapping used to teach home care clients their medication interactions. This map depicts a medication information handout that shows drug interactions. This educational handout can be reviewed with the client and left in the home for future reference.

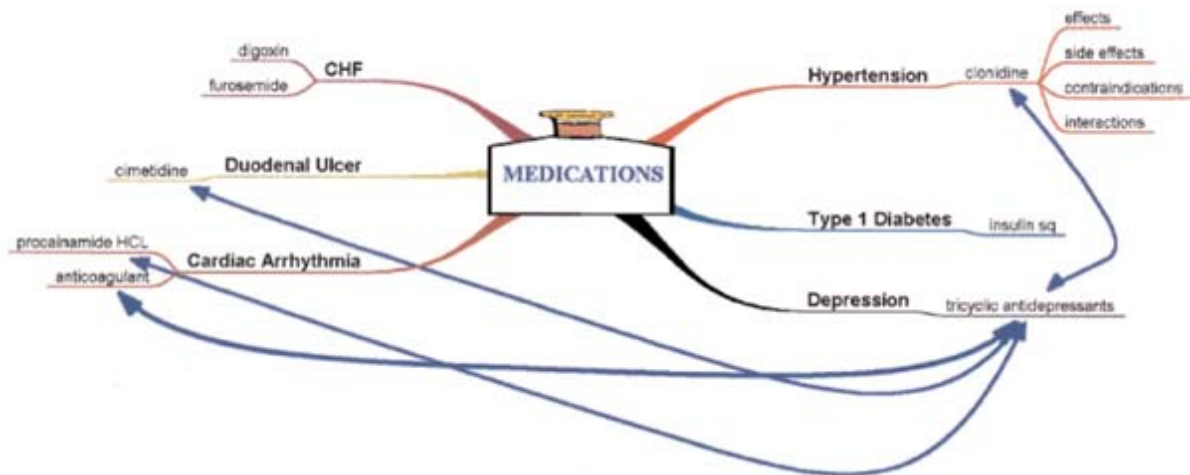


Figure 4: Tricyclic antidepressants interact with cardiac and duodenal ulcer medications

5. Conclusion

By combining the visual learning technique of Mind Mapping with the portability and power of PDAs, the authors believe the strategy will be particularly attractive and useful to students who are motivated by new learning formats based on technology.

We presented initial results of the M-K toolkit development efforts aimed at creating instructional activities focused on Mind Maps that enhance the development of higher order thinking skills, analyzing, evaluating, elaborating, knowledge sharing and collaboration. Mind Mapping is a strategy that should be embraced by educators and students as new teaching and learning tools to support the

educational institutions in reaching their ultimate goals of having effective and efficient educational system.

The M-K toolkit study technique improves ability to learn and help students clarify thought processes.

Utilizing the mind's ability to understand and remember visual information and portability are a key element in the mind mapping M-K toolkit technique.

By actively inspiring students through a brain-friendly, interactive approach to learning, the M-K toolkit encourages them to be more receptive and co-operative in the classroom. It can also make lessons more spontaneous, creative and enjoyable, both for the educator and the students.

References

- Buzan, T. (1991). *The Mind Map Book*. New York: Penguin. Chapter "Mind Mapping Guidelines"
- Buzan, Tony. (2000). *The Mind Map Book*, Penguin Books, 1996.
- Cañas, A. J., Hill, G., Granados, A., Pérez, C., & Pérez, J. D. (2003a). *The network architecture of CmapTools* (Technical Report No. IHMC CmapTools 2003-01). Pensacola, FL: Institute for Human and Machine Cognition.
- Farrand, P.; Hussain, F.; Hennessy, E. (2002). "The efficacy of the mind map study technique".
- Nast, J. (2006). *Idea Mapping: how to access your hidden brain power, learn faster, remember more, and achieve success in business*. New Jersey: John Wiley & Sons.
- Novak, J. D. (1993), "How do we learn our lesson?: Taking students through the process". *The Science Teacher*, 60(3), 50-55.
- Novak, J. D. Alberto J. Canas (2004), "Building on New Constructivist Ideas and CmapTools to Create a New Model for Education", Institute for human and machine cognition..
- Michellini, C., *Mind Maps: A new Way to Teach patients and Staff, Home Healthcare Nurse*. vol. 18 • no. 5, May, PP. 318-322
- Pressley, M., VanEtten, S., Yokoi, L., Freebern, G., & VanMeter, P. (1998). "The metacognition of college studentship: A grounded theory approach". In: D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in Theory and Practice* (pp. 347-367). Mahwah NJ: Erlb.
- Vygotsky, L., & Cole, M. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.
- Williams (2000) *Encyclopedia of Pseudoscience*. Facts on file.