Thought and knowledge (Halpern, 2014): abstracts

Below are the book abstract and individual chapter abstracts of Halpern's 'Thought and knowledge'. They were produced for https://csl4d.wordpress.com/ as part of an inquiry of the linkages between critical thinking and Churchman's dialectical systems approach. The abstracts served as a basis for the construction of a concept map which was discussed at https://csl4d.wordpress.com/ and which is also available at the end of this document.

Halpern, D. F. (2014). *Thought and knowledge: an introduction to critical thinking* (5th ed.). New York, NY: Psychology Press. http://www.worldcat.org/oclc/881202893

Book abstract   The 5th Edition of Thought and Knowledge: An Introduction to Critical Thinking applies theory and research from the learning sciences, including cognitive science, to teach students the critical thinking skills they need to succeed in today's world. Critical thinking is the use of purposeful, reasoned and open-ended cognitive skills and strategies to increase the probability of a desirable outcome when solving problems, formulating inferences, calculating likelihoods, and making decisions. The role of memory is elucidated and a broad range of fallacies, biases, and techniques of propaganda is described. Other key topics include deductive reasoning, argument analysis, hypothesis testing, statistics, decision-making, problem-solving skills, and the need for creativity. It is emphasized that most of the problems encountered in life are ill-defined. Twelve different strategies for generating and evaluating solutions are presented, including means–ends analysis, working backwards, random search, rules, hints, split-half method, brainstorming, contradiction, and analogies and metaphors. All of the strategies to enhance creativity involve searching an individual's knowledge net so that remote ideas can be associated, analogies can be applied across domains of knowledge, and information that is stored in memory can become available.

Thinking   Rapid change and information overload has made critical thinking (CT) a key intellectual skill for the 21st century. CT is the use of purposeful, reasoned and open-ended cognitive skills and strategies to increase the probability of a desirable outcome when solving problems, formulating inferences, calculating likelihoods, and making decisions. It involves constructing a situation with an unlimited number of solutions and supporting the reasoning that went into a conclusion. It uses evidence and reasons and strives to overcome individual biases. Which outcomes are desirable depends on individual values. Instruction can teach CT skills, which transfer to real-world settings by practice in multiple contexts. Attitude + Knowledge + Thinking Skills = CT (Russell). The attitude of a critical thinker must be cultivated. It includes the willingness to plan, flexibility, persistence, the willingness to acknowledge one's errors in the face of evidence, being mindful, and consensus-seeking. Self-monitoring one's own thought processes is one way to improve thinking. Thinking can be considered to have two components: fast, intuitive System 1 and slower, more deliberate System 2 or CT. Intuitive thinking works best after repeated experience with trustworthy feedback. Rationality is bounded so people are satisficers, meaning that in the real world they make "good enough" decisions (Simon). Emotional aspects of thinking cannot be ignored. Multiple environmental cues affect our judgment. *(Ch. 1 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Memory   All thought depends upon the use of memory. Long-term memories are stored in associative networks to help remember related concepts. Memory is often inaccurate, even when people are confident. We often miss unusual events that occur "right before our eyes", while the "illusion of truth" can make us believe untruths. What and how we learn and remember depends on the type of information to be remembered, what we already know, the retention interval, and noncognitive factors like health and motivation. Working memory is the "place" in which we consciously think. It has a seriously limited capacity that we can control by deciding which information to attend to and how much effort a particular task is worth. When learning is difficult, we need to reduce the load on working memory by writing information on paper, making it more automatic, or attending to the information to-be-learned. Good learners will know when to use effortful learning and various learning strategies. Memory can be improved with appropriate retrieval cues and good organization. Mnemonics improve recall because they utilize the basic memory principles of attention, organization, meaningfulness, and chunking. Our memories are biased in predictable ways. Examine your own recall for the possible influence of biases related to stereotypes, general knowledge, positive

reflections on oneself, or for information characteristics such as being well known, familiar, prominent, recent, vivid, or dramatic. *(Ch. 2 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Thought and language   Psychologists (and psycholinguists) view language as a meaning component underlying a speech sound component. Comprehension is a movement from sender thought to receiver reconstruction through language and inferences. Language can be ambiguous. Language and thought exert mutual influences on each other. We use six rules of communication to determine what information we will convey and how to express the information. Our inferences can be misled depending on context, manner, and the words selected to convey the message. Our understanding can be biased by emotional words, euphemisms, prototypes (or stereotypes), labeling, name calling, ambiguity, vagueness, misuse of definitions, reification, and bureaucratese. A value that is easily available in memory can unconsciously serve as an anchor or starting point that we use to estimate quantities or cost. Strategies to improve the comprehension of text are described. They all require learners to attend to the structure of the information and to make the relationships between concepts explicit. A large number of skills to understand language influences were presented, including: (1) thinking about the reason for a communication; (2) understanding the use of framing with leading questions and negation; (3) using analogies appropriately; (4) deliberately giving a variety of examples when thinking about members of a category so that you are not thinking about category members in terms of a prototype. *(Ch. 3 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Reasoning   Deductive reasoning uses premises or statements that we accept as true to derive valid conclusions. People tend to alter the premises according to one's own beliefs. In linear orderings, we use premises to establish conclusions about ordered relationships. It is common to confuse truth with validity. Validity refers to the form of an argument and is unrelated to content. Personal beliefs often bias our ability to determine validity. In "if, then" statements a conditional relationship is established. Although formally incorrect, "If" may sometimes be interpreted as "if and only if" depending on the context. Confirmation bias is the tendency to seek and utilize information that supports or confirms the hypothesis or premise that is being considered. Quantitative syllogisms indicate which terms belong in the categories that are specified. Statements in syllogisms can take one of four different moods: universal affirmative, particular affirmative, universal negative, and particular negative. People often use their knowledge of the categories and their beliefs about the topics to determine which conclusions are valid instead of reasoning from the form of the syllogism. Circle diagrams are useful aids when dealing with syllogisms. *(Ch. 4 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Argument analysis   An argument serves to convince someone that a particular conclusion is true based on the reasons presented. All arguments must have at least one conclusion and one premise (reason). Sound arguments need acceptable premises, that are relevant and sufficiently strong. . A critical part of the analysis of arguments is the consideration of missing parts (e.g., assumptions, counterarguments, qualifiers, premises, and rival conclusions) and misleading statements. The measure of favourable support of each premise must be weighed along with the negative effects of counterarguments. People like to believe that their beliefs and actions are "reasoned"; however, most people are not sensitive to poor or weak reasoning. Unfortunately, there is a general preference for explanations that "make sense" over conclusions that are justified by available data. Critical thinkers need to understand the importance of data and value data-based conclusions. Similarly, there is a widespread bias to assign greater importance to reasons that support a conclusion that we favour (my-side bias). Twenty-one common techniques of propaganda are presented, including association effects, arguments against the person, appeals to pity, popularity and testimonials, false dichotomy, appeals to pride, suppressed information, circular reasoning, irrelevant reasons, slippery slope, straw person, and part-whole fallacies. The distinction between the terms "opinion," "reasoned judgment," and "fact" is explained. *(Ch. 5 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Hypothesis testing   In everyday thinking as in science we formulate beliefs about the world and collect observations to decide if our beliefs are correct. In the inductive method, we devise hypotheses from our observations. In the deductive method, we collect observations that confirm or disconfirm our hypotheses. Most thinking involves an interplay of the two processes (hypothetico-deductive model). Operational definitions are precise statements that allow the identification and measurement of variables. When we formulate hypotheses, we want to know about the effect of the independent variable on dependent ones. Most people tend to generalize on the basis of small, insufficiently representative samples. Strong causal

claims require a 3-stage experimental design. In daily life, we often use retrospective techniques to determine cause-effect relationships. Unfortunately, our memories tend to be selective and malleable. Prospective techniques are better. A common error is to infer a causal relationship from correlated variables. It is possible that variable A caused variable B, or that variable B caused variable A, or that A and B influenced each other, or that a third variable caused them both. Illusory correlation is another common type of error. Sensitive, valid, and reliable measurements are needed to draw correct conclusions. Many of our judgments lack validity, yet people report great confidence in them (illusory validity). We also tend to act in ways to create self-fulfilling prophecies. *(Ch. 6 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Probability   Few things in life are known with certainty, so probability plays a crucial role. Probability is defined as the number of ways a particular outcome (what we call a success) can occur divided by the number of possible outcomes (when all outcomes are equally likely). It is also used to indicate degrees of belief in the likelihood of events. People are often inaccurate likelihood estimators. In general, people tend to be more confident about uncertain events than the objective probability values allow. Not only do we underestimate the role of chance, but we also invent our own explanations for random outcomes. The form of presentation of information affects our interpretation. Tree diagrams can be used to compute probabilities. One real-life problem with expected values is that people often misjudge the value of an outcome (e.g., how much they will enjoy or dislike something). Personal probability judgments are distorted systematically when people believe that they have some control over the events. Most people fail to consider the cumulative nature of the likelihood of risky events. People tend to overestimate dramatic events. Extrapolation occurs when a value is estimated by extending a trend from known values. Depending on what is being extrapolated and the quality of the data, our best bets for future outcomes can range from fairly accurate to wildly unbelievable. *(Ch. 7 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Decision making   …. begins with a clear definition of a decision and a set of alternative solutions from which to choose. One way to improve on it is to frame the decision in several ways. Training helps people, including professionals, make better decisions. It is a common failure not to seek disconfirming evidence (confirmation bias). "Group think" is also common: groups tend to be overconfident in collective decisions. People often rely on heuristics or "rules of thumb" to help them make decisions. They can save money and time. The availability heuristic or reliance on events that are readily recalled is a common decision-making heuristic. Unwarranted optimism, however, can lead to poor decisions because it prevents a realistic assessment of both good and bad consequences. Decisions can be biased due to entrapment or by emotional states. There are unconscious influences on how we decide and the best we can do is to be mindful of them. Risky decisions require special care. There is often a tendency to downplay the likelihood of a disastrous outcome. Important decisions can be optimized by listing and weighing alternatives and considerations in a table format. People are most often satisfied with the decisions that they make, possibly because cognitive dissonance works to maintain consistency between actions and beliefs. There is an important distinction between a good decision that is based on the information that is available when the decision is being made and its outcomes. *(Ch. 8 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Problem-solving skills   All problems can be conceptualized as a so-called "problem space" having a start state, a goal state, and paths between them. You have a problem when there is a gap or barrier on the paths. Situation awareness triggers the recognition of the need for a solution. The problem-solving process can be divided into four stages: preparation or familiarization, production, judgment or evaluation, and incubation. Incubation is not always necessary: people can sometimes solve difficult problems during a "time-out." Grit, which is persistence despite failures, fatigue, and boredom, is a critical trait of good problem-solvers. Problems can be classified along a continuum ranging from well-defined to ill-defined. Well-defined problems have explicit paths and goals, and often a single correct answer. Ill-defined problems are subject to multiple interpretations and judgments about the goal state. **Most of the problems encountered in life are ill-defined.** A plan will include the construction of an external form of representation and the generation and evaluation of possible solutions. Twelve different strategies for generating and evaluating solutions are presented, including means–ends analysis, working backwards, random search, rules, hints, split-half method, brainstorming, contradiction, and analogies and metaphors. Four common sources of difficulty are: functional fixedness, mental set, misleading and irrelevant information, and social constraints. *(Ch. 9 of Diane F. Halpern 2014 Thought and Knowledge 5th ed.)*

Creative thinking   An increasingly popular view in psychology is that creative individuals are not qualitatively different from the rest of us. We all have the ability to be creative. Virtually all creative acts will involve novel ways of defining a problem, selecting relevant information, and judging the quality of the solution. Creativity has also been described as a blend of sensitivity, synergy, and serendipity. Creativity is putting memorized information to new uses. Creativity involves "noticing" or making unusual connections in knowledge networks. Groups tend to be more creative than individuals, but only when the group process fosters creativity. To develop creative insight, you will need to work on predictable projects and develop expertise. There is no quick and easy route to insight. Creative people tend to be self-motivated, persistent, tolerant of ambiguity, self-confident, and willing to take risks. The environment should support intrinsic motivation. Extrinsic motivation works only when **creative self-determination** is not undermined. Strategies to foster creative thinking include: brainstorming, Crovitz's relational algorithm, de Bono's "Plus, Minus, Interesting" strategy, analogies and metaphors, and visual thinking. All of the strategies to enhance creativity involve searching an individual's knowledge net so that remote ideas can be associated, analogies can be applied across domains of knowledge, and information that is stored in memory can become available. *(Ch. 10 of Diane F. Halpern 2014 Thought and Knowledge 5*[th] *ed.)*

The Last Word   When deciding which skill to use, think about the thinking skills framework. The thinking skills framework is four questions: What is the goal? What is known? Which skills will get you to your goal? Have your reached your goal? *(Ch. 11 of Diane F. Halpern 2014 Thought and Knowledge 5*[th] *ed.)*

An abstract of the book is available at https://www.mendeley.com/community/csl4d/documents/
A description of below concept map of the global contents of the book can be found at
https://csl4d.wordpress.com/2018/11/08/thought-knowledge-and-the-systems-approach .