

The Acquisition Of Knowledge And Skills For Taskwork And Teamwork To Control Complex Technical Systems A Cognitive And Macroergonomics Perspective

A cognitive psychology which becomes increasingly specialized requires a special effort in order to avoid a fragmentation into several controversial issues that are independently discussed but also inherently related. Rather than asking additional differentiated questions which are then investigated by more specialized experimental methods and designs, this book promotes unified theories and a levels approach for their experimental evaluation. Within this cognitive science approach and on the basis of the most foundational assumptions of Kintsch's construction integration theory, a computational theory of knowledge acquisition is then developed and subsequently evaluated by psychological experiments. For forty years, computer simulation techniques and experimental psychology research have greatly matured the understanding of human knowledge and its acquisition in different learning environments. This volume critically assesses the advantages and limitations of these approaches and then develops an integrated research methodology. It goes on to provide significant progress concerning the following questions: * What are the most promising research methodologies for investigating human cognition? * How can the experimental psychology research on text comprehension, concept formation, and memory become more closely related to one another when the very specialized research paradigms and the highly specific scientific controversies promote their separation and independent discussion? * How can a general comprehension-based theory bridge the gap between simple experimental settings and the real-life situations that occur in education and work environments? This book demonstrates how experimental psychology can proceed more successfully by investigating those aspects that are shared among different areas of research like text comprehension, categorization, and learning by exploration. It also shows how unified theories can assist in applying experimental psychology and cognitive science results to areas such as intelligent tutoring systems, instructional design, and the development of expert systems in complex real world domains.

One of the most intriguing questions about the new computer technology that has appeared over the past few decades is whether we humans will ever be able to make computers learn. As is painfully obvious to even the most casual computer user, most current computers do not. Yet if we could devise learning techniques that enable computers to routinely improve their performance through experience, the impact would be enormous. The result would be an explosion of new computer applications that would suddenly become economically feasible (e. g. , personalized computer assistants that automatically tune themselves to the needs of individual users), and a dramatic improvement in the quality of current computer applications (e. g. , imagine an airline scheduling program that improves its scheduling method based on analyzing past delays). And while the potential economic impact of successful learning methods is sufficient reason to invest in research into machine learning, there is a second significant reason: studying machine learning helps us understand our own human learning abilities and disabilities, leading to the possibility of improved methods in education. While many open questions remain about the methods by which machines and humans might learn, significant progress has been made.

This important practitioner's guide is among the first to formulate a theoretical basis and derive a set of methods for consultants, knowledge engineers, and application programmers who must acquire human expert knowledge to create expert systems. By taking a cybernetic approach to the problems of knowledge acquisition, the authors use a single descriptive vocabulary to deal equally with recursive phenomena, knowledge acquisition, knowledge elicitation, expert system development, and the experts domain/knowledge base descriptions. Following a brief overview of the field, the authors focus on heuristic algorithms, the details of setting up a framework to define a given expertise, the practical interviewing process by which human experts pass on their knowledge to be modeled and coded for use in an expert system. The book concludes with a comprehensive case study selected for its broad application to all areas of knowledge acquisition. This book provides the first comprehensive literature review on the acquisition and retention of complex skills in High Reliability Organizations. Based on this review, it introduces a theoretical model of how skill and knowledge acquisition for complex tasks is accomplished and shows how this model can be used to derive training methods and instructional techniques. Successful acquisition and retention of complex technical skills within High Reliability Organizations requires a full understanding of the learning process, knowledge structure, and skill requirements associated with the effective operation and management of technology. For researchers and for organizations, the understanding of these processes is vital for designing training programs as well as for reducing errors with severe consequences for human lives and the environment. Until now, only theoretical fragments exist on this topic, and only a very limited number of publications actually address complex tasks in vocational/occupational settings. "The Acquisition of Knowledge and Skills for Task Work and Teamwork to Control Complex Technical Systems" uses its literature overview and theoretical model to formulate training principles, that can be used to develop training experiments for further empirical investigations as well as training methods for applied organizational contexts.

Currently, both fields are moving towards an integrated approach using machine learning techniques to automate knowledge acquisition from experts, and knowledge acquisition techniques to guide and assist the learning process.

The purpose of this study was to investigate the role of three different kinds of information--examples, generalizations, and explanations in acquiring knowledge in explanatory science domains. The first research issue was to examine the role of two types of primary input information (i.e., one specific and one general information) in acquiring inferential knowledge. The second research issue was to investigate the role of several types of explanatory information in acquiring both inferential and explanatory knowledge. To test these research issues, six acquisition conditions and four types of tests were developed in two science topics ("Seasonal Changes" and "Formation of Island Chains"). The acquisition conditions were created by varying the combination of three types of information. They were Examples, Generalizations, General Explanation, Instantiated Explanations, Explanations of Generalizations, and Student-Generated Explanations. The four types of tests were constructed to infer the forms of knowledge acquired in the six acquisition conditions. They were two inferential and two explanatory tests. The experiment required two sessions, on separate days, for each student. Students were randomly assigned to the experimental conditions simply by distributing sets of materials arranged beforehand. Ninety-three students in seven sixth-grade classes for whom complete data were available were included in the analysis. Results showed that the three types of information

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played almost equivalent roles in acquiring inferential knowledge. Although the role of explanatory information was initially considered very crucial in acquiring knowledge in knowledge-rich, explanatory domains, the students seemed to learn inferential knowledge not only from explanatory information but also from primary input information (Examples and Generalizations). With regard to the acquisition of explanatory knowledge, the superiority of explanatory information to specific information (Examples) was well demonstrated. However, adding elaborated explanations was not beneficial. Finally, student-generated explanations were more effective than the experimenter-provided explanations. Having students generate their own explanations seems to facilitate the deeper level of understanding the topics and inferring proper explanations for new situations.

In 1963 an initial attempt was made in my *The Psychology of Meaningful Verbal Learning* to present a cognitive theory of meaningful as opposed to rote verbal learning. It was based on the proposition that the acquisition and retention of knowledge (particularly of verbal knowledge as, for example, in school, or subject-matter learning) is the product of an active, integrative, interactional process between instructional material (subject matter) and relevant ideas in the learner's cognitive structure to which the new ideas are relatable in particular ways. This book is a full-scale revision of my 1963 monograph, *The Psychology of Meaningful Verbal Learning*, in the sense that it addresses the major aforementioned and hitherto unmet goals by providing for an expansion, clarification, differentiation, and sharper focusing of the principal psychological variables and processes involved in meaningful learning and retention, i.e., for their interrelationships and interactions leading to the generation of new meanings in the individual learner. The preparation of this new monograph was largely necessitated by the virtual collapse of the neobehavioristic theoretical orientation to learning during the previous forty years; and by the meteoric rise in the seventies and beyond of constructivist approaches to learning theory.

Media-didactics have recently become more firmly grounded on cognitive theory, with an increasing concern for the internal processes of knowledge representation and acquisition. With this cognitive aspect in mind, an international group of researchers held a meeting in Tübingen, Federal Republic of Germany, to present and discuss the theoretical approaches to and empirical investigations of knowledge acquisition from text and pictures. This volume contains the revised contributions resulting from that meeting.

This is the first book to provide a step-by-step guide to the methods and practical aspects of acquiring, modelling, storing and sharing knowledge. The reader is led through 47 steps from the inception of a project to its conclusion. Each is described in terms of reasons, required resources, activities, and solutions to common problems. In addition, each step has a checklist which tracks the key items that should be achieved.

The Acquisition of Strategic Knowledge Elsevier

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Epistemology is the study of how "knowledge" is formed. Standard epistemology isolates the "known" from the "knowers," thereby defining "knowledge" as objectively constant. Multiple epistemologies suggest that individuals learn in different ways shaped by life factors such as education, family, ethnicity, history, and regional beliefs. In this groundbreaking volume, editors Peter V. Paul and Donald F. Moores call on ten other noted scholars and researchers to join them in examining the many ways that deaf people see and acquire deaf knowledge. This collection considers three major groups of deaf knowledge perspectives: sociological and anthropological, historical/psychological and literary, and educational and philosophical. The first explores the adoption of a naturalized, critical epistemological stance in evaluating research; the epistemology of a positive deaf identity; how personal epistemologies can help form deaf education policies; and valuing deaf indigenous knowledge in research. The next part considers dueling epistemologies in educating deaf learners; reforms in deaf education; the role of deaf children of hearing parents in creating Deaf epistemologies; and the benefit of reading literature with deaf characters for all students. The final part explores the application of the Qualitative-Similarity Hypothesis to deaf students' acquisition of knowledge? a metaparadigm for literacy instruction in bilingual-bicultural education; collaborative knowledge-building to access academia; and examination of the benefits and disadvantages of being deaf.

This book constitutes the proceedings of the 17th International Workshop on Knowledge Management and Acquisition for Intelligent Systems, PKAW 2020, held in Yokohama, Japan, in January 2021. The 10 full papers and 5 short papers included in this volume were carefully reviewed and selected from 28 initial submissions. PKAW primarily focuses on the multidisciplinary approach of the human-driven and data-driven knowledge acquisition, which is the key concept that has remained unchanged since the workshop has been established.

Knowledge acquisition has become a major area of artificial intelligence and cognitive science research. The papers in this book show that the area of knowledge acquisition for knowledge-based systems is still a diverse field in which a large number of research topics are being addressed. However, several main themes run through the papers. First, the issues of integrating knowledge from different sources and K.A. tools is a salient topic in many papers. A second major topic in the papers is that of knowledge modelling.

Research in knowledge-based systems emphasises the use of generic models of reasoning and its underlying knowledge. An important trend in the area of knowledge modelling aims at the formalisation of knowledge models. Where the field of knowledge acquisition was without tools and techniques years ago, now there is a rapidly growing body of techniques and tools. Apart from the integrated workbenches already mentioned above, several papers in this book present new tools. Although knowledge acquisition and machine learning have been considered as separate subfields of AI, there is a tendency for the two fields to come together. This publication combines machine learning techniques with more conventional knowledge elicitation techniques. A framework is presented in which reasoning, problem solving and learning together form a knowledge intensive system that can acquire knowledge from its own experience.

From novice to expert: tools and techniques to make your learning faster, deeper, and stronger. Time to master the most important meta-skill of all: learning. Too bad you didn't

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have this book years ago! Scientifically-proven, step-by-step methods for effective absorption, retention, and comprehension. Rapid Knowledge Acquisition & Synthesis is a collection of the very best methods to get ahead of the typical learning curve. You'll learn how to create an environment for information absorption at shocking speeds. From scientifically-validated tips to best practices of some of the world's smartest polymaths, you'll get it all. Faster, deeper, stronger. Directly from one of self-education's thought leaders. Peter Hollins has studied psychology and peak human performance for over a dozen years and is a bestselling author. He has worked with a multitude of individuals to unlock their potential and path towards success. His writing draws on his academic, coaching, and research experience. Clear guidelines for every stage of the learning process.

- The most common obstacles of learning and how to overcome them.
- Single loop learning, double loop learning, and how to fundamentally change your comprehension mindset.
- Best practices for reading, note-taking, absorbing knowledge, and making things stick inside your brain.
- The most strategic questions to ask that will make information become memorable and 3d.
- Dual coding, REM sleep, shifting locations, the efficacy of variety, and catching your own blind spots.

Unlock the most important meta-skill of all: learning. Make yourself recession-proof, upgrade-proof, competition-proof, absent-minded-proof, and stagnant-proof.

The field of Information Science is intertwined with the complexity present in society. The study object in this field refers to data, information, and knowledge generated, mediated, and appropriated by different individuals in the most diverse human activities. Thus, discussing complex issues that are intertwined with information management, knowledge management, innovation management, organizational intelligence, information mediation, information appropriation, and information literacy is essential for understanding the future perspectives of digital humanity. Role of Information Science in a Complex Society presents discussions that can be applied to local, regional, and national policies aimed at economic and social development and supports innovative actions in economic segments that depend on innovation. Highlighting topics that include information literacy, ethics, knowledge management, and organizational learning, this book is an ideal reference source for academicians, professionals, researchers, and students, as well as entrepreneurs from different economic segments.

Exemplar-Based Knowledge Acquisition: A Unified Approach to Concept Representation, Classification, and Learning covers the fundamental issues in cognitive science and the technology for solving real problems. This text contains six chapters and begins with a description of the rationale for the design of Protos Approach, its construction and performance. The succeeding chapters discuss how the Protos approach meets the requirements of representing concepts, using them for classification, and acquiring them from available training. These chapters also deal with the design and implementation of Protos. These topics are followed by a presentation of examples of the application of Protos to audiology and evaluate its performance. The final chapters survey related work in the areas of case-based reasoning and automated knowledge acquisition and the contributions of Protos approach. This book will be of great value to psychologists, psychiatrists, and researchers in the field of artificial intelligence.

Education is a key part of a society's growth and progress. It is the process of facilitating learning, or the acquisition of knowledge, abilities, values, morals, beliefs, and customs. Education helps to eliminate gender inequality, reduce poverty, create a sustainable planet, prevent needless deaths and sicknesses, and foster peace. And in a knowledge economy, education is the new currency in which nations maintain economic competitiveness and international wealth. When people are educated, they can significantly contribute to their families and society in various aspects and fields, thus creating a stable and stimulating community. Do you think attending school and doing projects for your college is a waste of time? This book will give you great answers!

A clear and practical introduction to second language acquisition, written for students encountering the topic for the first time.

The implicit/ explicit distinction is central to our understanding of the nature of L2 acquisition. This book begins with an account of how this distinction applies to L2 learning, knowledge and instruction. It then reports a series of studies describing the development of a battery of tests providing relatively discrete measurements of L2 explicit/ implicit knowledge. These tests were then utilized to examine a number of key issues in SLA - the learning difficulty of different grammatical structures, the role of L2 implicit/ explicit knowledge in language proficiency, the relationship between learning experiences and learners' language knowledge profiles, the metalinguistic knowledge of teacher trainees and the effects of different types of form-focused instruction on L2 acquisition. The book concludes with a consideration of how the tests can be further developed and applied in the study of L2 acquisition.

An adjunct to the increased emphasis on developing students' critical thinking and higher order skills is the need for methods to monitor and evaluate these abilities. These papers provide insight into current techniques and examine possibilities for the future. The contributors to Diagnostic Monitoring of Skill and Knowledge Acquisition focus on two beliefs: that new kinds of tests and assessment methods are needed; and that instruction and learning can be improved by developing new assessment methods based on work in cognitive science.

The Acquisition of Strategic Knowledge deals with the automation of the acquisition of strategic knowledge and describes a knowledge acquisition program called ASK, which elicits strategic knowledge from domain experts and puts it in operational form. This book explores the dynamics of intelligent systems and how the components of knowledge systems (including a human expert) interact to produce intelligence. Emphasis is placed on how to represent knowledge that experts require to make decisions about actions. The move toward abstract tasks and how tasks are solved are discussed, along with their implications for knowledge acquisition, particularly the acquisition of expert strategies. This book is comprised of eight chapters and begins with an overview of the knowledge acquisition problem for strategic knowledge, as well as the relevance of strategic knowledge to artificial intelligence. The next chapter describes a dialog session between the ASK knowledge acquisition assistant and the user ("the expert"). The discussion then turns to software architecture with which to represent strategic knowledge; design and implementation of an assistant for acquiring strategic knowledge; and approaches to knowledge acquisition. Two applications of the ASK system are considered: to evaluate the usability of the elicitation technique with real users and to test the adequacy of the strategy rule representation upon which the approach is dependent. The scope of ASK, its sources of power, and its underlying assumptions are also outlined. This monograph will be a valuable resource for knowledge systems designers and those interested in artificial intelligence and expert systems.

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Promoting organizational knowledge is an important consideration for any business looking toward the future. Understanding the dynamics of knowledge-intensive organizations is a crucial first step in establishing a strong knowledge base for any organization. Organizational Knowledge Dynamics: Managing Knowledge Creation, Acquisition, Sharing, and Transformation introduces the idea that organizational knowledge is composed of three knowledge fields: cognitive knowledge, emotional knowledge, and spiritual knowledge. This book is useful for graduate students, researchers, and practitioners in knowledge management, intellectual capital, human resources management, change management, and strategic management.

The book offers condensed summaries of twenty-three major models of skill acquisition and expertise development presented by leading researchers during the last half a century of classic and new research. This book presents new researchers in learning, training, cognitive sciences or education disciplines with a big picture starting point for their literature review journey. The book presents an easy to understand taxonomy of twenty-three models which can give new researchers a good bird's eye view of existing models and theories, based on which they can decide which direction to dig further. The reviews in this book are complemented with over 200 authentic sources which a researcher read for detailed and deeper dive and set the direction for further exploration. This book would also act as an essential reference for training & learning professionals and instructional designers to design research-based training curriculum to develop skills of their staff. Chapter 1 of the book elaborates on how the processes of learning, skill acquisition, and expertise development are interwoven. Chapter 2 presents a classification of various models reviewed in literature in five categories. Chapter 3 describes twelve models of skill and expertise acquisition which are represented in the form of stages, used frequently in learning, training and performance literature. The chapter also discusses the implications of each model toward developing skills and expertise of a less proficient individual to a higher level of proficiency briefly. Chapter 4 reviews practice-, time- or task-based models which are theories or models suggesting that acquisition of knowledge & skills, development of expertise and performance improvement is a function of nature of practice, amount of time spent on the task and task type. Chapter 5 presents the factor-based models, which are based on theories or models suggesting the interplay of several factors that influence the acquisition of knowledge & skills, development of expertise and performance improvement. Chapter 6 embarks on describing expert modeling-based models which are theories or models suggesting modeling an expert through elicitation or guidance for acquisition of knowledge & skills, development of expertise and performance improvement. Chapter 7 covers some newer movement toward cognition-based models which are theories or models focusing on mechanisms of cognition learning for the acquisition of knowledge & skills, development of expertise and performance improvement. Chapter 8 concludes the book by integrating views from various thought leaders to explain a famous staged skill acquisition model.

The present book is a result of a seven-year (1986-1992) national research program in cognitive science in Germany, presumably the first large scale cognitive science program there. Anchored in psychology, and therefore christened Wissenpsychologie (psychology of knowledge), it has found interdisciplinary resonance, especially in artificial intelligence and education. The research program brought together cognitive scientists from over twenty German universities and more than thirty single projects were funded. The program was initiated by Heinz Mandl and Hans Spada, the main goals of which were to investigate the acquisition of knowledge, the access to knowledge, and the modification and application of knowledge from a psychological perspective. Emphasis was placed on formalisms of knowledge representation and on the processes involved. In many of the projects this was combined with computer simulations. A final but equally important goal was the development of experimental paradigms and methods for data analysis that are especially suited to investigate knowledge based processes. The research program has had a major impact on cognitive psychology in Germany. Research groups were established at many universities and research equipment was provided. It also inspired a considerable number of young scientists to carry out cognitive research, employ modeling techniques from artificial intelligence for psychological theorizing, and construct intelligent tutoring systems for education. Close contacts with cognitive scientists in the U.S. have helped to firmly integrate the program with international research endeavours. Each year, one or two workshops were held. The present volume is the result of the final workshop which was held in September 1992. Selected results from seventeen projects are presented in this book. The volume is enriched by three guest scholars who agreed to participate in the final workshop and to comment on the chapters of the book.

Originally published in 1977, this book reports the proceedings of a conference sponsored by the Navy Personnel Research and Development Center. The one common thread running through all of the formal papers and dialogue was that the knowledge a person already possesses is the principal determiner of what that individual can learn from an educational experience. These questions were addressed: How is knowledge organized? How does knowledge develop? How is knowledge retrieved and used? What instructional techniques promise to facilitate the acquisition of new knowledge? The kinds of answers provided are characterized by their as well as by their specificity. Accordingly, the volume should be of interest to both the generalist and the specialist.

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