LEARNING WITH ANIMATION

The use of animations is increasingly common in multimedia teaching and learning. Animations are assumed to increase interest and motivation, to direct attention, to illustrate procedures, and to explain how things work. Recent research shows that animations are not inherently effective. Their educational effectiveness depends on how the characteristics of animations interact with the psychological functioning of the learner.

This book presents the first comprehensive treatment of learning with educational animation. Based on research of internationally recognized experts, it aims to clarify and integrate the major themes of current research into learning with animation. In addition, it explores requirements for the principled design of learning resources that incorporate animation. Such materials can be successful only if their design reflects principles governing how learners develop understanding when they work with animations. The overarching goal of the book is, therefore, to improve the way educational animations are designed and used within a variety of learning contexts.

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Research Implications for Design

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Preface

Animations have become an increasingly prominent feature of technology-based learning environments in recent years. However, much of the animation now used for the purposes of education and training may be far less effective than is generally supposed. This is because its design is not based on an understanding of what is required for people to learn from animation. The rapid development in educational applications of animation has been driven largely by progress in information and communications technology. In this context, designers of these animations have had little research to draw on for guidance regarding educational effectiveness. As a result, their approaches to design have tended to rely on intuition rather than being based on principled guidelines derived from empirical investigation. The purpose of this book is to contribute to the development of a more principled approach to the design and development of educational animations. It brings together leading international scholars in the field to provide a first account of the present research-based understanding of how learners perceive and cognitively process animations. While charting the current landscape of research on learning with animation, it also identifies major issues that remain to be addressed by researchers.

The practical feasibility of using animation for teaching and learning depends on the availability of powerful authoring and presentation technologies. As a result, the widespread application of animations in education has a relatively short history. This is in marked contrast to the many hundreds of years over which static graphics have been used to support education and training. When asked to produce educationally effective static graphics, designers can draw on a rich heritage of expertise that has been accumulated over the centuries. However, this is not the case for animated graphics, due to their much more recent arrival on the educational scene. Current practices in the educational application of animations indicate that they are assumed to

increase interest and motivation, to direct attention, to illustrate procedures, and to explain how things work. However, recent research shows that animations are not inherently effective in supporting learning. Indeed, this research indicates that under some circumstances the effects of animation on learning can be negative. The educational effectiveness of animations depends on how their characteristics interact with the psychological functioning of the learner. Contributions in this book examine various aspects related to these influences on educational effectiveness. The chapters are organized into four sections, each of which covers a major theme of current research.

Section 1, "Information Search and Processing," addresses the fundamental issues of how to extract task-relevant information from an animated presentation and deal with it appropriately. It contains chapters by Mary Hegarty and Sarah Kriz ("Effects of Knowledge and Spatial Ability on Learning from Animation"); Richard Mayer ("Research-Based Principles for Learning with Animation"); and Richard Lowe ("Learning from Animation: Where to Look, When to Look").

Section 2, "Individual Differences and Strategies," moves the focus to the capacities and approaches that influence learner success in learning from animations. The chapters in this section are by Rolf Ploetzner, Daniel Bodemar, and Sieglinde Neudert ("Successful and Less Successful Use of Dynamic Visualizations in Instructional Texts"); Wolfgang Schnotz and Thorsten Rasch ("Functions of Animation in Comprehension and Learning"), Daniel Schwartz, Kristen Blair, Gautam Biswas, Krittaya Leelawong, and Joan Davis ("Animations of Thought: Interactivity in the Teachable Agent Paradigm"), and Mireille Btrancourt and Alain Chassot ("Making Sense of Animation: How Do Children Explore Multimedia Instruction?").

The first half of the book concludes with a commentary by John Kirby on issues raised by contributors to Sections 1 and 2.

Section 3, "Interactivity and Learning," addresses the growing opportunities provided by advances in technology for animated learning materials to include responsive and interactive capacities. Various perspectives on the utility and potential of interactivity are presented in chapters by Roxana Moreno ("Animated Pedagogical Agents: How Do They Help Students Construct Knowledge from Interactive Multimedia Games?"); Jean-Michel Boucheix ("Young Learners' Control of Technical Animations"); and Teresa Hübscher-Younger and Hari Narayanan ("Turning the Tables: Investigating Characteristics and Efficacy of Student-Authored Animations and Multimedia Representations").

Section 4, "Instructional Issues," draws together several research themes that are of direct relevance to making best use of animations to support learning. The future of educational animation is a common thread running through

chapters by Barbara Tversky, Julie Heiser, Rachel Mackenzie, Sandra Lozano, and Julie Morrison ("Enriching Animations"); Yvonne Rogers ("A Comparison of How Animation Has Been Used to Support Formal, Informal and Playful Learning"); and Wolfgang Schnotz and Richard Lowe ("A Unified View of Learning from Animated and Static Graphics").

The book concludes with a commentary by Susan Goldman on issues raised by contributors to Sections 3 and 4.

Richard Lowe and Wolfgang Schnotz