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Johannes Konert

Interactive Multimedia Learning

Using Social Media for Peer Education
in Single-Player Educational Games

Doctoral Thesis accepted by
Technische Universität Darmstadt, Germany

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Johannes Konert, Stefan Göbel, and Ralf Steinmetz. Towards Social Serious Games. In Thomas Connolly, Patrick Felicia, Grace Neville, and Sabin Tabirca, editors, *Proceedings of the 6th European Conference on Games Based Learning (ECGBL)*, Cork, Ireland, 2012. Academic Bookshop. ISBN 9781908272690.

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*For the Digital Natives
and everyone feeling connected*

Supervisor's Foreword

It is a great pleasure to introduce Dr. Johannes Konert's thesis, accepted for publication within Springer Theses and awarded with a prize for his outstanding original work. Dr. Konert joined our Multimedia Communications Lab at Technische Universität Darmstadt in July 2010. He started his doctoral program with a 14-month scholarship of the interdisciplinary DFG research training group *Feedback-based Quality Management in E-learning*. He continued his research within a full position as Research Assistant in Engineering. He completed it with an oral defense in December 2013. Dr. Konert's thesis includes significant original scientific contributions, representing a considerable advancement in the field of interactive multimedia learning. He published as first author in top journals and international well-recognized conferences most of his findings. The work has been widely recognized and awarded with several Best Full Paper Awards.

Social Media, as an information and communication technology, enables users to exchange information about experiences and insights in easy ways. Such exchange can be used for peer interaction among learners in E-learning scenarios or also to support players of educational computer games. The players profit from social media content interpreted as learning resources that are created, edited, and then shared by peers. Therefore, social media applications and concepts can serve as a way to bring peer education concepts closer to educational games in specific and to systems for technology enhanced learning in general. Appropriate information technology enhances the way learners share hints, assess each others' solutions, and give feedback in the learning and playing process. However, the intersection of serious games and social media appears to be a quite novel field of research with various uncertainties to be addressed by scientists.

With his thesis, Dr. Konert defines, to a much larger extent than before, this new research area of social serious games. He integrates the perspectives and findings from didactics, pedagogical psychology, social media, and educational games in order to enhance knowledge exchange among learners in virtual environments. His exceptional interdisciplinary work addresses several core problems of technology-enhanced learning. It includes the integration of user-generated content in learners'

interactions, the sophisticated diagnosis of problem solving competency, and a proper assessment of learners' solutions—especially to open-format problems. Additionally, Dr. Konert offers enhanced solutions for algorithmic peer learning group formation based on manifold criteria to improve learning effectiveness as well as quality of feedback among the peers.

This is the first time single-player games are enhanced by content integration and game adaptation based on social media interactions. The achievable improvements are shown by a multitude of conducted studies including field tests with pupils of secondary schools, laboratory studies with master's degree students, extensive simulative evaluation, as well as expert interviews with CEOs of video game development studios in Germany.

With his findings, Dr. Konert brings the field of serious games and technology-enhanced learning an enormous step forward. His insights allow the use of social media to establish effective circles for knowledge exchange between learners. Core aspects are the integration of user-generated content into the learning process and the algorithmic learning group formation in the application field of educational games.

Darmstadt, June 2014

Prof. Dr.-Ing. Ralf Steinmetz

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I am forever grateful to my social network of family, friends, and acquaintances for their love and support. Without their continuous encouragement and faith in me, my studies and this thesis would have been hardly possible.

Darmstadt, October 2013

Dr.-Ing. Johannes Konert

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About the Author

Dr.-Ing. Johannes Konert was born in Bad Nauheim, Germany in 1979. He graduated with a German *Diplom* in Computer Science from the Karlsruhe Institute of Technology (KIT), Germany in 2006. During these studies, he was granted a scholarship from the Baden-Württemberg foundation for his studies abroad at the Australian Catholic University (ACU), Sydney, Australia, where he studied relevant courses in telematics and electronic commerce. In the following years he successfully co-founded a German company for the development and operation of an online social network application and worked as a freelancer and employee in the field of social media and web applications. In 2010, he was awarded scholarship by the German Research Foundation (DFG) for his Ph.D. work in the research training group *Feedback-based Quality Management in E-learning*.

As lead author he won the Best Full Paper Award at the International Conference of Advanced Learning Technologies for the development of the Peer Education Diagnostic and Learning Environment PEDALE in 2011. Two years later, he won as lead author the Best Full Paper Award at the German E-learning and IT Conference DeLFI for the optimization algorithm GroupAL that addresses the problem of quality-optimized learning group formation. In 2013, he received his Ph.D. degree with *Summa Cum Laude* from the Technische Universität Darmstadt, Germany based on the thesis published in the book at hand.

He has co-acquired and co-lead several national and international research projects. Besides his activities as lecturer and thesis supervisor, he has successfully co-designed and coordinated an interdisciplinary, integrated course for students from architecture, psychology, and computer science working on project topics assigned from the field of serious games.

His current research is focused on the adaptation of learning resource recommendation and the interconnection of learners for knowledge exchange in social serious games and social media applications.

Acronyms

AJAX	Asynchronous JavaScript and XML
API	Application Programming Interface
BPT	Bartle Player Types
CBKST	Competency-Based Knowledge Space Theory
CEO	Chief Executive Officer
CI	Content Integration
CPI	Cohort Performance Index
ECD	Evidence-Centered Design
GA	Game Adaptation
GPI	Group Performance Index
GUI	Graphical User Interface
HTTP	Hypertext Transfer Protocol
ILS	Index of Learning Survey
JPEG	Joint Photographic Expert Group
JSON	JavaScript Object Notation
LSI	Learning Style Inventory
MBTI	Myers-Briggs Type Indicator
MIT	Massachusetts Institute of Technology
MOOC	Massive Open Online Course
MUD	Multi User Dungeon
NEO-PI-R	Neuroticism Extraversion Openness (NEO)-Personality Inventory Revised
NPC	Non-Player Character
PF	Peer Group Formation
PLE	Personal Learning Environment
PPI	Pair Performance Index
SNA	Social Network Analysis
URL	Uniform Resource Locator

UXQ	User Experience Questionnaire
VLE	Virtual Learning Environment
WBT	Web-Based Training
XML	Extensible Markup Language