

Spring 4-1-2015

Personality-based versus Task-based Factors as Indicators for Personalised Learning Environments

Philipp Melzer

University of Hohenheim, melzer@uni-hohenheim.de

Mareike Schoop

University of Hohenheim, schoop@uni-hohenheim.de

Follow this and additional works at: <https://aisel.aisnet.org/ukais2015>

Recommended Citation

Melzer, Philipp and Schoop, Mareike, "Personality-based versus Task-based Factors as Indicators for Personalised Learning Environments" (2015). *UK Academy for Information Systems Conference Proceedings 2015*. 21.
<https://aisel.aisnet.org/ukais2015/21>

This material is brought to you by the UK Academy for Information Systems at AIS Electronic Library (AISeL). It has been accepted for inclusion in UK Academy for Information Systems Conference Proceedings 2015 by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Personality-based versus Task-based Factors as Indicators for Personalised Learning Environments

Philipp Melzer, Mareike Schoop
*Information Systems Group,
University of Hohenheim,
70593 Stuttgart, Germany
philipp.melzer@wi1.uni-hohenheim.de,
schoop@uni-hohenheim.de*

Abstract

Personalised learning aims to improve learning outcomes by adhering to personal needs of learners. The research question of this paper is to discuss how such personal needs can be defined to inform the design of a tool to support personalisation of learning methods in learner-centred personalised learning environments. Therefore two approaches, i.e. the analysis of personality-based factors and task-based factors as indicators of personal needs, are discussed regarding their adequacy. We argue that the analysis of task performance based on clearly defined cognitive tasks is the sounder approach. Further steps how to implement and evaluate a proof-of-concept within the domain of electronic negotiation training conclude our argumentation.

Keywords: personalised learning environment, learning style, cognitive task, quantified self, electronic negotiation, negotiation support system

1. Introduction to Personalised Learning

Personalisation is one of the most important goals in current education research and practice (Johnson et al. 2015). Its aim is to improve learning outcomes by adhering to personal needs of learners. This can be achieved by (1) individualisation enabling learners to decide themselves how to progress through the materials e.g. how much time to use for a specific unit and (2) differentiation tailoring the mode of instruction to specific learning preferences (U.S. Department of Education 2010). However, the question remains what types of individual needs match different learning methods. In face-to-face courses with a limited number of students, such matching is usually done by the teacher. In courses with larger numbers of students or courses that rely on e-learning technologies especially electronic communication media, this is hardly possible.

In hybrid or completely electronic settings, personalisation can be achieved using Personal Learning Environments (PLEs) which are user-configured sets of interchangeable web 2.0 tools such as weblogs, wikis, social networks, or social

bookmarking services (Attwell 2007). These environments enable learners to create, share, and discuss content using the tools they prefer and, therefore, these systems are adaptive to the learners' needs. PLEs follow a learner-centred and self-regulated learning approach rooted in constructivist theory (Attwell 2010). Such a learner-centred perspective to learning is increasingly applied in blended learning or flipped classroom scenarios where knowledge acquisition is relocated from lectures into discussion groups outside the classroom or electronic communication media (Oeste et al. 2014). Since learners build knowledge structures themselves in situated contexts the question how a matching between personal needs and learning methods (e.g.: what tools to use and how to use them) can be rigorously defined is left to the learner. We argue, however, that this task of personalisation is very demanding and requires support. In order to design a tool usable within the context of PLEs that supports the establishment of such a matching between personal needs and learning methods, the research question of this paper is to discuss *what candidates of personal needs are relevant and useful to inform the tools' design with rigorous and relevant requirements*. The tool will be applied in the domain of electronic negotiation training because negotiation is a complex task which is of great importance for managers and requires a broad set of competences (Melzer, Schoop 2014b).

2. Personality-based or Task-based Factors as Indicators for Personalisation?

The work of C.G. Jung on personality types (Jung 2011) has led to numerous theories and instruments to define personality traits with the Myers-Briggs Type Indicator (Myers et al. 1985) and the "big five" (Costa, McCrae 1992) being the most prominent ones. Such personality traits have a rich history as a means to derive individual learning styles in research and practice. Literature reviews and taxonomies find over 70 different learning style theories and instruments (Curry 1987; Cassidy 2004). They can be structured in five families from largely constitutionally based factors over relatively stable types to concrete learning approaches, strategies, orientations, and conceptions (Coffield et al. 2004). In management education, people are trained to understand and use such styles; thus, the more volatile factors are relevant. In the following Kolbs' theory of learning styles will be evaluated as it represents stable as well as volatile aspects of learning styles being one of the most

wide-spread instruments (Kolb 1985; Kolb et al. 2001). The process of experiential learning defined by Honey & Mumford (Honey, Mumford 1992) draws upon the work of Kolb. The cycle of experiential learning includes four learning styles: (1) Activists being exposed to a new experience; (2) Reflectors reflecting on this experience; (3) Theorists generating abstract theories; and (4) Pragmatists planning their next steps. These learning styles reflect learning preferences rooted in personality traits. Honey & Mumford do not assume certain learning styles to be superior over others. Moreover, each style fits to certain learning situations (Honey, Mumford 2000).

Personality-based factors have been a topic in IS research analysing cognitive styles in IS usage patterns (Taggart, Robey 1981; Taggart et al. 1982) or learning styles in training how to use information systems (Sein, Bostrom 1989; Bostrom et al. 1990; Davis, Bostrom 1993; Melzer, Schoop 2014a; Crews et al. 2014). Several matches between learning styles and training methods have been proposed and in some cases confirmed by experimental evaluation. However, many learning style instruments lack validation and findings are seldom reproduced. Thus, the value of using personality traits in the design and usage of IS has been questioned (Huber 1983; Robey 1983; Ruble, Stout 1993).

Over the years, learning styles have influenced education research and practice on a large scale (Gregory, Carolyn 2013; Crews et al. 2014). However, their scientific background is still criticised (Cassidy 2004; Coffield et al. 2004; Pashler et al. 2009). The main points of criticism are (Erpenbeck, Hasebrook 2011): (1) the historical background of personality traits research which is closely-related to metaphysical and philosophical questions which allow numerous interpretations leading to (2) a high number of theories and instruments with completely different underlying methods and assumptions, (3) often missing empirical validation of instruments or evaluation of theories missing experimental rigor leading to not-reproducible or conflicting results, and finally (4) the complex inference from psychometric properties on actual learning behaviour.

Instead of personality-based learning styles, the choice and performance of learners in a specific learning task can be used to infer preferences and predict learning outcomes. One of the most prominent taxonomies of learning objectives defines cognitive learning objectives, which will be the focus of this paper, as an allocation of the kind of knowledge achieved when performing a specific cognitive task (table 1)

(Bloom et al. 1984; Anderson, Krathwohl 2001; Krathwohl 2002). The Knowledge Dimension represents different levels of knowledge from knowledge on facts, concepts, or procedures regarding a specific domain to knowing about one's own knowledge (metacognitive knowledge). Such knowledge can be acquired performing different cognitive tasks such as remembering, understanding, applying, analysing, evaluating, or creating. Exercises typically encompass several learning objectives combining cognitive tasks and knowledge levels.

The Knowledge Dimension	The Cognitive Process					
	Remember	Understand	Apply	Analyse	Evaluate	Create
Factual Knowledge						
Conceptual Knowledge						
Procedural Knowledge						
Metacognitive Knowledge						

Table 1. Taxonomy of Learning Objectives (Krathwohl 2002, p.216)

Table 1 shows the taxonomy of learning objectives which is highly cited and has been applied by scientists and educators. Most of its initial criticism has been eliminated with its revised version (Anderson, Krathwohl 2001). However, the theoretical background builds on the behaviourist (Skinner 1958) and cognitivist approaches (Frank, Meder 1971) towards learning omitting modern learning paradigms such as constructivism (Kafai 2006). Similar to the theories of learning styles, there is little empirical validation and critical analysts find fault with the often conflicting definitions of cognitive tasks in the learning sciences (Haladyna, Rodriguez 2013).

One approach to alleviate these points of criticism is to simplify the taxonomy focusing only on knowledge, skills and abilities (KSA) as the main steps of cognition (table 2). Factual, conceptual, principal, or procedural knowledge are differentiated and specific cognitive tasks are defined to acquire and use this knowledge such as recognition, understanding, or application. Skills can be differentiated into mental or physical skills along with a definition of cognitive demands to acquire them. Abilities combine knowledge and skills in performing a series of applied and often complex tasks.

Cognition	Types	Demands
Knowledge	Fact, concept, principle, procedure	Recall/recognise Comprehend/understand Application
Skills	Mental, physical	Recall/recognition of procedure for performing skill Comprehension/understanding of procedure for performing the skill Performing the skill
Ability	Collection of structured and ill-structured tasks	Use knowledge and skills in the performance of each task

Table 2. Knowledge, Skills & Abilities (Haladyna, Rodriguez 2013 p.39)

KSAs are used in Human Resource Management to predict future job performance. Other domains of application are education and test theory. Similar approaches in the literature add communication competence and metacognitive competence. Contrary to the theories of personality-based factors, most approaches on KSAs rely on the same key concepts (Erpenbeck, Hasebrook 2011).

To summarise, the analysis of personality-based learning styles to answer the matching hypothesis of personalised learning seems to be the obvious approach to elicit requirements for an integrated PLE. But, due to its theoretical fallacies (such as the specificity or stability of personality traits) as well as methodological obstacles (such as the difficulty of translating learning styles into specific learning methods), this approach might not lead to optimal results. Thus, the analysis of cognitive tasks, might be the theoretically sounder approach because it focuses on a small set of key concepts which are used throughout research and practice in unison.

3. Personalised Learning for Electronic Negotiations

Data on learning behaviour such as task choice and performance based on cognitive tasks (table 2) can be assessed using a quantified self approach, where users provide information (e.g. learning task, peers, time, location, marks, satisfaction, etc.) and

receive statistics and recommendations of matching learning behaviour and tools in return (Swan 2012).

Therefore, we chose a pragmatist methodology integrating design-based research in the learning sciences (Collins 1992; Brown 1992) and design science in information systems (Hevner et al. 2004). Using such a methodology enables us to encompass a comprehensive picture of all social, psychological, and technological variables involved in a learning intervention, at the same time providing exploratory insight in its development and implementation (Melzer, Schoop 2014a). Both methodologies aim for a creation of artefacts guided by practical requirements and related theories. These artefacts need to be applied in a real-life context involving practitioners followed by an iterative evaluation and improvement of artefacts.

The PLE support component to-be-designed will be applied to the domain of electronic negotiation training. Negotiations represent complex management tasks comprising of interdependent communication and decision making processes (Bichler et al. 2003). Electronic negotiations, furthermore, are defined as negotiations supported by electronic means with additional functionalities of support (Ströbel, Weinhardt 2003). In this domain, Negotiation Support Systems (NSSs) as archetypes of information systems have been developed providing communication support, decision support, document management and further support functionalities (Schoop et al. 2003; Schoop 2010). Consequently, NSSs have numerous complex features. Researchers propose an expanded inclusion of human requirements and context-aware functionalities to deal with this complexity (Gettinger et al. 2012).

This research, thus, aims for a twofold contribution: In the field of negotiation training, where theoretical as well as practical skills using NSSs are relevant, supported self-inquiry should increase learning outcomes. In the field of e-learning synergies may be leveraged as both tasks, electronic learning and electronic negotiation heavily rely on online communication and collaboration. Some learning theorists describe negotiation as a form of collaborative meaning construction which in the end is another form of learning (Andriessen 2006).

4. Next Steps

This conceptual paper discusses personality-based and task-based factors as indicators for personalised learning. Representing personality-based factors, the theory of learning styles by Honey & Mumford is contrasted with the classification of cognitive

tasks in KSAs. Both concepts have advantages and disadvantages regarding their usefulness to personalise learning. However we have to state a general lack of unambiguous definitions and validation of instruments due to the complex domain and the different learning paradigms.

To design a support tool for learner-centred learning in electronic negotiations and negotiation support systems, the next steps focus on generating requirements for such a tool based on a framework including all sources of personalisation. The resulting tool aims to support learner-centred learning in blended learning interventions or flipped classrooms that learners can use valuable face-to-face time to train and discuss negotiation role plays and explore features of negotiation support systems in realistic e-negotiations over the internet. Thus, the specific requirements of electronic negotiation trainings can be achieved and negotiators are able to gain first-hand experience interacting over electronic communication channels without physical cues (Melzer, Schoop 2014b). The resulting instantiation of a PLE will be evaluated in a real-life classroom intervention (following the methodology presented) to derive guidelines how personalisation in learner-centred PLEs can be supported.

References

- Anderson, L.W. and Krathwohl, D.R. (2001) A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives, Longman, New York.
- Andriessen, J. (2006) *Arguing to Learn*, In Sawyer, R.K. (Ed.): The Cambridge handbook of the learning sciences. Cambridge, New York: Cambridge University Press, pp. 443–459.
- Attwell, G. (2007) *Personal Learning Environments - the future of eLearning?*, eLearning Papers, 2.
- Attwell, G. (2010) *Personal Learning Environments and Vygotsky*. Pontydysgu. available at <http://www.pontydysgu.org/2010/04/personal-learning-environments-and-vygotsky/> (accessed March 9th 2015).
- Bichler, M., Kersten, G. and Strecker, S. (2003) *Towards a Structured Design of Electronic Negotiations*, Group Decision and Negotiation, 12 311–335.
- Bloom, B.S., Krathwohl, D.R. and Masia, B.B. (1984) Taxonomy of educational objectives: the classification of educational goals, Longman, New York.
- Bostrom, R.P., Olfman, L. and Sein, M.K. (1990) *The Importance of Learning Style in End-User Training*, MIS Quarterly, 14 101–119.
- Brown, A.L. (1992) *Design Experiments: Theoretical and Methodological Challenges in Creating Complex Interventions in Classroom Settings*, Journal of the Learning Sciences, 2 141–178.
- Cassidy, S. (2004) *Learning Styles: An overview of theories, models, and measures*, Educational Psychology, 24 419–444.

- Coffield, F., Moseley, D., Hall, E. and Ecclestone, K. (2004) *Learning styles and pedagogy in post-16 learning: A systematic and critical review*, Learning and Skills Research Centre, London.
- Collins, A. (1992) *Toward a Design Science of Education*, in Scanlon, E. and O'Shea, T. (Eds.), *New Directions in Educational Technology*, NATO ASI Series, Vol. 96, Springer Berlin Heidelberg, 15-22.
- Costa, P.T. and McCrae, R.R. (1992), *Personality Inventory (NEO-PI-R) and NEO five-factor inventory (NEO-FFI) professional manual*, Psychological Assessment Resources, Odessa, FL.
- Crews, T.B., Sheith, S.N. and Horne, T.M. (2014) *Understanding the Learning Personalities of Successful Online Students*, available at: <http://www.educause.edu/ero/article/understanding-learning-personalities-successful-online-students> (accessed January 21st 2015).
- Curry, L. (1987) *Integrating Concepts of Cognitive Or Learning Style: A Review with Attention to Psychometric Standards*, Learning Styles Network.
- Davis, S.A. and Bostrom, R.P. (1993) *Training End Users: An Experimental Investigation of the Roles of the Computer Interface and Training Methods*, *MIS Quarterly*, 17 61–85.
- Erpenbeck, J. and Hasebrook, J. (2011) *Sind Kompetenzen Persönlichkeitseigenschaften?*, in Faix, W.G. (Ed.), *Kompetenz, Persönlichkeit, Bildung*, Steinbeis-Edition, Stuttgart.
- Frank, H.G. and Meder, B.S. (1971) *Einführung in die kybernetische Pädagogik*, Vol. 4108, Dt. Taschenbuch-Verl., Munich.
- Gettinger, J., Dannenmann, A., Druckman, D., Filzmoser, M., Mitterhofer, R., Reiser, A., Schoop, M., Vetschera, R., Wijst, P. and Köszegi, S. (2012) *Impact of and Interaction between Behavioral and Economic Decision Support in Electronic Negotiations*, in Hernández, J.E. (Ed.), *Decision support systems - Collaborative models and approaches in real environments: Euro Working Group Workshops, EWG-DSS 2011, Revised selected and extended papers*, Vol. 121, Springer, Berlin, New York.
- Gregory, G. and Carolyn, C. (2013) *Differentiated instructional strategies: One size doesn't fit all*, Third edition, Corwin Press, Thousand Oaks, California.
- Haladyna, T.M. and Rodriguez, M.C. (2013) *Developing and validating test items*, Routledge, New York, NY.
- Hevner, A.R., March, S.T., Park, J. and Ram, S. (2004) *Design Science in Information Systems Research*, *MIS Quarterly*, 28 75–106.
- Honey, P. and Mumford, A. (1992) *The manual of learning styles*, 3rd ed., Peter Honey Learning, Maidenhead.
- Honey, P. and Mumford, A. (2000) *The learning styles helper's guide*, Peter Honey Learning, Maidenhead.
- Huber, G.P. (1983) *Cognitive Style as a Basis for MIS and DSS Designs: Much ado about Nothing?*, *Management Science*, 29 567–579.
- Johnson, L.; Adams Becker, S.; Estrada, V.; Freeman, A. (2015) *The NMC Horizon Report: 2015 Higher Education Edition*. The New Media Consortium. Austin, Texas. available at <http://cdn.nmc.org/media/2015-nmc-horizon-report-HE-EN.pdf>, (accessed at February 28th 2015).
- Jung, C.G. (2011) *Psychologische Typen*, Edition C. G. Jung, Sonderausg., Patmos, Ostfildern.
- Kafai, Y.B. (2006) *Constructionism*, in Sawyer, R.K. (Ed.), *The Cambridge handbook of the learning sciences*, Cambridge University Press, Cambridge, New York.

- Kolb, D.A. (1985) Learning Style Inventory, McBer & Co, Boston, Mass.
- Kolb, D.A., Boyatzis, R.E. and Mainemelis, C. (2001) *Experiential learning Theory: Previous Research and New Directions*, in Sternberg, R.J. and Zhang, L.-f. (Eds.), *Perspectives on thinking, learning, and cognitive styles*, The educational psychology series, L. Erlbaum Associates, Mahwah, NJ.
- Krathwohl, D.R. (2002) *A Revision of Bloom's Taxonomy: An Overview*, *Theory Into Practice*, 41 212–218.
- Melzer, P. and Schoop, M. (2014a) *Individual End-User Training for Information Systems using Learning Styles*, paper presented at UKAIS 2014, Oxford, UK.
- Melzer, P. and Schoop, M. (2014b) *Utilising Learning Methods in Electronic Negotiation Training*, paper presented at Multikonferenz Wirtschaftsinformatik (MKWI), Paderborn.
- Myers, I.B., McCaulley, M.H. and Most, R. (1985) *Manual, a guide to the development and use of the Myers-Briggs type indicator*, Consulting Psychologists Press, Palo Alto, Ca.
- Oeste, S., Lehmann, K., Janson, A., Leimeister, J. (2014) *Flipping the IS Classroom – Theory-Driven Design for Large-Scale Lectures*, paper presented at International Conference on Information Systems (ICIS) 2014. Auckland, New Zealand.
- Pashler, H., McDaniel, M., Rohrer, D. and Bjork, R. (2009) *Learning Styles: Concepts and Evidence*, *Psychological Science in the Public Interest*, 9 105–119.
- Robey, D. (1983) *Cognitive Style and DSS Design: A Comment on Huber's Paper*, *Management Science*, 29 580–582.
- Ruble, T.L. and Stout, D.E. (1993) *Learning Styles and End-User Training: An Unwarranted Leap of Faith*, *MIS Quarterly*, 17 115–118.
- Schoop, M. (2010) *Support of Complex Electronic Negotiations*, in Kilgour, D.M. and Eden, C. (Eds.), *Advances in Group Decision and Negotiation*, Springer Netherlands, Dordrecht.
- Schoop, M., Jertila, A. and List, T. (2003) *Negoisst: a negotiation support system for electronic business-to-business negotiations in e-commerce*, *Data & Knowledge Engineering*, 47 371–401.
- Sein, M.K. and Bostrom, R.P. (1989) *Individual Differences and Conceptual Models in Training Novice Users*, *Human-Computer Interaction*, 4 197–229.
- Skinner, B.F. (1958) *Teaching Machines. From the experimental study of learning come devices which arrange optimal conditions for self-instruction*, *Science*, 128 969–977.
- Ströbel, M. and Weinhardt, C. (2003) *The Montreal Taxonomy for Electronic Negotiations*, *Group Decision and Negotiation*, 12 143–164.
- Swan, Melanie (2012): *Sensor Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0*. *Sensor and Actuator Networks* 1 (3), pp. 217–253.
- Taggart, W. and Robey, D. (1981) *Minds and Managers: On the Dual Nature of Human Information Processing and Management*, *The Academy of Management Review*, 6 187–195.
- Taggart, W., Robey, D. and Taggart, B. (1982) *Decision Styles Education: an Innovative Approach*, *Journal of Management Education*, 7 17–24.
- U.S. Department of Education (2010) *Transforming American Education: Learning Powered by Technology*. National Educational Technology Plan 2010, available at: <http://www.ed.gov/sites/default/files/NETP-2010-final-report.pdf> (accessed at March 9th 2015).