

DOCTORAL (PHD) STUDIES
COURSE UNIT DESCRIPTION

Course unit title	Scientific areas	Faculty	Institute, department
Technology enhanced learning	Informatics Engineering (T 007)	Faculty of Mathematics and Informatics	Institute of Data Science and Digital Technologies, Education Systems Group

Study method	Number of credits	Study method	Number of credits
Lectures		Consultations	2
Individual works	3	Seminars	2 (autumn semester)

<p>Summary</p> <p>The main aim of the course is to introduce PhD students with the basics of cognitive sciences, methodological principles of learning sciences in the linkage of social, cultural and technological sciences, information technology based education research methods, necessary for every scientist working in the area of computer science.</p> <p>PhD students, completed these studies, will be able to:</p> <ol style="list-style-type: none"> 1. Interpret theoretical and practical problems of information technologies in the area of education, participate in the scientific discussions on the topic. 2. Apply technological knowledge and skills in the interdisciplinary research work in computer science, informatics engineering, and education. 3. Choose suitable technological tools in order to solve educational problems. 4. Evaluate and further develop their Computational Thinking. 5. Evaluate and develop their technological and educational competencies. <p>This course includes the basics of sociocultural pedagogical theories and cognitive sciences, as well as the Learning Sciences and their influence on the educational process, basic methodologies of the Learning Sciences, the aim of computer and other modern technologies in education and technology based education research methods. The main focus is on understanding of the basic principles of the Learning Sciences and the abilities to apply these principles in order to create learning environments, as well as to carry out research in the interdisciplinary area of computer science and education. Recent paradigms and views on computer science and methodologies of the Learning Sciences, educational information technologies, computer and information and communication technology application in education are discussed.</p> <p>1. The theoretical basics of the Learning Sciences: social, cultural and cognitive origins. Interdisciplinary nature of the Learning Sciences. Sociocultural basics of learning. Cognitive basics of learning. Constructivist learning theory. Knowledge construction: theory, pedagogy, and technology. The nature of knowledge: ontological and epistemological basics, research and applications. The main directions of the theory of the basics of ontological and epistemological knowledge. Conceptual change. Knowledge integration into teaching and learning. Spatial perception and imagination in learning. Technological literacy and the Learning Sciences. Educational neurosciences.</p> <p>2. Research methods of the Learning Sciences. Design-based research: its origin and the main principles. Practical applications of the design-based research method. Collaboration and interaction analysis methods. Text mining and discourse analysis methods. Main principles of the cognitive research. Design Science Research. Digital video research methods. Microgenetics methods. The Learning Sciences methods application in education research.</p>
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3. Application of the ideas of the Learning Sciences and technologies in contemporary pedagogy. Technological pedagogical content knowledge framework (TPACK). Digital Competence Framework for Educators. Virtual learning and communication. Action learning and technology. Constructivism and Constructionism. Constructionist learning and technologies. Learner-centered learning methodology. Project-based learning. Basics of authentic learning. Model-based learning. The role of digital technologies in integrated learning. Holistic STEM and STEAM learning models.

4. Computer-based learning technologies. Analysis and comparison of paradigms of integration of Information and Communication Technologies (ICT) in education in the world. ICT integration in education strategic directions in Lithuania. Educational digital resources. Open educational resources. Features and stages of technology enhanced learning and open learning integration within the organization. Open source software and its importance in education. Licenses, authorship, Creative Commons Licenses.

5. Computational thinking. Computational thinking definition, computational thinking development, interdisciplinary aspects and relevance in the modern society. The main components of computational thinking (abstraction, analysis, automation). Relationship of computational thinking and programming, as well as algorithmic thinking. Models of development of computational thinking.

6. E-learning. E-learning. Personalization of e-learning systems. Mobile learning. Micro-learning. Learning objects and their classification. Learning object metadata, metadata structure and standards. Digital content development. Massive open online courses (MOOCs).

7. Virtual mobility. Tools of virtual mobility: reflective, collaborative learning, communicative, social networks. Models of virtual mobility.

8. Assessment in digital environment. Electronic quizzes, quiz development tools and standards. Monitoring learning in the virtual learning environment, analysis of written works, collective writings. E-portfolio: conception, models, possibilities of application in education and professional activities.

9. Teaching and learning programming. Programming as the basis of computational thinking. Programming as a tool for deeper understanding of technology. Programming paradigms. Environments and tools to learn programming. Programming tools for beginners.

10. Collaborative learning. Collaborative learning and technologies. Distant education and collaboration. Language and knowledge construction: learning by providing arguments. Virtual learning communities. Action models: active and problem-based learning. Inquiry-based learning. Application of action models in learning.

11. Modern educational technologies and learning environments. Modern educational technologies and tools, their classification and review. Innovative teaching and learning methods and application of digital educational tools and resources. Motivation and learning by discovering in constructivist learning environments. Modern sociocultural learning perspectives. Internet in education: possibilities, expectations, and problems. Teacher education and technologies. Developing innovations in education. Perspectives and challenges of learning sciences and education.

12. Education for data-driven technologies and artificial intelligence (AI). Educational theory and methods for artificial intelligence, big data, machine learning, and neural networks based technologies.

Practical assignments

- Information search and comparison in the databases of scientific resources.
- Studying of the suggested literature resources individually and discussion in group during the seminars.
- Detailed study and presentation of the selected theoretical topics (written and oral presentation).

Main literature

Sawyer R. K. (Ed.) The Cambridge Handbook of The Learning Sciences. Second Edition. Cambridge University Press, 2014.

Duval, E., Sharples, M., Sutherland, R. (Eds.) Technology Enhanced Learning. Springer, 2017.

Selwyn N. Education and Technology, London, Continuum, 2011.

Spector, M., Merrill, M.D., Elen, J., Bishop, M.J. (Eds.) Handbook of research on educational communications and technology. 4th ed., Springer, 2014.

Selwyn N. Education and Technology Key Issues and Debates. London Continuum.pdf, 2017.

Isaias, P.; Sampson, D.G.; Ifenthaler, D. (Eds.) Technology Supported Innovations in School Education. Springer, Cham, 2020.

Russell S., Norvig P. Artificial Intelligence: A Modern Approach, 4th edition, Pearson, 2020.

Papildoma literatūra

Bennedsen J., Caspersen M. E., Kolling M. Reflections on the Teaching of Programming. Methods and Implementations.LNCS 4821, Springer, 2008.

Biggs J. Teaching for Quality Learning at University. Buckingham: Open University Press, 2000.

Bitinas B. Edukologinis tyrimas: sistema ir procesas. Vilnius: Kronta, 2006.

Kampylis, P., Law N., Punie, N. Y. (Eds.) ICT enabled innovation for learning in Europe and Asia. Report, 2013. <http://ftp.jrc.es/EURdoc/JRC83503.pdf>

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teachers' knowledge. Teachers College Record, 108 (6), 1017–1054.

Caena F., Redecker C. (2019) Aligning teacher competence frameworks to 21st century challenges: The case for the European Digital Competence Framework for Educators (Digcompedu)

Trends in Neuroscience and Education, <https://www.sciencedirect.com/journal/trends-in-neuroscience-and-education/issues>

Lecturer(s) (name, surname)	Science degree	Main publications
Valentina Dagienė	Dr.	http://www.elaba.mb.vu.lt/dmsti/?aut=Valentina+Dagienė
Tatjana Jevsikova	Dr.	http://www.elaba.mb.vu.lt/dmsti/?aut=Tatjana+Jevsikova
Vladimiras Dolgopolovas	Dr.	http://www.elaba.mb.vu.lt/dmsti/?aut=Vladimiras+Dolgopolovas