

Informatics in the Primary Social and Science Education

Torsten Brinda & Jan Grey & Inga Gryl &
Ludger Humbert & Miriam Kuckuck & Stephan
Napierala & Denise Schmitz

University of Duisburg-Essen

University of Wuppertal

E-Mail: projekt-ib-su@lists.uni-wuppertal.de

This presentation: <https://uni-w.de/lfaw5>



August 22nd 2022 – WCCE 2022

This document is published under the following Creative Commons license:



UNIVERSITÄT
DUISBURG
ESSEN

Offen im Denken



BERGISCHE
UNIVERSITÄT
WUPPERTAL

Project Introduction

Implementation at the University of Duisburg-Essen

Implementation at the University of Wuppertal

Summary

Project Introduction

Project Management

Prof. Dr. Miriam Kuckuck, Prof. Dr. Ludger Humbert (Wuppertal)

Project Management

Prof. Dr. Miriam Kuckuck, Prof. Dr. Ludger Humbert (Wuppertal)

Participating Universities

University of Duisburg-Essen, University of Münster, University of Wuppertal

Project Management

Prof. Dr. Miriam Kuckuck, Prof. Dr. Ludger Humbert (Wuppertal)

Participating Universities

University of Duisburg-Essen, University of Münster, University of Wuppertal

Funding

Ministry of Culture and Science of the State of North Rhine-Westphalia

Project Management

Prof. Dr. Miriam Kuckuck, Prof. Dr. Ludger Humbert (Wuppertal)

Participating Universities

University of Duisburg-Essen, University of Münster, University of Wuppertal

Funding

Ministry of Culture and Science of the State of North Rhine-Westphalia

Duration

April 2020 – December 2022

- ▶ Students of Primary Social and Science Education (PSSE) acquire informatics competences in seminars with a practical component.

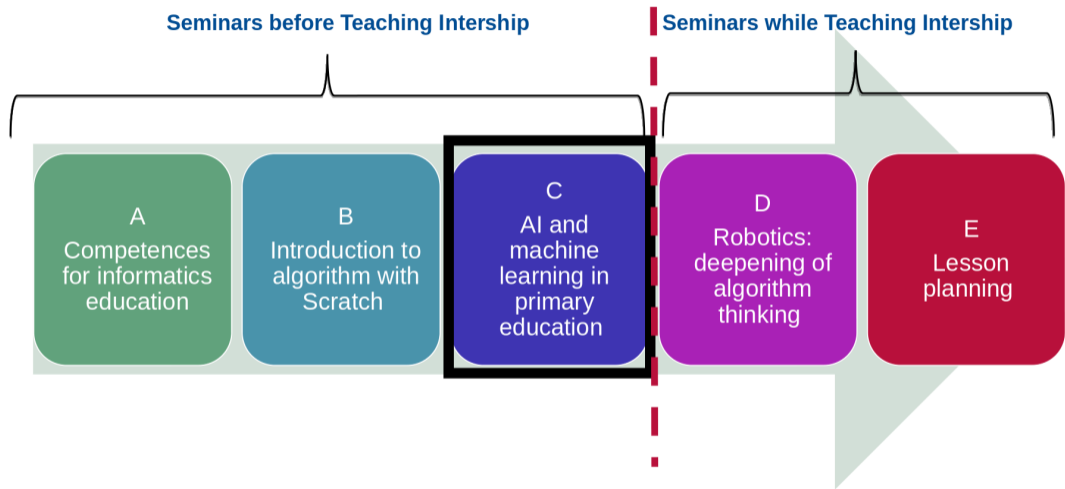
- ▶ Students of Primary Social and Science Education (PSSE) acquire informatics competences in seminars with a practical component.
- ▶ They transfer ideas and concepts to the primary schools and act as multipliers for teachers.

- ▶ Students of Primary Social and Science Education (PSSE) acquire informatics competences in seminars with a practical component.
- ▶ They transfer ideas and concepts to the primary schools and act as multipliers for teachers.
- ▶ The participating teachers experience possibilities and practical ideas for their own implementation of informatics education.

- ▶ Students of Primary Social and Science Education (PSSE) acquire informatics competences in seminars with a practical component.
- ▶ They transfer ideas and concepts to the primary schools and act as multipliers for teachers.
- ▶ The participating teachers experience possibilities and practical ideas for their own implementation of informatics education.
- ▶ The children acquire informatics competences.

Implementation at the University of Duisburg-Essen

Concepts of Informatics Education for Primary Education



Combining ideas from biology and informatics

Goal:

- ▶ Introducing basic ideas of AI and ML in PSSE with unplugged teaching material.

Combining ideas from biology and informatics

Goal:

- ▶ Introducing basic ideas of AI and ML in PSSE with unplugged teaching material.

Approach:

- ▶ Creation of teaching material about the identification of plants, which is part of the PSSE curriculum.
- ▶ Action oriented approach, students take the role of an AI system and complete a learning process in which they identify features of leaves.
- ▶ Based on supervised learning we developed a four-step approach for AI/ML:
 1. training data
 2. developement of rules
 3. testing the model
 4. reflection

AI and Machine Learning in Primary Education

Approach

First step: Training data (Memory Game)

- ▶ Similar to an AI system the students receive a set of training data (24 images of twelve different leaf types); each pair consists of a photograph and a schematic representation.
- ▶ Students try to find the pairs and discuss how the images of the leaves are related to each other.
- ▶ Students discover distinctive features of leaves (such as leaf shape, edge, tip).

Second step: Development of rules (Decision Tree)

- ▶ To develop rules, decision trees are created using the distinctive features of the leaves from the memory games.
- ▶ Based on the discovered features students create a decision tree which will be completed by the other groups.



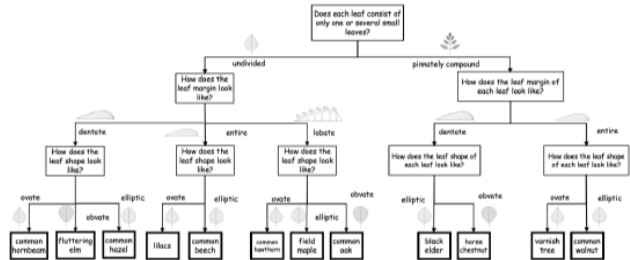
Approach

Third step: Test data (Unknown leaves)

- ▶ The students test their own decision tree using unknown leaves (test data).
- ▶ The students discuss the limits of the developed decision trees and add new elements to the tree.

Fourth step: Reflection (Limits of identification apps)

- ▶ Students test the leaf identification app *Seek*, make assumptions about how it works and discuss the limits of identification apps.



Implementation at the University of Wuppertal

- ▶ Students of PSSE acquire informatics competences in the preparatory seminar for the internship semester.

- ▶ Students of PSSE acquire informatics competences in the preparatory seminar for the internship semester.
- ▶ They conduct a teaching sequence on an informatics topic (cryptology or robotics), which also provides teachers with an opportunity for their own implementation.

- ▶ Students of PSSE acquire informatics competences in the preparatory seminar for the internship semester.
- ▶ They conduct a teaching sequence on an informatics topic (cryptology or robotics), which also provides teachers with an opportunity for their own implementation.
- ▶ Students research informatics issues through interviews with teachers and present their research within a research paper.

What relevance do teachers attribute to informatics education in Primary Social and Science Education, and how do they evaluate the developed materials? (Kuckuck und Humbert 2021a)

What relevance do teachers attribute to informatics education in Primary Social and Science Education, and how do they evaluate the developed materials? (Kuckuck und Humbert 2021a)

- ▶ Teachers' understanding of informatics
partly unspecific, wide-ranging

What relevance do teachers attribute to informatics education in Primary Social and Science Education, and how do they evaluate the developed materials? (Kuckuck und Humbert 2021a)

- ▶ Teachers' understanding of informatics
partly unspecific, wide-ranging
- ▶ Relevance of informatics education
great potential in Primary Social and Science Education

What relevance do teachers attribute to informatics education in Primary Social and Science Education, and how do they evaluate the developed materials? (Kuckuck und Humbert 2021a)

- ▶ Teachers' understanding of informatics
partly unspecific, wide-ranging
- ▶ Relevance of informatics education
great potential in Primary Social and Science Education
- ▶ Informatics teacher education
not enough training

What relevance do teachers attribute to informatics education in Primary Social and Science Education, and how do they evaluate the developed materials? (Kuckuck und Humbert 2021a)

- ▶ Teachers' understanding of informatics
partly unspecific, wide-ranging
- ▶ Relevance of informatics education
great potential in Primary Social and Science Education
- ▶ Informatics teacher education
not enough training
- ▶ Use of the material boxes
high relevance to everyday life

Summary

- ▶ The project is one of the first collaborative projects in the field of Primary Social and Science Education and informatics to research and promote informatics education in primary school in an interdisciplinary way.
- ▶ There continues to be much need for projects that explore foundations of informatics education in primary schools and develop and evaluate evidence-based materials for primary schools and teacher education.

If you have any questions or comments, please feel free to contact

us:

projekt-ib-su@lists.uni-wuppertal.de

Project website

An overview of the project and the developed materials are available at:

<https://uni-w.de/r28z7>

- Humbert, Ludger, Hrsg. (Sep. 2021). *Informatik – Bildung von Lehrkräften in allen Phasen. 19. GI-Fachtagung Informatik und Schule (INFOS 2021)*. (8.–10. Sep. 2021). Bd. p313. LNI – Lecture Notes in Informatics. Wuppertal: Gesellschaft für Informatik e.V. ISBN: 978-3-88579-707-4.
- Kuckuck, Miriam, Alexander Best, Inga Gryl u. a. (Sep. 2021). »Informatische Bildung in Praxisphasen des Sachunterrichts in NRW«. In: *Informatik – Bildung von Lehrkräften in allen Phasen. 19. GI-Fachtagung Informatik und Schule (INFOS 2021)* (8.–10. Sep. 2021). Hrsg. von Ludger Humbert. Bd. p313. LNI – Lecture Notes in Informatics. Wuppertal: Gesellschaft für Informatik e.V., S. 241–250. ISBN: 978-3-88579-707-4. DOI: 10.18420/infos2021_p220.

- Kuckuck, Miriam, Alexander Best und Denise Schmitz (Sep. 2021). »Förderung informatischer Bildung im Sachunterricht in der ersten Lehramtsbildungsphase in NRW«. In: *Informatik – Bildung von Lehrkräften in allen Phasen. 19. GI-Fachtagung Informatik und Schule (INFOS 2021)* (8.–10. Sep. 2021). Hrsg. von Ludger Humbert. Bd. p313. LNI – Lecture Notes in Informatics. Wuppertal: Gesellschaft für Informatik e.V., S. 335–335. ISBN: 978-3-88579-707-4. DOI: 10.18420/infos2021_w275.
- Kuckuck, Miriam und Ludger Humbert (19. Juni 2021a). *Poster – Informatische Bildung als Perspektive des Sachunterrichts im Praxissemester. Vorbereitung für die »FluxDays«*. Wuppertal. URL: <https://uni-w.de/whb1p> (besucht am 16.06.2021).

- Kuckuck, Miriam und Ludger Humbert (19. Juni 2021b). *Präsentation – Informatische Bildung als Perspektive des Sachunterrichts im Praxissemester. Vorbereitung für die »FluxDays«*. Wuppertal. URL: <https://uni-w.de/j9cr0> (besucht am 24. 08. 2021).
- Kuckuck, Miriam, Ludger Humbert u. a. (2022). *Informatische Bildung als Perspektive des Sachunterrichts im Praxissemester*. URL: <https://uni-w.de/d4zw6> (besucht am 19. 04. 2022).