Informatics in the Primary Social and Science Education

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Project Introduction

Implementation at the University of Duisburg-Essen

Implementation at the University of Wuppertal

Summary
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General Conditions of the Project

Project Management
Prof. Dr. Miriam Kuckuck, Prof. Dr. Ludger Humbert (Wuppertal)
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Funding
Ministry of Culture and Science of the State of North Rhine-Westphalia
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Funding
Ministry of Culture and Science of the State of North Rhine-Westphalia

Duration
April 2020 – December 2022
Project Goals

- 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.
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▶ The children acquire informatics competences.
Implementation at the University of Duisburg-Essen
Concepts of Informatics Education for Primary Education

Seminars before Teaching Internship

A  Competences for informatics education
B  Introduction to algorithm with Scratch
C  AI and machine learning in primary education

Seminars while Teaching Internship

D  Robotics: deepening of algorithm thinking
E  Lesson planning

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– Informatics in the Primary Social and Science Education – August 22nd 2022 – WCCE 2022
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. development of rules
   3. testing the model
   4. reflection
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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.
AI and Machine Learning in Primary Education

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
Preparatory and Accompanying Seminars

▶ Students of PSSE acquire informatics competences in the preparatory seminar for the internship semester.
Preparatory and Accompanying Seminars

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- They conduct a teaching sequence on an informatics topic (cryptology or robotics), which also provides teachers with an opportunity for their own implementation.
Preparatory and Accompanying Seminars

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▶ 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.
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  *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

