I'M NOT A ROBOT - REPORT ON THE IMPLEMENTATION OF AI IN EARLY CHILDHOOD EDUCATION

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Abstract

Artificial intelligence (AI) technology is creating a new reality in daily life with e.g., smart home functions. This in turn has a major impact on both the socialisation processes of children and communication behaviour in family. The increasing technology-driven saturation of our everyday routines with AI is a crucial challenge for educational institutions. However, looking at AI in pedagogical work in kindergartens from a scientific perspective, the topic still has some research gaps. Only a few articles, describe efficient education concepts aiming at fostering AI literacy (cf. Chen et al., 2020; Kandlhofer et al., 2017).

In Early Childhood Education (ECE) practice, however, there are many reservations about technology, digital media, and AI in particular (Mertala, 2017). Nevertheless, it is imperative that pedagogically trained professionals understand in depth the implications that arise from the interaction between humans and AI. Within the framework of the project, which is focused on pedagogical practice, educators are encouraged to deal with the topic of AI on the one hand and to test concrete implementation possibilities with didactic materials, so-called toolboxes, on the other. In this way, the use of AI can become a key competence both in pedagogical professional training and in the educational biography of children.

Consequently, the aim of *I'm not a robot*-project is to design transferable and practical modules within the further training of educational professionals to enable an active, creative, and conscious use of AI-based technologies throughout Europe. Furthermore, the goal is to develop and test innovative didactic methods regarding AI teaching and learning materials. The EduSpace Lernwerkstatt -a working unit of the Free University of Bolzano- will conduct the mixed-method study in close cooperation with the project partners, who will all carry out development and testing independently and with country-specific characteristics. The ultimate aim is to develop training programmes for educators that will enable them to integrate current technological developments into their everyday work in a meaningful way.

Keywords: Artificial intelligence, kindergarten, method boxes, training programmes for educators, EU project.

1. Introduction

Artificial intelligence (AI) plays a central role in our daily lives. For example, robots are on the move under the kitchen table after breakfast to collect the crumbs from the floor or trim the lawn in the front garden. Voice recognition software searches for contact data in the address book of the mobile device to make a call to the supervisor or mother-in-law. In some households, refrigerators order favourite products from the supermarket, and the driving assistant helps with parking or keeps a safe distance from the vehicle in front at the highway. AI skills are highly appreciated in economic fields and are strongly promoted as well in education policies in most of the industrialised countries.

However, the increasing impact of AI-assistants into everyday life is a new challenge for educational institutions. To avoid mystification or misinterpretation in the pedagogical work, interaction between humans and AI-assistants in everyday life as well as the basic of AI should firstly be understood by educators. To date, pedagogical approaches to teach basic knowledge adapted to ECE, independent of specific programming languages or tools are hardly to be found in literature. Currently existing studies mostly focus on promoting the application of artificial intelligence technology in preschool education (Jiang, 2020). Others are stressing the potential impact on teaching and learning (Nieding et al., 2020; Tuomi, 2018).

The *I'm not a robot*-project responds to a Europe-wide education and training deficit and offers field-tested concepts and modules for basic application skills in dealing with AI for both educational professionals and children aged 3 to 5 years. The aim is to develop both a demand-oriented methodology for a pedagogically designed application of AI-based technologies in kindergartens.

2. Designing practice-oriented teaching and learning tools

Firstly, to determine the specific situation as well as the existing needs in German, Danish, Lithuanian and Italian kindergartens regarding the topic of artificial intelligence, a questionnaire is developed and applied. This allows the educators' attitudes and reservations about digital media to be surveyed and can be taken into account in the further course of the project. Secondly, from the central results options and potentials for the design of so-called tool boxes are derived. In addition, indications of appropriate content are identified for the further training concept of the pedagogical staff. The training and strengthening of the medi-pedagogical competences of educators is the central goal of the project and thus ties in with the current discussions on the professionalisation of pedagogical professionals in the course of digitalisation (Stadler-Altmann, 2021).

The Free University of Bolzano is chiefly responsible for the development of the tool boxes. Due to the well-equipped environment of the EduSpace learning workshop, the experienced researchers of the Faculty of Educational Sciences find ideally suited prerequisites for both the scientific support in the conception of the boxes and their practice-oriented testing (Schumacher, 2020; Stadler-Altmann et al., 2020). The development and proving of the tool boxes take place in close cooperation with the international project partners and in consideration of the national-specific particularities.

The tool boxes refer to the European Framework for the Digital Competence of Educators (Redecker, 2017) and incorporate the described competency frameworks for responsible, self-determined participation in the digital society. Material and didactic notes inside are accounted for daily use in kindergarten practice. For this purpose, routine play and learning activities of kindergarten children could get deliberately pick up. Additionally, it is illustrated in which fields the resources that are already available in the kindergarten can be linked to the topic of AI. Thus, the underlying activities of the children correspond to the level of development and the developmental tasks of the kindergarten age

All subjects could be developed without much effort, using toys and already existing equipment in the sense of reinterpretation or upcycling. The tool boxes are fruitful in an overall context; thus, the learners get a widespread insight of the AI topic by working through all stages. Nonetheless, the boxes can also be taken independently of each other to highlight individual aspects of understanding and operating with AI. The set provides the opportunity, to apply to the AI topic with little or no prior knowledge of the subject, on the one hand, and to go deeper into the subject of AI with advanced knowledge and each box, on the other hand.

One basic tool box is specifically addressed at pedagogical professionals who are interested in the question of what AI mean in kindergarten and how ease children's access to the topic. In this box, the pedagogical challenges of using digital media in kindergartens are also addressed and embedded in the current state of the educational science discussion. This clarifies the central approaches of ECE in the context of digital media and makes them comprehensible for educators. Included are mainly elements for everyday kindergarten life itself, but also ideas for the home and suggestions for communication with parents.

3. Methods of exploring the media-related environment in kindergartens

The mode and extent of children's media behaviors are strongly hooked on socialisation factors (Hurrelmann & Andresen, 2012, p. 181). This includes both the way children relate to media consumption in their families and the way they get in touch with media in educational institutions. Research on media-related skills in the age group of 6 and older can be conducted using standard qualitative social science methods, whereas knowledge about the younger age group is obtained either through elaborate observation procedures or through surveys and observations of parents or educational professionals. Since the target group in the *I'm not a robot* project is teachers in kindergarten, we address them by means of a questionnaire.

Figure 1. Levels of digitisation of day care facilities for children.
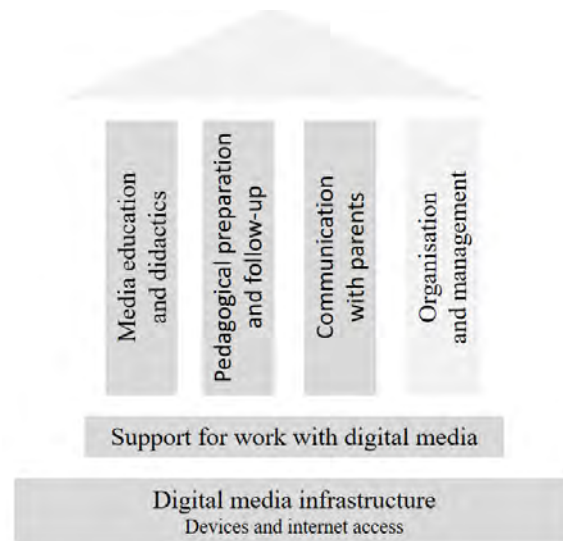
Of central interest to survey the current state are environmental preconditions, personal media competencies, and beliefs towards AI (see fig. 1). The area of organisation and management was not included since commonly inserted nation- or municipality-specific programmes cannot be changed by the institution itself or by the agency. For all areas, questions were asked about the current handling in the facilities, as well as about personal ideals and perceived obstacles. The questionnaire was already confirmed in 2019 within another study (Knauf, 2019, 2020) and was only adapted linguistically for this context.

The expected results will indicate to what extent the pedagogical staff considers their working environment to be functional and consider themselves competent enough to operate professionally with the topic of digital media in general and AI in particular.

4. Discussing approaches integrating AI in ECE

According to the MoFam study (see Wagner et al., 2016), professionals appreciate further education and training that is oriented towards their real working conditions. Furthermore, they are keen on giving a trial to AI or digital devices themselves to gain deeper insight. Materials with comprehensible recommendations are welcome to give confidence in argumentation while counselling parents. This in turn, generates a benefit for families themselves, e.g., as a relief in dialogues with their children.

The following example illustrates the implementation of the AI topic into the daily work with the children in kindergartens (see table 1).

Table 1. Example for the implementation of the AI topic at kindergarten.

Topic	Target group	
Let's play robots!	Educational professionals	Children
Objectives	differentiate terminology (AI, robots, algorithms, programming, coding, ...) Pick up and address various ideas of AI	social skills: leading and following, taking responsibility, developing trust Cognitive competences: planning and implementing sequences Linguistic and communicative competences (programming, understanding symbols) Body-space perception (what is a step, how much is 45° rotation)
Methods	Role-play: moving the robot from a starting point to a destination (touching head = forward, touching left shoulder = turn left, etc.)	
Material	Playing fields: colourful rubber mats, tile floor, command or symbol cards	

The content and orientation of the tool boxes is also based on the children's needs and curiosity about robots. The children's questions in the field of AI are chosen as the starting point for the development of the tool boxes in order to put the children's perspective in the focus of the considerations (Borowski et al., 2016). The structure of the tool boxes already demonstrates that the pedagogical work in the kindergarten is at the center.

5. Conclusion

The range of possibilities for using digital media is not only very wide in professional life, but also in the family or in educational institutions. Following Prentzas (2013), the children's motivation in taking part in learning and social activities and remain interested in the technological resource even in long term interaction is documented well. A survey of professionals in day-care centres conducted by Knauff (2019) shows a great open-mindedness towards the use of digital media. According to the majority of the surveyed working with the computer is comfortable since it facilitates activities of organisational duty.

Generally, a reflected awareness of one's own media competences is a basis to jointly clarify which tasks and goals should be set to promote interaction with digital media and AI. The activity of "playing" in

the children's activities on the computer are too short-sighted. It would be necessary to discuss with each other whether and in what context computer games are a meaningful activity in a day care centre.

So here it would be necessary to define clear objectives and propose didactic arrangements, as mentioned in the example (see tab. 1). Based on this, it can also be determined more precisely which additional competences should be strengthened on the part of the pedagogue.

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