Developing Robot-Supported Inclusive Education (ROSIE)

A Play-Based Approach to STEM Teaching and Inclusion in Early Childhood Education

Bertel, Lykke Brogaard; Brooks, Eva; Dau, Susanne

Published in:
Proceedings of the 13th Conference of the European Science Education Research Association (ESERA)

Publication date:
2019

RObot-Supported Inclusive Education (ROSIE): Developing Educational Robotics Activities and Inclusive Learning Designs in the Transitions Between Preschool and Primary School Practices ROSIE

Applicant name: Aalborg Universitet
Submitted: Tuesday, August 14, 2018 kl. 12:00 PM
Created: Tuesday, August 14, 2018 kl. 1:14 PM
Number of appendices: 12
Funding body: Danmarks Innovationsfond
Instrument: Grand Solutions/Grand Solutions
Case number: 8089-00034A

Table of contents

1. Application

TITLE AND APPLICANT

APPLICATION TITLE

Application title:	RObot-Supported Inclusive Education (ROSIE): Developing Educational Robotics Activities and Inclusive Learning Designs in the Transitions Between Preschool and Primary School Practices
Acronym:	ROSIE

APPLICANT

APPLICANT INFORMATION

CVR-no.:	29102384
Organisation name:	Aalborg Universitet, KST3
Address:	Kroghstræde 3
Zip code:	9220
City:	Aalborg Øst
E-mail:	eb@learning.aau.dk
Telephone no.:	99407730

CONTACT PERSON

Firstname:	Eva Iréne
Lastname:	Brooks
E-mail:	ep@create.aau.dk

SUMMARY

PITCH SUMMARY

What is the innovation and the need behind the innovation?:	By means of educational robotics, this project presents inclusive learning designs for efficient transitions for all children (5-8 years) in the otherwise divided transfer between preschool and school
What is the most important competing solution?:	A comprehensive and powerful mixed method assessment approach validating the utility and impact to broadly scale the results
Who will ultimately receive the value created?:	Due to better inclusion, municipalities&society will save money, children&teachers will develop crucial life and work skills
What will the applied investment from Innovation Fund Denmark mainly be used for?:	Develop educational robotic activities, inclusive learning designs, mixed method evaluation procedures, targeting teachers
How will the project results be implemented?:	The consortium includes end-users who are expected to be the first to adopt the new solutions (AAL, TS, UCN, Kubo, Tiimo).

PREVIOUS APPLICATIONS

PREVIOUS APPLICATIONS TO INNOVATATION FUND DENMARK

Is this a resubmission or a continuation of a previous application to one of Innovation Fund Denmark's programmes. List up to four of the most relevant applications:	No

RELATED APPLICATIONS

RELATED APPLICATIONS

Have you applied for or recieved grants from other funding agencies covering activities in this project or closely related projects. List up to four of the most relevant applications:	No

AIM

AIM

Aim:

The presence of educational robotics in classroom settings is relentlessly getting stronger and has shown to have powerful inclusive and playful qualities (Camilleri, 2017). The question is whether it is possible to make use of these advantages to improve the challenging educational transfers in children's early years (5-8 years of age). In close collaboration with end-users (teachers and children), ROSIE aims to develop practice- and evidence-based knowledge on how play-based pedagogies, educational robotics activities, and mixed method evaluation tools can improve inclusion and learning in early years' educational transitions.

The aim will be reached through three objectives:

- To develop inclusive learning designs to allow for a more smooth and efficient transition for all children in the otherwise divided transfer between preschool and pre-primary school.
- To design and implement play-based and robot-supported learning activities to empower essential life skills through which children develop their imagination, collaboration and communication skills, and to provide pathways capable of including and detecting a diversity of children in a more advanced way than currently offered by traditional usage of educational technologies.
- To develop and validate a systematic and rigorous mixed-method assessment methodology, including authentic as well as big data to understand the utility and impact of educational robots to foster inclusive transition processes.

See concept illustration and technology catalogue in Appendix A, Fig. 1 and Fig. 2.

ROSIE aims to move from SRL6/TRL4 to SRL9/TRL8, with a solution fully scalable and marketable within 18-30 months after project end. Customers will be municipalities and educational technology developers. The consortium includes end-users who are expected to be the first to adopt the new solutions.

UNMET NEED

UNMET NEED

Unmet need:

Getting ready for school is a crucial life change in a child's life (Larsen, 2014). Yet, teachers experience challenges in finding ways to include all children in activities targeting a smooth transition between preschool and primary school as well as developing inclusive learning environments (DEA, 2017; Ministeriet for Børn, Undervisning og Ligestilling, 2016). In Denmark, studies have identified that bigger shifts in learning environments, such as in the transition between preschool and school, include risks for a child to experience difficulties and failures (Ministeriet for Børn, Undervisning og Ligestilling, 2016). An unsuccessful transition can result in socioeconomic, and individual difficulties, e.g. becoming an early leaver from the school system, social and work life alienations, and a passive citizenship. In Scandinavia a student dropout costs approx. 7 million kr. and a total yearly cost for early leavers in Scandinavian schools is approx. 7.5 milliarder kr. (Thedin, 2013).
To give all children a chance to develop to active participants in their own learning, as well as experiencing success and progression in learning activities, teachers need competence to design inclusive learning environments and adequate pedagogical approaches. The problem here is that even though Danish municipalities since 2012 (when the law was changed to improve children's inclusion in the general Folkeskolen to a level of 96%) have allocated resources to handle a diversity of children in general classroom settings, municipalities need to improve their prioritisation of efforts and resources at all levels in the educational system (Ministeriet for Børn, Undervisning og Ligestilling, 2016)
In 2017, an average of 10.6 % of young people (aged 18-24) in the EU-28 were early leavers from education and training (having completed at most a lower secondary education). 12.1 % of young men and 8.9 % of young women in 2017 in EU were early leavers from education. The strategic framework for European cooperation in education was adopted by the European Council in May 2009. It sets out strategic objectives for education and training in the EU, such as making lifelong learning and mobility a reality; improving the quality and efficiency of education; promoting social cohesion and active citizenship; and enhancing creativity and innovation at all levels of education. International research has shown that children's skills and comfort need to be better supplied by a focus on students lifelong, social and personal competencies (OECD, 2018; UNESCO, 2017; EVA, 2012).

The Danish government has addressed that all children should be part of a preschool and school community and emphasises that there is still a need for strengthening the transfer from preschool to school with adequate methods and content (Regeringen, 2017). Yet, preschools and schools offer various pedagogical approaches to early education, all promoting the benefits of their particular methods (Fisher, 2009; Broström, 2013). The challenge lies in teachers' restraint approach to work in cross-disciplinary collaborations (Larsen, 2014).

Disadvantaged children are likely to struggle more during a transition and they aremore exposed to risk factors than other children, such as having low teacher expectations for their competencies. By improving this situation, children can get ahead and boost social mobility (OECD, 2017). Educational robotics has shown being an adequate approach to sustain a process of integration and social inclusion as well as developing key competencies in educational practices (Tosato & Baschiera, 2013; Alimisis, 2013; Alimisis, 2016; Mubin et al., 2013; Rusk et al., 2008; Le et al., 2013). The challenge however lies in a lack of quantitative studies to validate how educational robotics works in learning activities, for whom it works, when it works, and under which conditions.

Due to the cross-disciplinary character of the problem field, teachers' need of support for inclusive practical implementations of educational robotics, the lack of evidence-based knowledge, and the lack of studies validating learning designs including educational robotics, the above-mentioned unmet needs have not been sufficiently approach or solved. Considering that technological developments happens in a fast pace, it is crucial that these needs are met from a pedagogical perspective, rather than a technology-focus, to cope with different kinds of technologies and platforms. ROSIE will contribute to a new ecosystem of inclusive learning opening up new solutions for future educational practices. These solutions rest on a pedagogical continuity, collaborations between teachers from different educational approaches grounded in knowledge that they jointly develop.

STATE-OF-THE-ART

STATE-OF-THE-ART

State-Of-The-Art:

Research into the educational potential and affordances of digital technologies in learning designs for inclusion and diversity indicate strong and promising results in supporting children in need of special support (Murchú & Sorensen, 2004; Sorensen, Andersen & Grum, 2013), e.g. facilitating communication (Sorensen & Andersen, 2017) and increasing feelings of presence, participation and achievement in teaching and learning processes (Sorensen & Andersen, 2016), provided teachers are able to utilize it both pedagogically and technologically (Voldborg et al., 2016). In Denmark, practice-oriented studies (e.g. the HPA and VIDA projects, AU) show how goal-directed work for exposed children in a Danish context strengthen cognitive, social and emotional competences, forming the base for a good start at school and contributing to a better schooling process, and - in the long run - better educational and work possibilities in youth and adult life. Similarly, in Sweden inclusion has been a theme discussed through decades of practice-oriented research, including from classroom studies to interviews with school leaders (Lindqvist & Nilholm, 2013). However, in spite of a long and strong ideological tradition of inclusive policies in Scandinavia, much research in the field has not yet reached the actual educational environment (Berhanu, 2011; Göransson & Nilholm, 2014).
One approach gaining momentum these years is play-based learning (Brooks, 2017). Research shows that play-based learning has an inclusive character and enhances children’s academic and developmental learning outcomes, setting them up for essential skills in children’s life in the 21st century (Eguche, 2014). A play-based approach builds on children’s natural engagement and interest, using play as a context for learning, where children can explore, experiment, discover and solve problems in imaginative and playful ways (Bers, 2008). Such an approach involves both child-initiated and teacher-supported learning, for example by encouraging children’s learning and inquiry through interactions that aim to include and, at the same time, stretch children’s thinking to higher levels.

In the recent Horizon Project Regional Report on Technology Outlook for Scandinavian Schools, educational robotics is identified as a group of technologies to watch, with approximately 3 years to adoption (Adams et al., 201), however research shows that implementation in practice can be difficult and challenge institutional practice (Hasse, 2018).

Whereas programmable, embodied robots encourage interaction, construction and problem-solving and facilitate experiences of meaningfulness, creativity and motivation (Papert, 1980; Caprani & Thestrup, 2010) or “tinkering” characterized as a “playful, experimental, iterative style of engagement (Resnick & Rosenbaum, 2013), until now the dominant application of these robots is rare outside STEM teaching (Fraillon et al., 2014).
When it comes to special needs education and inclusion, social anthropomorphic robots have been explored as robotic tutors, particularly in autism education (Robins, Dautenhahn & Dickerson, 2009; Feil-Seifer & Matarić, 2009; Scassellati, Admoni, & Matarić, 2012), which shows potential but might also reinforce the enactment of specific target groups as passive/disabled consumers in opposition to active/able producers of digital practice (Hansbøl, 2016). Some Human-Robot Interaction (HRI) research suggests social robots in the role as peer rather than tutor (Belpaeme et al., 2012; Tanaka & Kimura, 2010; Zaga, Lohse, Truong & Evers, 2015), however only in few cases is the pedagogical potential of the programming of such social robots considered (Bertel & Hannibal, 2016).

This clear distinction between robots in general education and special needs education carries the risk that the benefits children with diverse needs and skills could have from creating and programming robots might be overlooked. Thus, although robots seem to be excellent educational tools, the pedagogy of robot--supported learning is still in its infancy (Mataric, 2004; Silva, Curto & Moreno, 2015). Another limitation to state-of-the-art research in human-robot interaction is, that it focuses primarily on the role of the robot in one-on-one interactions. Less is known about what roles people occupy with robots in dyads, triads, groups or open environments.

Based on the above analysis, we claim that it is necessary to (1) engage with children, teachers and pedagogic professionals in focused interactions to mobilise their tacit knowledge about the learning and social practices they are engaged in within classroom settings, (2) understand how a novel robot technology can be integrated in these practices, and (3) assess how the practices change by introducing this technology.

STRATEGIC RELEVANCE OF THE PROJECT

STRATEGIC RELEVANCE OF THE PROJECT

Relevance of the project: x

PROJECT DESCRIPTION

PROJECT DESCRIPTION

Project description:

Through collaborative action research combined with participatory design studies and a rigorous assessment procedure, ROSIE aims to investigate the following research questions:

- How can inclusive learning design guidelines for development of efficient transitions between preschool and school be designed in collaboration with practitioners?
- How can programmable, educational robots mediate imagination, collaboration and commmunication skills, and facilitate a play-based approach?
- How can an assessment procedure combining qualitative and quantitative data be designed?

The overall project plan of ROSIE extends to a complete duration of 36 months, dividing the project into three iterations allowing for continuous cycles of validation to ensure that learning designs and robotic activities, as well as scalability models and outreach activities meet the expectations of all involved and that any feedback gained is effectively incorporated. The project plan is methodologically based on collaborative action research (Lofthouse et al., 2016) and participatory design, facilitating innovation, inclusivity and sustainable practice development. Furthermore, the project strategically includes a value network of participants to increase effectiveness and acceptance of the project as well as qualifying outcomes from the three iterations. We plan for a four-phases process to achieve our goals in the most successful way, as illustrated in Appendix A, Figure 2. Rosie's approach follow an incremental process: results from respective iteration will be used as input for the next phase, where adjustments to the pedagogy are made to ensure prolonged use after the project completion.

1. Requirement specification and concept/pedagogy definition
Analysis of the current educational practices (schools and preschools) and to investigate how various affordances and limitations act out and can be evaluated in different educational settings.
• Screening of research and practice ([video-]observations, interviews)
• Requirement analysis
• Future workshop including all project partners
These activities form the basis for the operational requirement and concept definition outcomes as illustrated in Appendix A, Figure 2, Phase 1.

2. Learning designs and educational robotics integration and implementation
Based on outcomes from Phase 1, develop and implement inclusive learning environments suitable to fit in and grow with its children's evolving transition experiences.
• The process for developing learning designs and scenarios is based on capacity building principles (Lopez et al., 2005; Heffernan & Poole, 2005; Levin & Fullan, 2008; Levin, 2012). Development of the learning designs and robotic activities will be carried out locally. Iterative formative evaluation supports the development; the designs and scenarios should be contextually reconciled.

3. Mixed method evaluation
Produce insights to cultivate respective practices in educational settings based on a mix of qualitative and quantitative methods.
The evaluation design and included methods are Illustrated in Appendix A, Figure 3 (bottom left). The implementation and result evaluation is based on the "virknings" evaluation methodology, which focuses on: what works, for whom does it work, when does it work and under which conditions does it work? Thus, the evaluation focuses both on "that it works" (the process and mechanisms) and "virkning" understood as effects and outcomes. This method will help to qualify the practice and create learning cross over methods, pedagogies and educational robotics

techniques regarding what works for whom, why and how. As the quantitative part of the methodology, we will implement data mining methods to identify patterns in big data sets involving machine learning methods (with focus on 2D/3D cameras and other sensors) capturing streams of data from sensors to monitoring facial expressions, gestures and general body movements to validate, e.g. how children interact with each other, the teacher, and the environment when engaged with robots. Moreover, real-time emotional measurements will be carried out by means of Tiimo smartwatch, where children can use icons to develop their emotional experiences.

4. Dissemination, scalability and outreach
To ensure a successful dissemination, scaling and outreach activities targeting different actors' needs and interests, a gathered strategy focusing on recipients, messages and needs, channels and cadence will be developed at the start of the project and be revised once a year to take into account both the continuous communication from the project and dissemination of the final results. Moreover, this strategy will have a specific focus on scaling activities throughout the project. The strategy will be discussed with the expert group. Criteria for the strategy: practice relevance; tailored use; efficient dissemination; support several channels

WORK PLAN

WORK PLAN

Work plan:

WP1: Conceptual framework and requirements specification (M1-31)
The requirements for the inclusive play-based learning principles will be specified alongside the requirements for the educational robotics and for the mixed method evaluation strategy.
Tasks
T1.1 Conceptual framework for the description and analysis of inclusive transition pedagogies.
T1.2 Analysis of preschools and primary schools' transition procedures.
T1.3 Requirement analysis of educational robotics.
T1.4 Idea incubation and prototype evaluation.
T1.5 Development of ROSIE concept based on inclusive play-based learning principles by means of educational robotics for preschools and pre-primary schools.
Deliverables
D1.1 ROSIE concept sketches and requirements, version 1. (M4)
D1.2 Conceptual framework for the description and analysis of play-based learning environments by means of educational robotics. (M8)
D1.3 Contextual analysis report on inclusive play-based learning environments by means of digital technologies in general, including description of strategies and methods used for seeding and cultivating inclusive learning environments by means of digital technologies, version 1. (M12)
D1.4 ROSIE concept sketches and requirements, version 2. (M20)
D1.5 Contextual analysis report on inclusive play-based learning environments, version 2. (M31)
Milestones:
M1.1 Conceptual framework and requirement specification.

WP2: Development of inclusive play-based learning principles and educational robotics scenarios (M5-32)
Tasks:
T2.1 Robot workshops
T2.2 Test sessions
T2.3 Documentation of the connection between the different inclusive play-bsed learning principles, educational robotics solutions and the context in which they are used.
Deliverables:
D2.1 Inclusive play-based learning principles by means of educational robotics scenarios, version 1 (M18)
D2.2 Inclusive play-based learning principles by means of educational robotics scenarios, version 1 (M24)
Milestones:
M2.1 Robot workshops (M14)
M2.2 Test sessions (M20)

WP3: Implementation (M4-36)
This WP targets implementation of three interventions related to educational robot-supported inclusive play-based learning designs. The first objective of this WP is to develop a strategy for an in-context situated implementation (in 5 primary schools, 7 preschools, involving 24 teachers/pedagogues) of three robot-supported inclusive play-based learning designs to enhance children's transition between preschool and pre-primary school. The second objective is to develop tools for documentation and assessment of this transition procedure.
Tasks:
T3.1 Development of strategy for an in-context situated implementation of three robot-supported inclusive play-based learning designs to enhance children's transition between preschool and pre-primary school (interventions) (M20)
T3.2 Implementation of play-based robotic-supported activities
Deliverables:
D3.1 Implementation design (M20)
D3.2 Methods and tools for documentation and assessment of educational robot-supported inclusive play-based learning designs to enhance children's transition between preschool and pre-primary school focusing on three different interventions (M30)
Milestones:
M3.1 Initialising in-context situated implementation (M30)

WP4: Evaluation(M7-36)
The main aim of this WP is to test and evaluate the ROSIE environment, to provide

formative feedback for the iterative development process and to assess the impact of educational robot-supported inclusive play-based learning designs.
Tasks:
T4.1 Specification of the implementation-evaluation. This part of the evaluation should support both the implementation process in preschools and pre-primary schools and municipalities and a valid assessment of the effectiveness of the implemented educational robot-supported inclusive play-based learning designs to enhance children’s transition between preschool and pre-primary school (M7-M36)
T4.2 Specification of the effect and outcome-evaluation. This part of the evaluation should assess if and how the implementation works. It will include authentic as well as big data to understand causal links between the implemented educational robot-supported inclusive play-based learning designs to foster children’s transition between preschool and pre-primary school and the contextual circumstances, which might influence the causality and, thereby, offer possibilities to assess, what is essential for effective interventions in the transitions between preschool and pre-primary school and for local engagement. Performance evaluation thus also contributes to assess whether the project's overarching-purpose and goals are met (M7-M36)
T4.3 Establishment of a baseline. We will implement a baseline via measurements using HPA (measurement of children’s social and learning competencies) and SDQ (Strength and Difficulties Questionnaire) tools. The results from these measurement can be aligned with the Danish norm-values for scoring of SDQ as well as with results from, in particular, Aalborg and Odense municipalities, but also in general Danish municipalities. These measurements will take place in the initial phase of the project and as midterms- and final evaluation (M7-M36)
Deliverable
D4.1 Specification of the implementation and result evaluations (M12)
D4.2 Specification and setup of the baseline studies (M14)
D4.3 Evaluation report, version 1 (M20)
D4.4 Evaluation report, version 2 (M36)
Milestones
M4.1 Feedback to ROSIE development process based on outcomes of implementation (formative) evaluation (M14-M36)

WP5: Scalability, dissemination and outreach (M1-36)
The first objective is to develop a realistic stakeholder based scalability strategy for ROSIE as well as a continuation plan after the project end. The second objective is to ensure that results and knowledge gained during the project are available to all interested parties through a website and appropriate promotion activities. We will organise a workshop targeting relevant players in the education sector, in particular preschools and Folkeskole (with Aalborg municipality and Teknologiskolen in Odense as a starting point) and one workshop for the robotics community. Scientific dissemination will be done mainly via publications in high level conferences and journals. Based on the knowledge that are developed within ROSIE, the third objective is to carry out specialisation modules at UCN (pedagogue, teacher and social educations). Moreover, the project till keep a continuous dialogue with relevant political actors to scale educational robotics-supported inclusive activities, principles and scenarios to foster children’s play-based skills.
Tasks:
T5.1 Scalability strategy (M6-M36)
T5.2 Public awareness activities (including web-pages, communication via media, etc.) (M1-M36)
T5.3 Two workshops (M12 and M30)
T5.4 Scientific dissemination
T5.5 Continuation plan and applying for funding (M30)
Deliverables:
D5.1 Scalability strategy and roadmap (M42)
D5.2 Report on the two workshops (M34)
D5.3 15+ peer reviewed scientific papers (M36)
Milestones:
M5.1 Workshop for players in the educational sector (M12)
M5.2 Scientific workshop at a major robotic-learning / human-robot-interaction conference (M30)

WP6: Management (M1-36)
Tasks:
T6.1 Scientific management of the project.
T6.2 Financial Management of the project.
Milestones:
M6.1 Concept and requirement specification completed (M8)
M6.2 Iteration 1 Play-based learning principles and educational robotics scenarios

	operational. M6.3 Iteration 2 Play-based learning principles and educational robotics scenarios operational. M6.4 Iteration 3 Play-based learning principles and educational robotics scenarios operational. M6.5 Successful implementations at Aalborg Kommune and through Teknologiskolen.

READINESS LEVELS (TRL AND SRL)

TECHNOLOGY READINESS LEVELS

Start TRL:	6
End TRL:	9

SOCIETAL READINESS LEVELS

Start SRL:	4
End SRL:	8

RISK MANAGEMENT

RISK MANAGEMENT

Risk management:

ROSIE is an educationally innovative project, driven by stakeholders’ needs and prototypical work, thus the project faces several risks and proposes the following management of these:

- Inadequate Problem: The project requirements stem from actual needs and practical problems identified by researchers and practitioners in collaboration and iterated throughout the project period (M1.1).

- Inadequate Innovation: Leading researchers with complementary expertise, cutting-edge knowledge and extensive outreach in educational robotics and programming interfaces, learning design, pedagogy and inclusion guarantees that the project will be at the forefront of the disciplines (M2.1 & M5.1-2).

- Inadequate Solutions: Through iterative processes and formative assessment (M3.1) as well as the involvement of leading practice experts and educators and R&D companies with extensive experience in development and implementation of technological and pedagogical interventions , the project consortium can confidently to develop, apply and refine robot-supported learning designs and methods in correspondence with Danish educational innovation and practice (M4.1).

- Inadequate Project Organisation: The consortium contains the right mix of research institutions, integrators (UCN/CFU and Teknologiskolen), technology providers, and end-users to guarantee success. The designated project coordinator (AAU) has great experience in managing research projects and the work plan has been designed carefully to accommodate the size of the consortium and type of project and the consortium has an established history of previous successful collaborations. If a partner has difficulties to reach critical milestones, the Co-ordination Committee is responsible for finding a solution and inform Innovationsfonden.

- Inadequate Timing: Continuous monitoring of the other main players will be part of an ongoing evaluation to guarantee that the project reaches all its goals in time (M6.2-4).

LEGAL, ETHICAL OR REGULATORY DEMANDS

LEGAL, ETHICAL OR REGULATORY DEMANDS

Legal, ethical or regulatory demands:

The ROSIE project is subject to common research-ethical principles of transparency in the research process, systematics, and conditions of quality of documentation as well as the protection of sources, individuals, groups, etc. requiring full anonymity and a demand for informed agreement from parties who by their participation deliver empirical data. The national rules from the Research Ethics Committee will be respected as well as European regulations for data protection and privacy (GDPR).

Since the ROSIE project involves vulnerable user groups (minors and children with special needs), in addition to general legal standards and regulatory demands, special ethical consideration must be made, especially with regard to informed consent, human-technology interaction and data collection methods.

Furthermore, the participatory approach to educational design and implementation in ROSIE requires open, democratic processes with continuous stakeholder involvement and close collaboration between equally valued partners from both research and practice.

VALUE CREATION - GROWTH AND EMPLOYMENT

VALUE CREATION - GROWTH AND EMPLOYMENT

Value creation - growth and employment:

In addition to solving societal issues related to inclusion and improved quality of life for children with special needs as well as the prevention of drop-outs, the market for robotic toys and educational robotics is growing rapidly in recent years, with an estimated time-to-adoption set to 2-3 years (2017 NMC Technology Outlook report for Nordic Schools). Both education and entertainment are considered key market domains in the coming years (Robotics 2020 Multi-Annual Roadmap for Robotics in Europe). The current entertainment and education market, however, is primarily concerned with either robotic toys with no supporting learning design or particular educational value, or with the supply of kits and systems to school and higher education markets, where robotics is often used as the basis for the practical side of this type of teaching, thus a gap can be identified between the need for innovative pedagogic approaches to the use of robots in education and entertainment, and the lack of both relevant robotic platforms and supporting educational material and methods to support the use of these in practice. As there is no pan European standards for education, the markets tend to be fragmented along national boundaries (SRL 4 or 5) there is a great potential for Denmark to set new standards in terms of developing and exporting a holistic robot pedagogy as well as the development of new robotic technologies, aimed specifically at preschool or particular target groups in this context (targeted to and across gender, certain age groups, special abilities or needs etc).

PROJECT OUTCOME RECIPIENTS

PROJECT OUTCOME BENEFICIARIES/RECIPIENTS

Project outcome beneficiaries/recipients:	The project outcome will benefit primarily children, social workers, teachers and pedagogic professionals. The children's challenges in the transmission from preschool to primary school is met with educational robot-supported inclusive play-based learning designs to foster the children's transition between preschool and primary school. From the perspective of the play-based learning and the use of robotics ROSIE will enhance children's academic and developmental learning outcomes, setting them up for 21st century skills. The presence of educational robotics in classroom settings will support an inclusive and playful educational transmission offering the children digital, social, and cognitive skills The social workers /pedagogues at kindergarten and teachers and pedagogues in preschool will receive novel design tools and process methods to meet the children's transition challenges facilitated by the technology of Tiimo, Kubo and other platforms within educational robotics. The integrated solutions offered by the project will support the existing inclusive work of teachers and pedagogic professionals combined with a familiarity of the use of robotics. Thus, the project increases the digital competencies of both children and educators combined with inclusive works and better early years' educational transitions.

IMPLEMENTATION

IMPLEMENTATION

Implementation:

Implementation of results throughout the project period is ensured through an ambitious plan for dissemination and integration of the project results based on ongoing user involvement as well as both academic and public dissemination.

Academic implementation and dissemination will happen through peer-reviewed papers published in national and international conference proceedings and journals. A publishing plan will be designed in alignment with the project milestones and will be adjusted and further refined annually.

In addition, the project will initiate workshops and seminars on robot-supported learning and inclusion with the purpose of facilitating national and international networking opportunities on the design, development and implementation of educational robot technology, bringing together researchers, developers and practitioners within educational science and practice, engineering, robotics and other relevant fields of research, providing a platform for interdisciplinary and cross-cultural collaboration.

For research to have impact and enrich the actual and practical use of robots for inclusion, research must be aligned with current practice. Thus, the consortium employs a team of highly experienced integrators through UCN, CFU and Teknologiskolen. These partners work to facilitate projects and launch local networks and activities for teachers and pedagogic professionals within technology-enhanced learning and have vast experience in implementing technology in practice. Furthermore, the ROSIE project will propose a strategy for competence development activities for educators and students within the educational field.

The consortium aims to communicate and take actions to implement the project results throughout the project period as well as ensure that the project is aligned with the reality of stakeholders in the educational system. This is done by increasing the interaction between researchers, developers and practitioners both within the formal educational system and informal learning environments (private and public companies, museums, activity centres etc.). Finally, project results will be disseminated on relevant digital platforms.

The achievement of the expected impacts depends on a variety of factors, only some of which are under the direct control of the project. Internal factors such as the organisation of the consortium, quality assurance, time management are addressed in the risk assessment. External factors of particular importance for the long-term impact of the project results include:

Political backing, which is crucial for long-term success and impact of research areas that may require several years to mature and consolidate. This holds especially for
areas such as education change where the impact often can be assessed only in the long run. Furthermore, the social acceptance of robot-based solutions heavily influences the success of new technologies and scientific findings, as the introduction must be aligned and integrated with the educational practices but also with collective policies and organizational strategies. Towards this end, a close collaboration between research and practice is considered a prerequisite for the adoption and implementation of new solutions and practices in the educational institutions.

The scientific acceptance of the significance of the research area is important for the successful implementation of results in the scientific as well as in the practice domain. While topics related to the ROSIE project such as robot-mediated learning, creativity, computational thinking and computer-supported collaborative learning are currently of high interest to the research community, it still remains a challenge to combine rapid technological advancements in ICT and robotics with those of the learning sciences.

INTELLECTUAL PROPERTY RIGHTS

INTELLECTUAL PROPERTY RIGHTS

Intellectual property rights:

Based on the existing collaboration a contract governing the IPR will be made between the partners. This will ensure an open communication and collaboration ensuring both patents and publications.

In order to maximize impact of the project and ensure the best possible exploitation of its results both commercially and in relation to further research, the applicants will pursue the strategy outlined below for intellectual property protection of project results. Taking into consideration the subject matter of the project, the applicants assume that the intellectual property rights with relevance for this project will consist of patent rights and/or copyrights.

In the event that a result is deemed patentable, including the fulfillment of the requirements for inventive step and novelty, as well as commercially viability, a patent application will be filed. The disclosure of results (e.g. in publications) will await the filing of the patent applications, in order to safeguard the requirement of novelty. This means that patent applications, if relevant, will be filed at an early stage, in order not to block such disclosure or publication. The project partners have discussed the IPR strategy and at the time of submission all partners agree that there are no particular challenges related overlapping business areas between partners, nor are there any apparent barriers in relation to the intellectual property protection of the results generated in the project or relations to intellectual property rights of third parties. That is, the above strategy will be explicitly described in the consortium agreement.

The consortium generation of results is, to the best knowledge of the consortium, not dependent on access to existing intellectual property rights.

FINANCIAL GEARING

FINANCIAL GEARING

Financial gearing:

-

GOVERNANCE AND LEADERSHIP

GOVERNANCE AND LEADERSHIP

Governance and Leadership:

The principal investigator (PI) will be Professor Eva Brooks (EB). EB has an extensive
management experience in coordinating and leading national and international research projects. Day-to-day management of ROSIE will be handled by AAU and be assisted by a financial secretary from AAU for budgeting and accounting. The PI will handle
day-to-day scientific matters together with WP leaders and will be responsible for achieving the milestones. A steering committee (SC) will be established with members from partners not involved in daily operations. Scientific coordinator will be responsible for major scientific, financial and management decisions.
Advisory Board (AB): Mikala Hansbøl, Docent, ph.d., Det Samfundsfaglige og Pædagogiske Fakultet, Institut for Skole og Læring, Metropol; Forælder in Aalborg Kommune; Rasmus Greve Henriksen, Leder, Pædagogisk og Digital Udvikling; Researcher Krig Hanning/Professor Mitchel Resnick, Massachusetts Institute of Technology, USA.

COMPETITORS

COMPETITORS

Competitors:	Relevant competitors include other educational robotics developers, in particular toy companies moving into the field of education (LEGO, Beebots, Dash & Dot etc.), however these competitors have little insight into transition processes between preschool and primary school and do not offer specific tools related to learning and inclusion. Other relevant competitors include integrators such as other University Colleges and organisations who offer services related to implementation of educational tools and competence development of professionals. Research competitors include related robotics groups, most prominently located at MIT, Stanford University and University of Hertfordshire, however this research is mainly conducted in experimental settings with less focus on applicability in practice.

PEER REVIEW

SUGGESTION FOR PEER REVIEWER 1

Name:	Carsten Jessen
Place of employment:	Aarhus
Position:	Emeritus
Competencies:	Robotteknologi til leg og bevægelse
Link to webpage:	http://pure.au.dk/portal/da/persons/carsten-jessen(6ca324c0-4886-4c61-9871-c7a65ee46114).html

Do you wish to list unwanted peers?: No

BUDGET INFORMATION

DURATION

Project start date:	01-01-2019
Project end date:	31-12-2021
Duration in months:	36

AMOUNT

Applied amount excl. overhead :	4.098.765 kr.
Applied amount for overhead:	1.641.076 kr.
Applied amount incl. overhead:	5.739.841 kr.
Total budget incl. overhead:	7.670.310 kr.
Investment in the project from Innovation Fund Denmark:	75%

ADMINISTRATOR

CVR no.:	29102384
Administrator:	Aalborg University
Institution type:	Dansk: Universitet
Department/institute:	Department of learning and philosophy, Department of architecture, Design and Media Technology and Departement of Planning
Address:	Fredrik Bajers Vej 5
City:	Aalborg Øst
Postal no.:	9220
Country:	Denmark

1. Appendix A: Figures

Appendix A: Figures, pictures and tables

State the numbering, title, brief figure description and the most relevant section of the application form, relating to each figure.

This front page template and all one-page figures must be compiled according to the numbering, into a single PDF document and attached the application. The front page is not included in the 5 page limit.

Figure number	Title	Brief description	Related section of the application
1.	Illustration of the ROSIE concept	Conceptual framework describing the implementation and assessment of ROSIE inclusive learning designs and robot-supported learning activities for smooth transition procedures between preschool and primary school (5-8 year old children).	Aim
2.	Technology catalogue	Examples of a range of programmable, educational robots that could be included in the project.	Aim
3.	Illustration of the ROSIE overall methodology	A four-phases process describes the overall methodology to achieve our goals in the most successful way. ROSIE's approach follow an incremental process: results from respective iteration will be used as input for the next phase, where adjustments to the pedagogy are made to ensure prolonged use after the project completion.	Project description
4.	ROSIE development process (top left), implementation strategy (right) and evaluation design (bottom left)	*Top left figure*: Development process for educational robotics and pedagogy designs and activities. *Right hand figure*: Four phases implementation strategy. *Bottom left figure*: Evaluation design.	Project description
5.	Gantt chart of the ROSIE project	Outline of tasks within the work packages, and timeline of work packages.	Work plan

2. Appendix A: Figures

Figure 2: Catalogue of Educational Robots

Rather than testing the applicability of one specific robotics platform for learning and inclusion, the project aims to develop robot-supported designs for learning that are adaptable to different types of robots for different purposes. Thus, this catalogue presents a range of programmable, educational robots that could be included in the project depending on the context. Many of these are already available to project partners through self-financed activities; others could be acquired partly through the project if relevant.

Fable

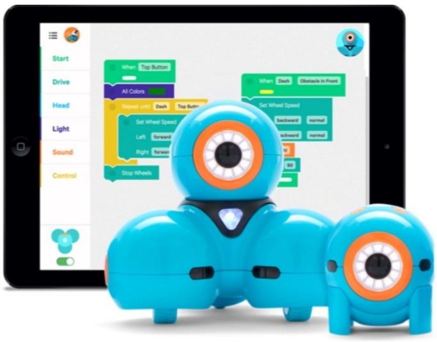
Fable is a modular robotic platform developed by Danish DTU spin-off Shape Robotics. Fable enables non-expert users to develop and program robots ranging from advanced robotic toys to robotics solutions to problems encountered in their daily lives. Until now Fable has mainly been tested as part of learning designs supporting 21st century skills (programming, innovation, creativity, complex problem solving and systematic thinking) with children aged 8+.

KUBO

Kubo is a simple and intuitive educational robot developed by Danish startup Kubo Robot. Kubo is designed to support learning for children in early primary school in various subjects, such as coding, language, and music through a tangible coding language; TagTiles. The potential of Kubo to support specific needs and skills is yet to be explored.

Dash & Dot

Dash & Dot is an educational toy robot that teaches children aged 6+ to code through play using apps on tablets and phones. Most studies and application with Dash & Dot focuses on programming and 21st century skills and less on the pedagogic potential of embodied, social interaction with the robots.



Bee Bot

Bee Bot is a simple, mobile robot designed for young children with the purpose of introducing basic programming and sequencing through simple commands and playful interaction. Bee Bot is fairly accessible and a Danish guide with exercises has been made, however none of these seem to focus specifically on inclusion or diversity in play and learning.

3. Appendix A: Figures

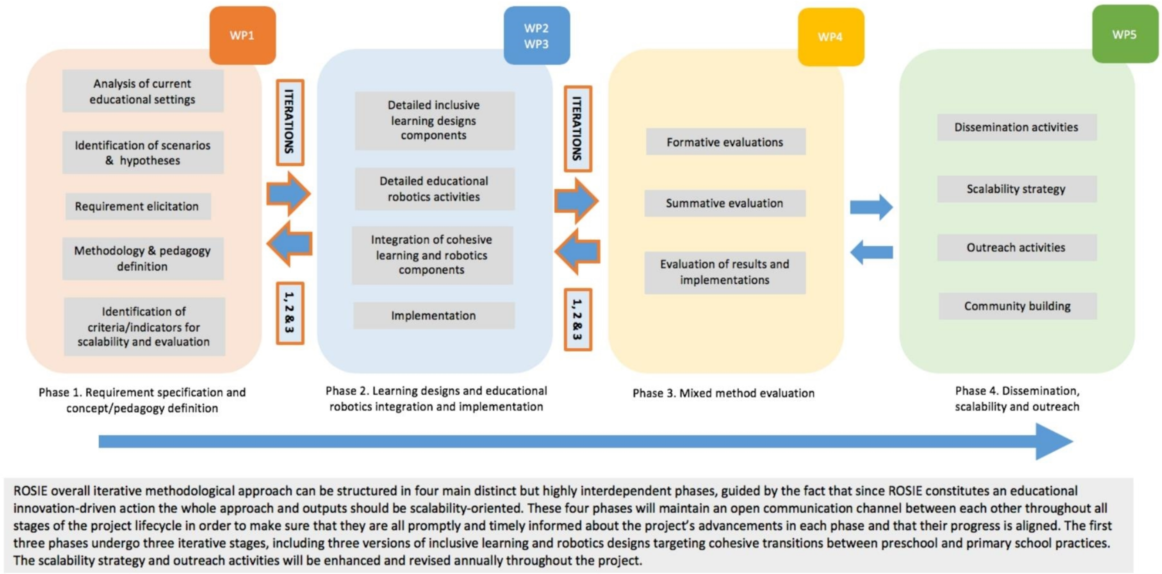


Figure 3: Rosie overall methodology

4. Appendix A: Figures

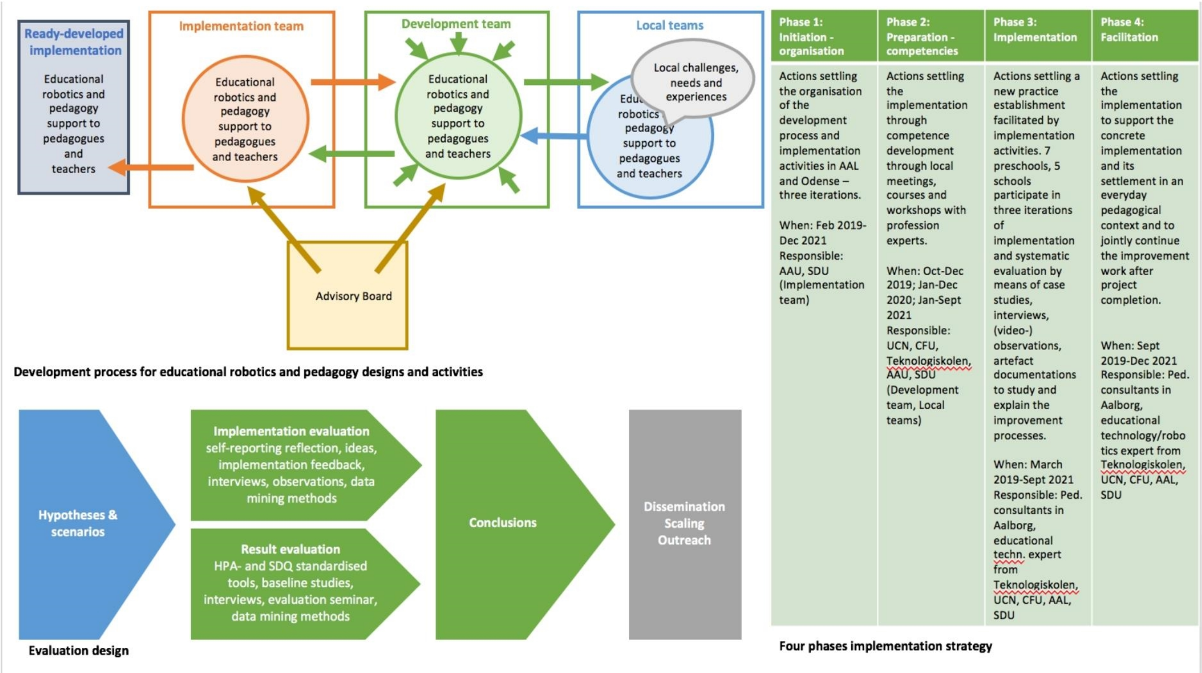


Figure 3: ROSIE development process (top left), implementation strategy (right) and evaluation design (bottom left)

5. Appendix A: Figures

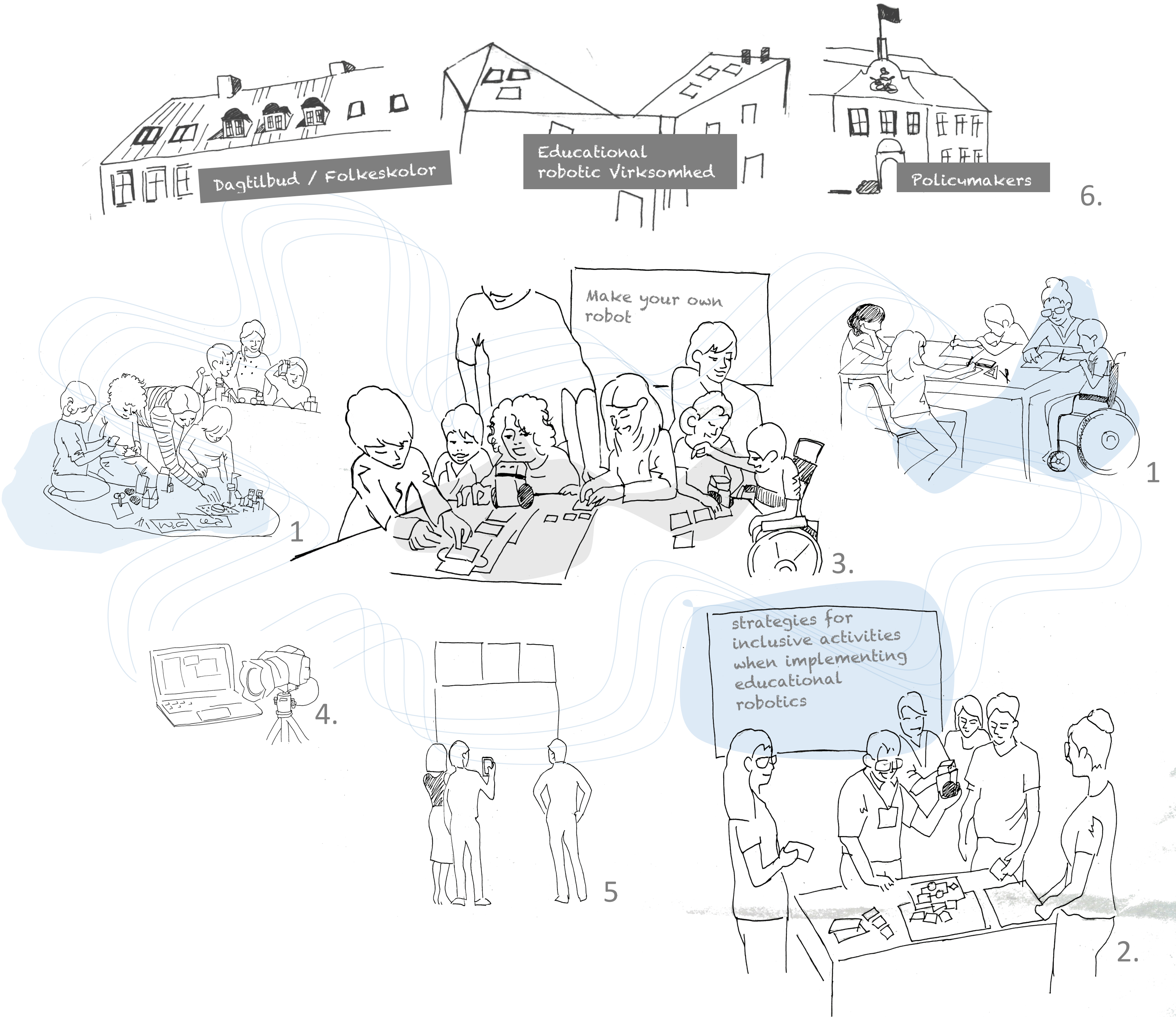


Figure 1 ROSIE conceptual framework: ROSIE focuses on an iterative approach to build capacity among teachers to create inclusive learning environments by means of educational robotics. The concept is assessed and validated through a rigorous mixed method approach targeting a broad scaling and dissemination to other municipalities and for companies to develop their business:

(1) The mainstream learning environments in preschool (left) and school (right) lean on different pedagogical approaches. Preschool is based on themes and play is a common ingredient in planned and free activities. School is based on a structured curricula focusing on different subjects rather than themes, resulting in clearly different activities.

(2) Through the ROSIE project, practitioners from preschools and schools come together with experts from AAU, UCN, SDU, TS, KUBO and Tiimo, to jointly create a common ground and understanding of inclusive activities. They enjoy playing with the different technologies and learn about them in relation to inclusive and play-based activities.

(3) Practitioners have become experts and created an inclusive robotic-supported play-based learning space. Here, children can use powerful robotic platform and develop essential life skills, in particular ROSIE focuses on collaboration, communication, imagination, problem solving and critical thinking competencies. Children from primary school teach preschool children how to programme and they enjoy playing together. Flexibility and sensitivity to children's diverse needs and desires are naturally included in the activities, which sometimes are children-directed and sometimes teacher-led – it depends on the context.

(4) In order to collect qualitative and quantitative data, different equipment (e.g. cameras, sensors, iPads) are used for the mixed method assessment.

(5) Parents have a crucial role when it comes to transitions between preschool and primary school. Parents are not directly involved in the project, but play a crucial role in the advisory board. From a parent perspective, they will help the project to keep on track.

(6) Through a rigorous assessment and validation ROSIE targets a broad scaling of the new innovative pedagogy, including inclusive learning designs and play-based educational robotics activities and the assessment approach. Primary customers are municipalities and educational robotics companies.

ROSIE conceptual framework is depicted as an evolving assemblage of material, social and cognitive resources enacted in practice.

6. Appendix B: Partner motivation

Appendix B: Partner motivation

Describe each partner's key competences and motivation in relation to the project activities. List the partner's number from filled in budget file (xlsx).

Partner (name and no.)	Key competences and motivation
1. Aalborg University (AAU)	ROSIE is cross-disciplinary project and therefore includes three different departments at AAU, Learning, Create and Plan – each of them with specific key competencies and motivations. Learning has conducted research in the field of playful learning, digital technologies, interaction design, inclusion, and have extensive evaluation and research experiences. Create contributes with the computer vision group, which consists of 20 researchers. The group has conducted research within computer vision and machine learning for 20+ years and has participated in numerous (inter)national projects. Plan has conducted research specifically in robotic for learning and inclusion.
2. University College North (UCN)	University College of Northern Denmark (UCN) is an educational and research institution in the northern region of Denmark. We deliver educations and research to the whole region. The research program "Professional Development & Educational Research" at UCN is managing the educational research and research of blended learning and digital learning. CFU (Centre for teaching resources/aid) is offering courses and robotics and digital resources for municipal the schools
3. Southern Denmark University (SDU)	Our key competences are in educational technologies and robots. We develop new robots and new applications of existing robots. Our methodology are based on participatory design, which means that the end users participate in all phases of the design process. Additionally, we explore new of the shelf educational robots in learning and teaching. The project will strongly support our research in educational technology especially educational robots. Moreover, this project will enrich to our knowledge in technology didactics for young children.
4. Teknologiskolen (TS)	Teknologiskolen, TS, is a volunteer NGO that was founded in 2015 because we identified a need for technologically oriented after school activities. Our first season was a huge success with 60+ participants between 10 and 16 years attending. The two following seasons we had 100+ participants and 20+ volunteers split into 7 different classes, also introducing a new class for children between 5 and 9 years. Our objectives are to develop high-quality technologically oriented after school activities based on supervision in small groups rather than traditional teaching. Our age groups within our activities are currently 5-9, 10-12 and 13-16.
5. Aalborg commune (AAL)	Skoleforvaltningen består af 48 folkeskoler, hvor kerneopgaven er elevernes læring, dannelse og trivsel. Formålet med folkeskolen er at forberede eleverne til videre uddannelse samt at ruste eleverne til et indgå aktivt i en digital fremtid. Der lægges vægt på at eleverne udvikler såvel programmeringsforståelse og-kompetence samt kommunikations- og samarbejdskompetencer. Projektet matcher vores mål om, at læringen skal foregå overvejende eksperimenterende og problemløsende, herunder en "trial and error" tilgang, og projektet passer også ift. vores strategi om den gode overgang mellem dagtilbud og børnehaveklasse.
6. KUBO (KUBO)	KUBO Robotics is a multi-award-winning enterprise established in 2016. We have created a unique robotic classroom solution, which breaks down barriers to teaching technology to students from as young as four years. With its groundbreaking TagTile™ system, KUBO allows educators to introduce concepts of coding in an easy, hands-on, screen-free way so that children can learn to become creators, innovators, and designers of our future technologies. Through ROSIE, we expect to gain essential insights on implementation in schools and other institutions, which will strengthen our foundation for creating new classroom materials and activities.

Partner (name and no.)	Key competences and motivation
7. Tiimo (TiiM)	Tiimo is a spin-out from the IT University, specialised in providing structure and empowering children with special needs through technology. After successful implementation, we decided to focus on developing the self-assessment module Tiimood, an application improving ADHD therapies through real-time emotional measurements. We see a unique opportunity to validate and further develop this in the ROSIE project as a tool to collect data and access real-time emotions in educational interventions.

7. Appendix C: Key persons including CVs

Curriculum Vitae
Eva Brooks has a PhD in Education Science, is Professor in IT-based Design, Learning and Innovation, and Director of the *Xlab: Design, Learning, Innovation* at the Department for Learning and Philosophy, Aalborg University, Denmark. Brooks' research evolves around digital technologies for play, learning and rehabilitation, including the question of how they can be designed to foster play and innovative forms of learning for people with a diversity of abilities. Her research interest has always been attached to trans-disciplinary teamwork and thereby carried out cross-over competencies and in close collaboration with stakeholders. She has a specific interest in methodologies, methods for qualitative and design oriented research as well as of mixed methods approaches.

Brooks has an extensive experience in coordinating and leading national and international research projects. She has received more than 4 million € in research grants, e.g. European projects within ICT programme, COST Action, Erasmus Plus, and Swedish national research programmes, e.g. the Knowledge Foundation. She has collaborated with the industry in different projects, e.g. BRIO AB and IBM. Recently, she has received funding from Eurostar/Innovationsfonden, AP Møller Foundation, Erasmus+, Cost Action, European Commission FP7-Objective ICT-2011.8.1, and Innovationsfonden.

Selected Publications:
Sylla, C., Brooks, E., Pareira, Í, Zagalo, N. (2017). t-books - a Block Interface for Young Children's Narrative Construction. Accepted for International Journal for Child-Computer Interaction.

Brooks, E. (2017). Lekfull Kreativitet. Fysiska Användargränssnitt som Erbjuder Social och Fysisk Interaktion [Playful creativity. Physical User Interfaces Offering Social and Physical Interaction]. PAIDEA, 13, pp. 55-65.

Beckett, A., Brooks, E., & Holt, R. (2017). Moving Beyond Boundaries: When User-Centered Design meets Sociology. In the DSAI 2016: Proceedings of the 7th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion.

Petersson, E. & Brooks, A. (2007). Non-formal Therapy and Learning Potentials through Human Gesture Synchronized to Robotic Gesture [HRI] within a Virtual Environment [VE]. Universal Access in the Information Society, 6:166-177.

Borum, N. Petersson Brooks, E. & Brooks, A. L. (2015). Designing with Young Children: Lessons Learned from a Co-Creation of a Technology-Enhanced Playful Learning Environment. In Marcus, A. (Ed.). Design, User Experience, and Usability: Interactive Experience Design. Lecture Notes in Computer Science. Berlin Heidelberg: Springer International Publishing, pp. 142-152.

Petersson Brooks, E. & Brooks, A. L. (2015). Digital Creativity: Children's Playful Mastery of Technology. In Brooks, A. L., Ayiter, E. & Yazicigil, O. (Eds). Arts and Technology. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering. Berlin Heidelberg: Springer, pp. 116-127.

Petersson Brooks, E. (2013). Ludic Engagement Designs: Creating Spaces for Playful Learning. In Stephanidis, C. & Antona, M. (Eds.), Universal Access in Human-Computer Interaction. Applications and Services for Quality of Life. Lecture Notes in Computer Science. Berlin Heidelberg: Springer-Verlag, pp. 241-249.

CV for Thomas B. Moeslund, PhD, PROFESSOR

Date of birth:	Marts 20, 1971
Affiliation:	Department of Architecture and Media Technology (CREATE), Technical Faculty of IT and Design (TECH), Aalborg University
Address:	Rendsburggade 14, DK 9000 Aalborg
Phone:	+45 9940 8787
E-mail:	tbm@create.aau.dk
WWW:	www.create.aau.dk/tbm
Present positions:	
2016-	Professor at Aalborg University
2012-	Head of Media Technology, Aalborg (approx. 40 people)
2006-	Head of the Visual Analysis of people lab (approx. 20 people)
Previous positions:	
2012-2016:	Professor MSO, Aalborg University
2006-2012:	Associate Professor, Aalborg University
2004-2006:	Assistant professor, Aalborg University
2001:	Vision Engineer at Thoustrup and Overgaard, Randers, Denmark
Education:	
2012:	Research Management, Copenhagen Business School
2003:	PhD, Aalborg University
1996:	M.Sc. EE, Aalborg University

Research interests:
Main interest is building systems for automatic understanding images and videos containing humans: Looking at people. Other interests include (random order): image analysis, computer vision, machine learning, machine vision, surveillance, drones, robotics, motion capture, human perception, augmented reality, virtual reality, HCI, computer graphics and animations

Fundraising in the last year:
Total (my share): 4,576,000 EUR (2007 - 2018)
Recent grants:

2018-2020:	WP leader in AAU project on assistive personal robotics (share ~ 200,000 EUR)
2018-2020:	PI in TrygFonden project on preventing drowning accidents (share ~ 150,000 EUR)
2018-2020:	Supervisor for an industrial PhD on quality control (share ~ 48,000 EUR)
2017-2021:	WP leader in IFD project on human-robot interaction (share ~ 145,000 EUR)
2017-2020:	WP leader in Utzon project on human-machine interaction (share ~ 100,000 EUR)
2017-2020:	PI in LOA project on Sports analysis (share ~ 100,000 EUR)
2017-2018:	PI in Obel project on Camera equipment (share ~ 40,000 EUR)
2017-2018:	PI in Hammel Neurocenter project on neuro-rehabilitation (share ~ 26,000 EUR)
2017-2020:	WP leader in IFD project on esthetic quality control (share ~ 107,000 EUR)
2017-2020:	Supervisor for an industrial PhD on food manufacturing (share ~ 48,000 EUR)

Supervision:
PhD students: 10 graduated. Currently 9 enrolled
Master thesis: 52

Publications: (details: www.create.aau.dk/tbm/publications/)

Peer reviewed journal articles:	57
Peer reviewed conference articles:	179
Books:	13
Citations:	8651 (Google Scholar)
h-index:	33 (Google Scholar)

Google Scholar: https://scholar.google.dk/citations?user=XmkDts4AAAAJ&hl=da

MISC.:

- Best paper awards: 2017, 2016, 2016, 2012, 2013, 2010
- Nordjysk Universitetsfond Innovationspris, 2013
- Teacher of the year award, 2010
- Most cited paper award, 2009
- (Co-)Organized 24 conference/workshops/tutorials
- (Co-)Organized 5 journal special issues
- Associate editor for four journals
- PhD examiner: 11 times internationally and three times nationally
- External evaluator for the Austrian, Belgium and Swedish research councils
- Public dissemination: TV = four times. Radio = six times. Newspaper = 20 times

Lykke Brogaard Bertel
Rendsburggade 14, 9000 Aalborg Ø
Tel: +45 29864154, email: lykke@plan.aau.dk
Date of birth: 25th of August 1986

Lykke Brogaard Bertel received her PhD in Human-Computer Communication & Interaction in 2016, specializing in Persuasive Educational and Entertainment Robotics (PEERs). She has a background in digital technologies and persuasive design, and has worked as a specialist in robot-mediated motivation and learning since 2011. She is affiliated with the UNESCO centre for Problem-Based Learning as well as the Aalborg U Robotics group. Her research interests are in the fields of human-robot relationships, motivational psychology and participatory design. In her PhD thesis, she studied design-aspects of robot-supported learning in primary and special education.

Education

PhD in HCI and Human-Robot Interaction	2012-2016
MSc IT, Persuasive Design	2009-2012
BA, Communication & Digital Media	2006-2009

Appointments held

Postdoc at Department of Planning, Aalborg University	2017-
External lecturer at Embodied Systems for Robotics and Learning, SDU	2016-
Consultant/specialist, Center for Robot Technology and Health & Human Interaction Technologies, DTI (Industrial PhD 2012-2016)	2011-2017

Fundraising & Research projects

Tiimo, Datadriven self-assessment for children with special needs, Innobooster	2018
Persuasive Educational and Entertainment Robotics (PEERs), Industrial PhD, Innovationsfonden	2012-2016
FutureTech : Co-creating digital learning designs with 3D-printers and robot technology, Insero Foundation	2013-2014
Virtual Learning Desk (ViLD), Interactive and adaptive Smart tables for accessibility, Trygfonden	2012-2013

Relevant publications

- Bertel, L. B. & Hannibal, G. (2016). *The NAO-robot as a Persuasive Educational and Entertainment Robot*, Læring og Medier (LOM), Vol. 8, No. 14
- Bertel, L. B., Rasmussen, D. M., Majgaard, G. and Hannibal, G. (2015). *Design-Based Research in Child-Robot Interaction : Bridging the Gap between the intended and the implemented,* Abstract and poster presentation at Workshop on Evaluating Child-Robot Interaction, 7th International Conference on Social Robotics
- Bertel, L. B., Rasmussen, D., and Christiansen, E. (2013). *Robots for Real : Developing a Participatory Design Framework for Implementing Educational Robots in Real-world Learning Environments*. International Conference on Human-Computer Interaction (INTERACT)

Susanne Dau

Associate professor (Docent) and Head of the research program Professional Development & Educational Research

PROFILE

I am certified in research management from CBS. I do research and project management and supervision of Ph.D. students in the research program. My research includes; blended learning, flexible learning design, learning spaces, digital navigation, digital learning and learning design in higher education. I do mixed method and qualitative research methods.

Contact Information:

Name: Susanne Dau

sud@ucn.dk

+45 72691246

University College UCN

Mylius Erichsens Vej 137

9210 Aalborg SØ

RELEVANT EDUCATION

2016	PhD, Aalborg University, Human Centret Communication and Informatic HCCI)
2002	Master in learning processes (MLP), Aalborg University
1997	Diploma in nursing science, Danmarks Sygeplejehøjskole
1992	Nurse (RN)

EMPLOYMENT

2017-	Docent (ass. Professor) and Head of the research programme Professional Develop ment & Educational Research, UCN
2015-	Head of the research programme Professional Development & Educational Research, UCN
2002-2015	Teacher and lecturer at Nursing Education, UCN
1997-2002	Clinical Education Coordinator and Manager in the secondary psychiatric health sec- tor of Region in Northern Jutland

PROJECTS

2013-2015 Digital Uddannelseslaboratorium (DUIT)

2012-2015 FlexVid (Fleksible Videregående uddannelser)

RECENT AND RELEVANT PUBLIKATIONS

Kjærgaard & Dau (2018). Revisiting the 21st Century Learning Skills, Networked Learning AAU

Dau, S. & Konnerup, U. (2017). Didaktisk design, blendede læringsrum og fællesskab

– et grundlag for facilitering af læreprocesser. Tidsskriftet Læring og Medier (LOM), 9,16.

Full publication list available here: UC Viden Susanne Dau

Curriculum Vitae Gunver Majgaard

Personal Details

Name:	Gunver Majgaard (date of birth 030466)
Position:	Associate Professor
Organisation:	SDU University of Southern Denmark Campusvej 55, 5230 Odense
E-mail:	gum@mmmi.sdu.dk
Phone:	+45 44 66 74 46

Professional Experience

2013–date	Associate Professor (Research responsibility), SDU Campusvej 55, 5230 Odense M
2002–2012	Associate Professor (Teaching responsibility), University of Southern Denmark.
2001	Assistant Professor, University of Southern Denmark.
1997–2001	Assistant Professor, Business Academy Copenhagen North. Trongårdsvej 44, 2800 Lyngby
1995-1996	Assistant Professor, Business Academy Ballerup (Handelsskolen i Ballerup). Baltorpvej 1, 2750 Ballerup
1994	Software Engineer, Telecom (TDC). Telegaden 2, Højetåstrup

Educational background

2008-2011	**PhD, Syddansk Universitet - University of Southern Denmark** Dissertation title: Learning Processes and Robotic Systems – Design of Educational Tools and Learning Processes using Robotic Media and using Children as Co-Designers.
2005–2007	**Master of ICT and Learning, Organisation Aalborg University Master of ICT and Learning**
1990 -1994	B.Sc. Electrical Engineering, Technical University of Denmark

Research interests

Educational robots, Teaching and learning, play, game-based learning, participatory design processes and Mixed Reality.

Grants

2018-2020	Region Syd Danmak. Robotlæring. Educational robots in secondary education.
2018-2021	Trygfonden. Developing and pilot testing a Virtual Reality based tool for the training of alcohol & other drug resistance skills.
2013-2015	Insero, FREMTEK: Future Technologies - Didactical design and usage of 3D-printers and humanoid robots in primary schools. (Lead researcher)
2009	Robodays: Development of Fraction Battle and multidisciplinary innovative and playful courses.

Supervision

PhD-level.: Social robots in teaching and learning, and Mixed Reality training.
Master-level: Various in using Robots in teaching and learning e.g. development of KUBO-robot and Mixed Reality in health and industry.

Selected Publications (http://findresearcher.sdu.dk:8080/portal/da/person/gum)

I have 44 publications including 1phD dissertation, 15 journal papers, 7 book chapters, conference proceedings and other papers (160 citation, 6 h-index according to google Citations)

Majgaard, G. (2015). Humanoid Robots in the Classroom. In IADIS International Journal on WWW/Internet Vol. 13, No. 1, pp. 72-86 ISSN: 1645-7641

Majgaard G, Hansen JJ, Bertel LB, Anders P. Fra digitalt design til fysisk udtryk – anvendelse at 3-d-printere og NAO-robotter i folkeskolen (From digital design to physical expression – 3-d-printers and NAO-robots in primary school). Mona. 2014 dec; 2014(4):7-26.

Majgaard, G., Larsen, L. J., Lyk, P., & Lyk, M. (2017). Seeing the unseen: Spatial visualization of the Solar System with physical prototypes and Augmented Reality. International Journal of Designs for Learning, 8(2), 95-109.

UNIVERSITY OF
SOUTHERN DENMARK

CV: Jacob Nielsen

Personal Details

Position: Associate Professor
Organisation: Embodied Systems for Robotics and Learning, The Maersk Mc-Kinney Moller Institute, University of Southern Denmark
E-mail: jani@mmmi.sdu.dk
Phone: +45 28107568

Educational background

2005 – 2009	PhD degree in Modular Robotics, Maersk Mc-Kinney Moller Institute, University of Southern Denmark, Odense. Thesis: "User-Configurable Modular Robotics – Design and Use".
2001 - 2002	Civil Engineering degree in Computer Systems Engineering, Maersk Mc-Kinney Moller Institute, University of Southern Denmark, Odense. Thesis: "Intelligent Bricks".

Professional Experience

2012-present	Associate Professor, The Maersk Mc-Kinney Moller Institute, University of Southern Denmark
2009-2011	Assistant Professor at Centre for Playware, DTU Electrical Engineering, Technical University of Denmark, Lyngby.
2009-2010	Development Engineer, Entertainment Robotics, Odense.
2005-2008	PhD Student. Granted three years PhD Scholarship at the Faculty of Science and Engineering.
2002-2005	Researcher, The Maersk Mc-Kinney Moller Institute, University of Southern Denmark.

Supervision

1 phd as co-supervisor, 1 phd starting up as main supervisor. 30+ Master students and 30+ Bachelor students.

Selected publications

Pedersen, B. K. M. K., Andersen, K. E., Jørgensen, A., Köslich, S., Sherzai, F., & Nielsen, J. (2018). Towards playful learning and computational thinking — Developing the educational robot BRICKO: 2018 IEEE Integrated STEM Education Conference (ISEC).

Nielsen, J., Pedersen, R., & Majgaard, G. (2015). 8. klasse som kreative producenter af fremtidens velfærdsteknologi: konstruktionisme, problemløsning og dialog. *Læring og Medier*, *8*(14).

Nielsen, J., & Lund, H. H. (2008). Modular robotics as a tool for education and entertainment. *Computers in Human Behavior*, *24*(2), 234-248. DOI: 10.1016/j.chb.2007.01.011

Link to publications: http://findresearcher.sdu.dk/portal/da/persons/jacob-nielsen(bfca7bf8-41f7-4f6d-af41-38b9d20dbb8a)/publications.html

Selected Significant achievements

2015 - present Founder, chair and daily leader of Teknologiskolen (www.teknologiskolen.dk) – a volunteer union that offers technologically oriented spare-time activities to kids and youngsters – with a special focus on robot technology.

Anja Emilie Madsen

Aema-skole@aalborg.dk
Tlf. 93520064

Current position:
Skoleforvaltningen, Aalborg Kommune
Godthåbsgade 8, 9400 Nørresundby

Education:
- Læreruddannelsen
- Master i IKT og læring

Work experience:
2001 – 2014: Lærer, Vodskov Skole
2014 - : Pædagogisk konsulent

Key qualifications:
- Pædagogik og didaktik
- Implementering, koordinering
- Projektledelse
- Proceskonsulent
- Evaluering

Innovation and development:

Jonna Løkke Andersen

jla-skole@aalborg.dk

Current position:
Skoleforvaltningen, Aalborg Kommune
Godthåbsgade 8, 9400 Nørresundby

Education:
- Pædagoguddannelsen
- Efteruddannelse i ledelse
- Linjefag i DSA, dansk som andersprog

Work experience:
- Pædagog
- Leder indenfor daginstitutions- og skoleområdet
- Pædagogisk konsulent siden 1998

Key qualifications:
- Pædagogik og didaktik
- Ledelse
- Implementering, koordinering
- Projektledelse
- Proceskonsulent

Innovation and development:

Helene Lassen Nørlem
Istedgade 43B, 1650 København V
Tel: +45 60117621, email: hln@tiimo.dk
Date of birth: 19th of June 1985

Helene is the CEO and co-founder of Tiimo, a spin-out from the IT University, specialised in providing structure and empowerment to children with special needs. She holds a MSc in Digital Design and Communication by the IT University of Copenhagen. Her core competences lie in the development of solutions based on in-depth analysis of user needs and society contexts, combining design skills with the ability to see new business opportunities and ideas. From 2013 to 2016 she worked as a User Experience consultant at the It company Delegate A/S. In 2015, together with her co-founder, Melissa Azari, she performed several applied research works in the field of assistive technologies for helping children with special needs. As a result, in 2016 she gave life to Tiimo, which today is used by 300 families in Denmark.

After the first successful experiences in real environment conditions, Tiimo decided to focus their effort on also developing the new self-assessment module Tiimood, as the most relevant application for gathering real-time data and improving ADHD therapies through real-time emotional measurements.

Education

MSc IT, Digital Design and Communication	2012-2014
BA, Architecture and Design	2007-2010

Work experience

Founder and CEO of Tiimo ApS	2016-
UX and business consultant at Delegate A/S	2013-2016

Daniel Lindegaard

COO and co-founder at Kubo Robotics

daniel@kubo-robot.com

Summary

At KUBO Robotics, I'm responsible for ensuring a robust innovation process and great outcomes through nurturing a healthy and inspiring work culture where the company and people can grow.

ABOUT MY JOURNEY AND MOTIVATION
Since I was a child, I've been fascinated on how technology drives change and sometimes creativity. I taught myself coding at a very young age, as a means to be expressive and creative. Using these computational thinking skills has helped me understand subjects in education, such as math and physics.

In 2014, I started my journey on giving the gift of coding to the next generation through the development of KUBO - an educational robot for children in Kindergarten to 2nd grade - at KUBO Robotics ApS.

Experience

Co-founder and COO at KUBO Robotics
August 2015 - Present

KUBO is a straightforward and intuitive educational robot that children in early primary school use collaboratively to learn various subjects, such as coding, language, and music through the tangible and innovative coding language called TagTiles.

As CTO I have the responsibility of maturing our products for price and quality efficient manufacturing while treading into the unknown land of future technologies. I'm also responsible for our collaboration with production and technical development partners.

Learn more at kubo-robot.com

Ejer / konsulent
August 2012 - December 2016 (4 years 5 months)

IT developer at University of Southern Denmark
January 2013 - June 2015 (2 years 6 months)

I'm working in the department KnowledgeLab (knowledgelab.dk)

Teacher
January 2014 - September 2014 (9 months)

I'm working as a teacher in a course on distributed systems

Instructor at University of Southern Denmark
August 2013 - January 2014 (6 months)

This is my second time as an instructor in a course on interaction design

Instructor at University of Southern Denmark
August 2012 - December 2012 (5 months)

I worked as an instructor in a course on interaction design

Developer at TogiData
January 2012 - November 2012 (11 months)

Education

University of Southern Denmark
Master’s Degree, Master of Science (MSc) in Engineering (Learning and Experience Technology), 2014 - 2016
Activities and Societies: Instructor for Datalogy and Software Engineering at SDU.
Lincoln University (NZ)
Exchange student, Post graduate, Human Computer Interaction, 2015 - 2015
University of Southern Denmark
Bachelor's Degree, Learning and experience technology, 2011 - 2014

---

8. OV 1 - Key figures

Key Project figures	
Project title	ROSIE
Project acronym	ROSIE

Project - start date (on the form: dd-mm-yyyy)	01-01-19		
Project - end date (on the form: dd-mm-yyyy)	31-12-21		
Duration	2 years, 11 months, 30 days		
Total Project budget	kr. 7.670.310		
Total IFD investment incl. overhead	kr. 5.739.841		
IFD investment rates	**Project**	**Industrial research**	**Experimental development**
	74,83%	74,83%	0,00%

Total IFD investment excl. Overhead	kr. 4.098.765
Total IFD investment for overhead	kr. 1.641.076
Administrator	P1 - Aalborg University

Partner investment rates

Partner no.	Partner name	Partner investment rate	Industrial research	Experimental development
P1	Aalborg University	73,36%	73,36%	0,00%
P2	University College of Northern Denmark	88,51%	88,51%	0,00%
P3	University of Southern Denmark	88,97%	88,97%	0,00%
P4	Teknologiskolen	88,35%	88,35%	0,00%
P5	Aalborg Kommune	22,77%	22,77%	0,00%
P6	KUBO Robotics ApS	66,84%	66,84%	0,00%
P7	TiiM	59,67%	59,67%	0,00%

9. OV 2 - Budget by year

Budget by year

Partner number and name		2019	2020	2021	2022	2023	2024	2025	Total
Total		**kr. 1.495.443**	**kr. 2.182.574**	**kr. 2.061.824**	**kr. -**	**kr. -**	**kr. -**	**kr. -**	**kr. 5.739.841**
P1	Aalborg University	kr. 955.373	kr. 1.421.679	kr. 1.184.455	kr. -	kr. -	kr. -	kr. -	**kr. 3.561.507**
P2	University College of Northern Denmark	kr. 123.654	kr. 280.300	kr. 334.604	kr. -	kr. -	kr. -	kr. -	**kr. 738.558**
P3	University of Southern Denmark	kr. 230.604	kr. 294.847	kr. 388.965	kr. -	kr. -	kr. -	kr. -	**kr. 914.416**
P4	Teknologiskolen	kr. 59.038	kr. 131.679	kr. 95.856	kr. -	kr. -	kr. -	kr. -	**kr. 286.573**
P5	Aalborg Kommune	kr. 71.188	kr. 10.157	kr. 9.686	kr. -	kr. -	kr. -	kr. -	**kr. 91.031**
P6	KUBO Robotics ApS	kr. 28.940	kr. 36.959	kr. 35.725	kr. -	kr. -	kr. -	kr. -	**kr. 101.624**
P7	TiiM	kr. 26.646	kr. 6.953	kr. 12.533	kr. -	kr. -	kr. -	kr. -	**kr. 46.132**

10. OV 3 - Work packages (WP)

Work package number and name		Total budget							
		2019	2020	2021	2022	2023	2024	2025	Total
1	WP 1: Conceptual framework and requirements specification	kr. 429.162	kr. 311.656	kr. 339.680	kr. -	kr. -	kr. -	kr. -	**kr. 1.080.498**
2	WP2: Development of inclusive play-based learning principles and educational robotics scenarios	kr. 493.801	kr. 538.963	kr. 314.721	kr. -	kr. -	kr. -	kr. -	**kr. 1.347.485**
3	WP3: Implementation	kr. 391.181	kr. 632.661	kr. 425.063	kr. -	kr. -	kr. -	kr. -	**kr. 1.448.905**
4	WP4: Evaluation	kr. 217.402	kr. 565.424	kr. 681.164	kr. -	kr. -	kr. -	kr. -	**kr. 1.463.990**
5	WP5: Scalability, dissemination and outreach	kr. 362.710	kr. 513.627	kr. 710.562	kr. -	kr. -	kr. -	kr. -	**kr. 1.586.899**
6	WP6: Management	kr. 233.949	kr. 288.412	kr. 220.174	kr. -	kr. -	kr. -	kr. -	**kr. 742.535**
7		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
8		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
9		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
10		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
Total		**kr. 2.128.205**	**kr. 2.850.743**	**kr. 2.691.364**	**kr. -**	**kr. -**	**kr. -**	**kr. -**	**kr. 7.670.312**

Work package number and name		Experimental development							
		2019	2020	2021	2022	2023	2024	2025	Total
1	WP 1: Conceptual framework and requirements specification	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
2	WP2: Development of inclusive play-based learning principles and educational robotics scenarios	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
3	WP3: Implementation	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
4	WP4: Evaluation	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
5	WP5: Scalability, dissemination and outreach	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
6	WP6: Management	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
7		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
8		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
9		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
10		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
Total		**kr. -**	**kr. -**	**kr. -**	**kr. -**	**kr. -**	**kr. -**	**kr. -**	**kr. -**

Work package number and name		Industrial research							
		2019	2020	2021	2022	2023	2024	2025	Total
1	WP 1: Conceptual framework and requirements specification	kr. 429.162	kr. 311.656	kr. 339.680	kr. -	kr. -	kr. -	kr. -	**kr. 1.080.498**
2	WP2: Development of inclusive play-based learning principles and educational robotics scenarios	kr. 493.801	kr. 538.963	kr. 314.721	kr. -	kr. -	kr. -	kr. -	**kr. 1.347.485**
3	WP3: Implementation	kr. 391.181	kr. 632.661	kr. 425.063	kr. -	kr. -	kr. -	kr. -	**kr. 1.448.905**
4	WP4: Evaluation	kr. 217.402	kr. 565.424	kr. 681.164	kr. -	kr. -	kr. -	kr. -	**kr. 1.463.990**
5	WP5: Scalability, dissemination and outreach	kr. 362.710	kr. 513.627	kr. 710.562	kr. -	kr. -	kr. -	kr. -	**kr. 1.586.899**
6	WP6: Management	kr. 233.949	kr. 288.412	kr. 220.174	kr. -	kr. -	kr. -	kr. -	**kr. 742.535**
7		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
8		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
9		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
10		kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	kr. -	**kr. -**
Total		**kr. 2.128.205**	**kr. 2.850.743**	**kr. 2.691.364**	**kr. -**	**kr. -**	**kr. -**	**kr. -**	**kr. 7.670.312**

11. OV 4 - Partner budget

Partner number and name		Role	Type	Overhead factor	Cost factor	A: Expenditure budget (B+C) for the participant	B: IFD investment for the participant	C: Self-financing of own expences for the participant	IFD investment rate
Total						**kr. 7.670.310**	**kr. 5.739.841**	**kr. 1.930.469**	**74,83%**
P1	Aalborg University	Project Partner	Danish: University	44,00%	0,00	kr. 4.854.627	kr. 3.561.507	kr. 1.293.120	73,36%
P2	University College of Northern Denmark	Project Partner	Danish: University college, Academy of professional higher education or Maritime educational institution	44,00%	0,00	kr. 834.422	kr. 738.558	kr. 95.864	88,51%
P3	University of Southern Denmark	Project Partner	Danish: University	44,00%	0,00	kr. 1.027.831	kr. 914.416	kr. 113.415	88,97%
P4	Teknologiskolen	Project Partner	Danish: Public non-profit organisation or foundation	20,00%	0,00	kr. 324.373	kr. 286.573	kr. 37.800	88,35%
P5	Aalborg Kommune	Project Partner	Danish: Other public Institution/authority (not research-institutions)	0,00%	0,00	kr. 399.706	kr. 91.031	kr. 308.675	22,77%
P6	KUBO Robotics ApS	Project Partner	Danish: Private enterprise (de minimis aid)	0,00%	0,00	kr. 152.034	kr. 101.624	kr. 50.410	66,84%
P7	TiiM	Project Partner	Danish: Private enterprise (de minimis aid)	0,00%	0,00	kr. 77.317	kr. 46.132	kr. 31.185	59,67%

12. OV 5 - WP salary

Work packages salary overview

Partner number and name		Wor kpackages 1	2	3	4	5	6	7	8	9	10	Total
Total		**14,09%**	**17,57%**	**18,89%**	**19,09%**	**20,69%**	**9,68%**	**0,00%**	**0,00%**	**0,00%**	**0,00%**	**100,00%**
P1	Aalborg University	8,72%	12,61%	10,70%	12,77%	12,25%	6,23%	0,00%	0,00%	0,00%	0,00%	**63,29%**
P2	University College of Northern Denmark	0,57%	0,57%	3,14%	1,98%	3,21%	1,42%	0,00%	0,00%	0,00%	0,00%	**10,88%**
P3	University of Southern Denmark	3,47%	2,51%	1,59%	2,48%	2,64%	0,70%	0,00%	0,00%	0,00%	0,00%	**13,40%**
P4	Teknologiskolen	0,18%	0,74%	0,74%	1,17%	1,01%	0,37%	0,00%	0,00%	0,00%	0,00%	**4,23%**
P5	Aalborg Kommune	0,79%	0,76%	1,56%	0,54%	1,03%	0,53%	0,00%	0,00%	0,00%	0,00%	**5,21%**
P6	KUBO Robotics ApS	0,19%	0,39%	0,87%	0,00%	0,30%	0,24%	0,00%	0,00%	0,00%	0,00%	**1,98%**
P7	TiiM	0,16%	0,00%	0,28%	0,14%	0,24%	0,18%	0,00%	0,00%	0,00%	0,00%	**1,01%**