Kide Science:

Multi-Level Evidence for Early STEM Impact

White paper by Kide Science

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Executive Summary

At Kide Science we take a comprehensive approach to measuring our impact on young children; considering their learning, well-being, and development through play. This white paper outlines a four-level framework for assessing impact evidence.

The Impact Evidence Pyramid

At Kide Science we use a pyramid structure to show the different levels of impact evidence.

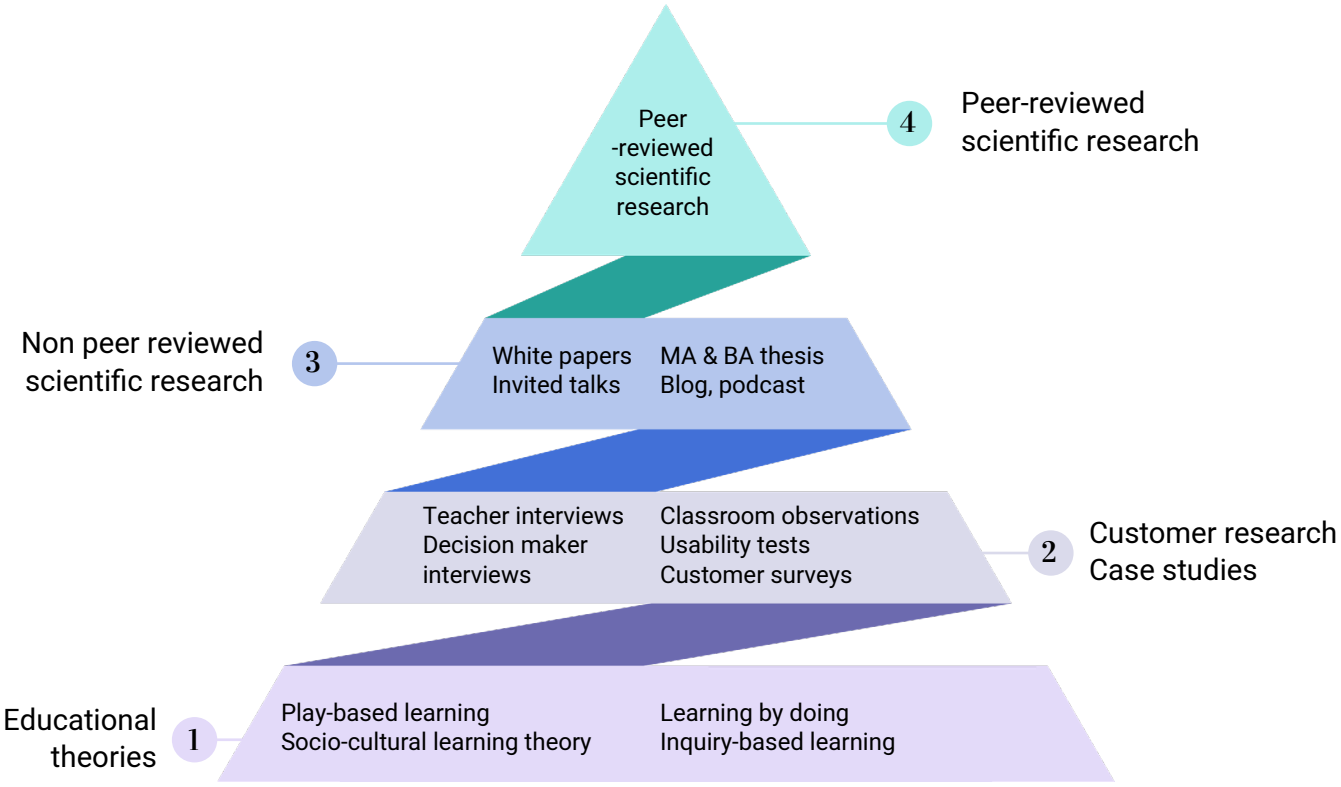
- At the foundation (Level 1) are established learning theories like play-based and inquiry-based learning.
- Building on this base, Kide Science conducts research (Levels 2 & 3) to improve the program, including teacher feedback (surveys, interviews) and evidence highlighting the importance of play in early learning (presentations, blog, podcasts).
- Finally, the strongest evidence, peer-reviewed scientific research, sits at the top (Level 4). This research demonstrates the Playful Inquiry model's effectiveness in supporting children's science skills and teacher confidence.
- Kide Science's global reach further emphasizes its impact, with a presence in 32 countries, over 30,000 educators using the program, and reaching over 1 million children.

Conclusion

In this white paper, Kide Science showcases its effectiveness in supporting early STEM education through a multi-layered approach. The different levels of impact evidence (research, user feedback, and global reach) all point to the efficiency of the Playful Inquiry model. The playful approach benefits teachers by reducing anxiety and creating a fun and flexible learning environment. The story-based approach keeps students engaged and fosters curiosity through open-ended problem-solving, making learning enjoyable and accessible for all.

Introduction

When it comes to Kide Science's impact evidence we adopt a holistic approach and this is especially true when it comes to impact on young children's learning. We look at children's learning and progress in STEM considering their well-being, mental health, and physical health, and aim to foster children's natural process of learning in the context of play. We assess and communicate impact using multiple resources and levels of impact evidence. This white paper aims to provide a quick overview of the four levels of impact evidence at Kide Science and showcase how the different levels support each other.



- **The first level of impact** makes up the foundation of Kide Science, consisting of well-established educational theories such as play-based learning and inquiry-based learning.

- **The second level** represents the ongoing research work in product development, which includes case studies, classroom observations, surveys, and interviews with our customers. Level 2 is fast action research to understand our customers needs so we can make our product more impactful.

- **Level three** represents larger-depth research work that is not scientifically published, such as white papers and works of popular science (e.g.invited talks, conference presentations, blog posts, podcasts).

- **On level four**, at the top of the pyramid, we have scientific research studies. These are published in peer-reviewed scientific journals alongside our ongoing research collaborations and academic research projects

Considering the breadth and scope of this paper, for each level, we only provide a few examples of impact evidence, but each section is supported with further links and references to encourage a deeper exploration.

Level 1: Impact evidence, the theoretical foundations

Researchers have widely recognized the importance of early STEM education in developing 21st-century future skills such as critical thinking and creative problem-solving. Placing emphasis on early STEM education can help students develop the foundations of scientific reasoning and foster children's natural curiosity. However, not all STEM programs and approaches are effective among young children.

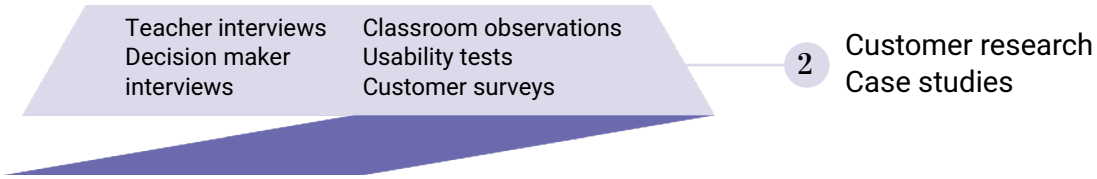
To support young childrens' natural learning processes, Kide Science provides teachers with curriculum materials that emphasise play and storytelling and the Kide pedagogy draws on established learning theories in early years' education, such as:

- **Social-cultural learning (Vygotsky, 1978):** Children learn best through social interaction and cultural context. Kide Science fosters this through collaborative play and stories.

- **Inquiry-based learning (Minner et al., 2010):** Children engage with the scientific process, not just learn facts. Kide Science structures this in manageable steps: orientation, investigation, conclusion.

- **Play-based learning (Wenner, 2009):** Play reduces stress and opens opportunities for exploration. Kide Science uses stories and hands-on experimentation to spark imagination and curiosity through play.

The philosophy behind Kide Science is a comprehensive "hands-on, heads-on, and hearts-on" strategy. This means that while children gain important science and critical thinking skills, their emotional engagement and the meaningfulness of their learning are also considered.



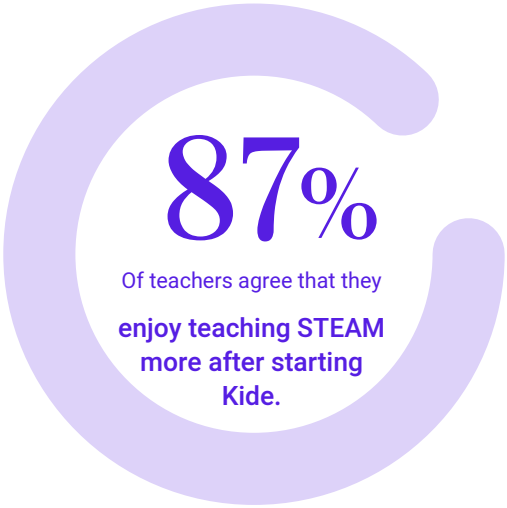
Level 2: Impact evidence in case studies and customer research

At Kide Science we find it important to always make data-driven product development decisions and conduct several cycles of user research studies with our customers throughout a year. These can include interviews with teachers where we aim to understand their needs and pain-points, explore how they use Kide Science in their lesson planning and assessment process, or usability tests to test new features of the product. The aim here is always to make Kide a more user-friendly and ultimately more impactful product.

We are also running several customer surveys throughout the year, for example in a recently conducted 'Kide Customer Feedback Survey' we asked our customers how Kide has impacted their teaching practices and their students' learning. Based on the survey results we have found the following main conclusions related to Kide's impact on teachers and students:

1. Kide increases teachers' enjoyment of STEM teaching
2. Kide benefits all children
3. Kide supports children's curiosity and inquiry skills

1. Kide increases teachers' enjoyment of STEM teaching



I'm so excited to have found this curriculum. I really enjoy the training videos which show, for example, how you can just put on a different pair of glasses, turn around and the kids will be engaged in that. **It gave me more confidence to teach science.**

2. Kide benefits all children

I have noticed that during Kide sessions, even children who struggle with concentration are much more engaged. They patiently wait for their turn, get excited about the experiments, and experience the joy of success to the fullest.

3. Kide supports children's curiosity and inquiry skills

We have come up with many research topics in our everyday lives, **developed methods for exploring them, and tak-en time to wonder together.**

Everyone loves Hoseli, and they talk to him, **sharing what they are doing and what they have learned.**

Our survey results show that the playful pedagogical model helps reduce teachers' anxiety in STEM teaching, and teachers start to enjoy teaching STEM more. The playful and child-centred approach meets the unique needs of all students, even the children who have trouble concentrating in regular classroom activities engage deeply in learning with Kide.

Our interviews with teachers show that

- Kide provides them a new pedagogical approach of teaching STEM and doing STEM activities in an age-appropriate holistic way, which significantly improves their confidence.

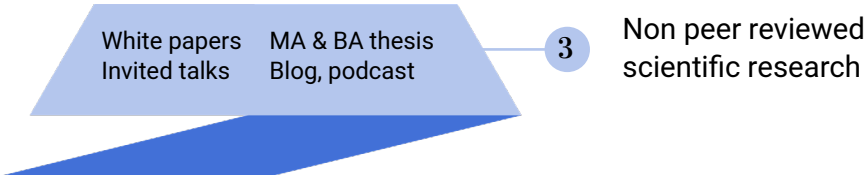
- Teachers find that they can integrate the Kide method also in teaching other subjects, and that Kide pedagogy can foster not only science but also literacy and math-related learning objectives.

"STEM has always scared me, even when I homeschooled, I just felt like I didn't have the tools to teach it. And You have completely changed my view about being a scientist, about learning and what science is all about."

(interview with S.,
Pre-k teacher, USA)

“For each day I have to do art, language, math, a group activity, fine motor, gross motor activity, so something that uses their muscle, and then a science project or something that is science- related... So, with Kide Science, when I do that, it hits every single point.”

(interview with J.,
Pre-k teacher, USA)



Level 3: Impact evidence in popular research

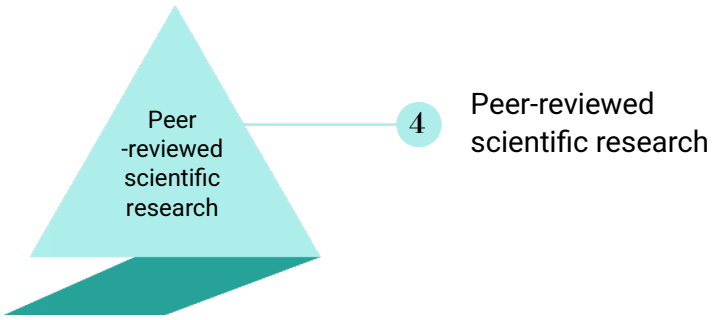
Level 3 includes research work of larger-depth that is not scientifically published such as white papers and works of popular science (e.g.invited talks, conference presentations, blog posts, podcast, MA and BA theses). We believe it is important to share knowledge and make our scientific findings visible to the general public.

We aim to continuously provide up to date information about our work and share knowledge in the topic of early childhood education, STEM teaching and the play-based pedagogical methods. This happens through our:

- **Kide Science Blog** provides up to date information on these topics as well as updates on our ongoing research collaborations
- **Kide Science Podcast** series provides discussions with researchers and practitioners from the field of early childhood education

From the many talks and conference presentations given by our co-founder, PhD Jenni Vartiainen, we would like to highlight a well-received talk given at The World Bank about using play to improve children's early education and well-being. The core message of the talk was that play is essential for children's development but is sadly declining in our societies. At Kide Science, our aim is to provide opportunities for incorporating more play into learning in order to impact children's well-being in kindergartens, preschools, and schools across the world.

As Kide has always been connect to academic research carried out at the University of Helsinki, there were several bachelors' and master's thesis written on the impact of Kide under the supervision of PhD Jenni Vartianen. From this group of evidence we would like to highlight the work of our other co-founder Aino Kuronen. In her MA thesis, she used an early version of Kide Science and found that the playful methodology and inquiry-based activities can positively impact early childhood educators' feelings of self-efficacy in science education (Kuronen, 2019). These early findings are in line with our current research on teachers' confidence discussed under the following section.



Level 4: Impact evidence in peer-reviewed scientific research

Summary of past research

Kide Science's pedagogical model, Playful Inquiry, has been developed through over five years of academic research (Vartiainen, 2016). The model was studied in classrooms with 3-8 year olds (n=135) from 2017-2020 (Vartiainen & Kumpulainen, 2019a, 2019b, 2020). The research explored how children engage in science through Playful Inquiry lessons, using video recordings (over 500 hours), field notes, and children's work (e.g., drawings, creations).

Results of these studies showed the key importance of play in young children's STEM education.

Through Playful Inquiry children can:

- understand the "culture" of science (how scientists think, work and act)
- start their own scientific exploration (asking questions, experimenting)
- connect science to their own experiences making the the learning fun and relevant
- turn everyday ideas into scientific concepts and start "talking science"

Ongoing projects

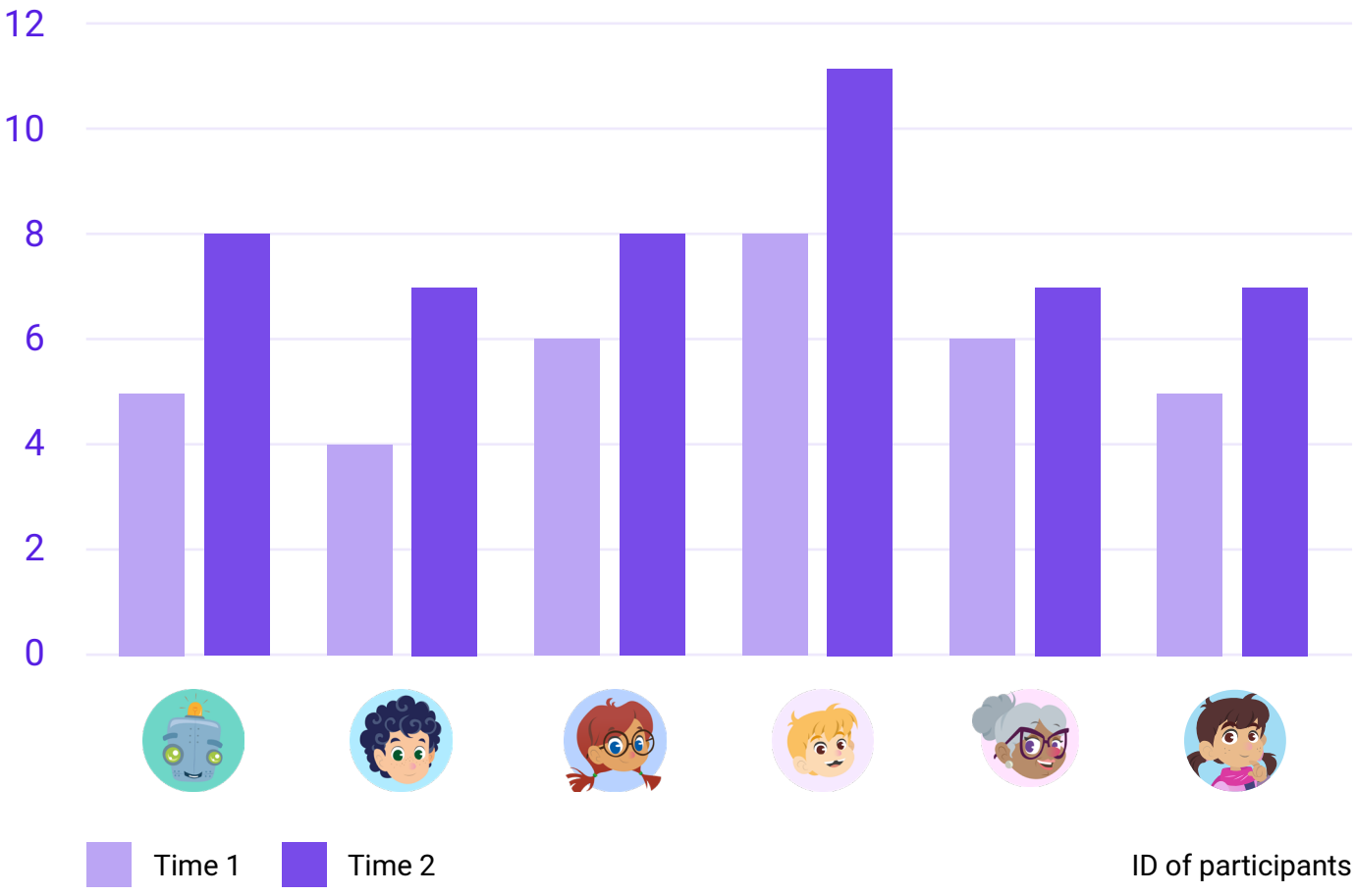
Impact of Kide on students

From the start of 2024 we had the unique opportunity to partner with one of our customer schools and carried out observational research for half a year as they were going on with their regular Kide lessons.

The focus of the study was to explore how Kide Science lessons can support the development of foundational science processing skills like observation and classification, alongside higher-level cognitive skills like executive functions (Vartiainen, Brezovszky & Kerr, in preparation). We collected data through video recordings of Kide Science classes and teacher observations were recorded in observation grids developed for the purpose of the study. The full analysis of data is currently ongoing.

However, initial results already suggest that students improved both in their observation and classification skills (e.g. see figure of preliminary results of observation for the 6 students in the observation group). Kide Science classes promoted students' engagement and inquiry learning, the story and the fantasy context helped students internalise the learning and recall what they have learned even outside the classes. The playful methodology was successful for kids of all skills and ability levels.

Change in children's observation skills between baseline and after 6 weeks of using Kide Science.



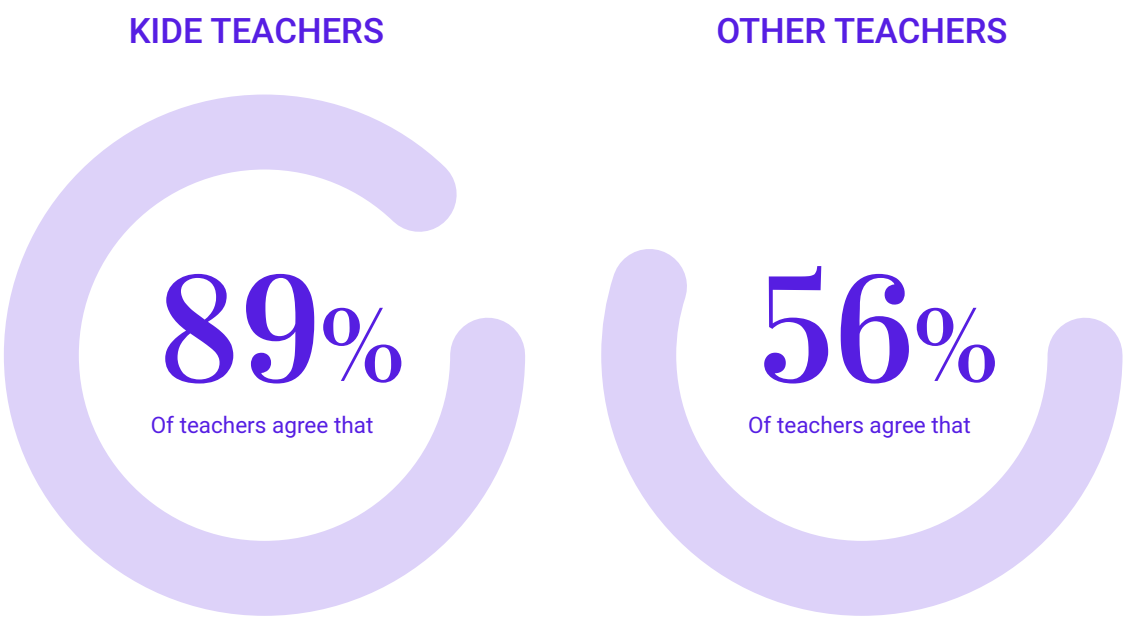
Impact of Kide on teachers

In our other ongoing study we have focused on exploring Kide's impact on teachers and teachers' confidence in teaching early STEM (Vartiainen & Brezovszky, in preparation). Using a mixed-methods approach, data from surveys and semi-structured interviews were analysed to identify key themes related to changes in teachers' confidence as a result of using Kide Science.

Preliminary results show that Kide lessons can foster a positive learning environment, enhance teachers' confidence, and reduce teachers' anxiety associated with STEM teaching. Teachers reported feeling more effective and having more fun teaching STEM, especially with frequent Kide use.

Our analysis suggests three key features of Kide lessons that likely boost teachers' confidence in STEM teaching:

- a positive and playful learning environment
- shared meaning-making with students
- practical resources for lesson planning and classroom management



doing inquiry-based activities with children makes me cheerful.

Kide impact in numbers

Finally, we started this paper by stressing that learning is a process which should not be reduced only to numbers. However, numbers can also be important. So here are few numbers that are meaningful related to Kide impact evidence.

32	30K+	1M+	200K+
countries	registered educators	children reached	Lesson plan views

In 2023, Kide Science was used in 20+ states in the US, with the most prominent user bases in California, Texas, New York, and Florida.

Kide Science has won 9 remarkable awards which have recognized Kide Science's impact on early childhood education.

"Best Learning Solution from Finland awarded by Education Finland"

"Winner of the Best Early Years Solution at the NY EdTech Week"

"Best STEM instructional resource judged exclusively by school district superintendents"

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