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Parents' Strategies: Introducing Science, Technology, Engineering, Arts, and Mathematics (STEAM) to Children through Digital Children's Story Books

Pasiningsih
Institut Agama Islam Negeri Kudus
pasiningsih@iainkudus.ac.id

Suci Herwani
Institut Agama Islam Negeri Kudus
suciherwani@iainkudus.ac.id

Abstrak

Science, Technology, Engineering, Arts, and Mathematics (STEAM) dalam konteks pendidikan anak usia dini merupakan salah satu elemen dalam pembelajaran Kurikulum Merdeka Belajar. Pembelajaran STEAM dinilai relevan dengan tuntutan dan kebutuhan untuk memberikan keterampilan kepada anak di abad 21 ini. Diperlukan cara yang menarik agar anak tertarik dengan pembelajaran STEAM. Orang tua dapat melakukan hal ini dengan mengenalkan STEAM melalui buku cerita anak berbasis digital yang mudah didapatkan dengan kemajuan teknologi. Artikel ini menjelaskan tentang ide pengembangan pembelajaran STEAM pada anak melalui buku cerita anak digital. Metode yang digunakan dalam penelitian ini adalah studi literatur tentang penggunaan buku cerita anak untuk mengajarkan STEAM. Hasil studi literatur menunjukkan bahwa buku cerita anak berbasis digital dapat menjadi sumber dan media alternatif yang efektif untuk pembelajaran STEAM. Buku cerita anak dapat membantu anak-anak untuk belajar STEAM dengan cara yang menarik dan tidak mengintimidasi sehingga anak-anak dapat mengembangkan rasa percaya diri dan harga diri mereka. Buku cerita anak digital sangat relevan dengan perkembangan teknologi yang mendukung anak-anak sebagai digital native. Orang tua dapat memperhatikan pemilihan konten cerita yang tidak hanya sesuai dengan pembelajaran STEAM, tetapi juga sesuai dengan konteks dimana cerita tersebut dibangun dan dikembangkan.

Kata kunci:

Abstrack

Science, Technology, Engineering, Arts, and Mathematics (STEAM) in the context of early childhood education is one of the elements in the learning outcomes of Merdeka Belajar Curriculum. STEAM learning is considered relevant to the demands and needs to provide skills to children in the 21st century. An interesting way is needed to make children interested in STEAM learning. Parents can do this by introducing STEAM through digital-based children's story books which are easy to obtain with technology advance. This article describes the idea of developing children's STEM learning through digital children's story books. The method used in this research was literature study on the use of children's story books to teach STEAM. The results of the literature review show that digital-based children's story books can be an effective alternative source and media for STEAM learning. They help children to learn STEAM in interesting way and unintimidating so children can develop their confidence and self-esteem. Digital children's story book is relevant to the technology development in which support children's as digital natives. Parents can pay attention to select the content of the story not only suitable for STEAM learning but also match with the context in which the story is built and developed.

Keywords: children's story books; digital; parents; STEAM

A. Introduction

STEAM is an acronym for Science, Technology, Engineering, Arts, and Mathematics. In the Merdeka Belajar curriculum at the Early Childhood Education (PAUD) level, which is also called the Foundation Phase, STEAM is one of the learning achievement elements under the name *Dasar-Dasar Literasi, Matematika, Sains, Teknologi, Rekayasa, dan Seni* (Basic Literacy and STEAM) (Badan Standar, Kurikulum, Dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, 2022). Learning outcomes in the early childhood education level for STEAM are children recognizing and using pre-mathematics concepts to solve problems in everyday life. Children demonstrate the basic ability to think critically, creatively, and collaboratively. Children show curiosity through observation, exploration, and experimentation by using the surrounding environment and the media as learning resources, to get ideas about natural and social phenomena. Children demonstrate an early ability to use and engineer technology and to seek information, ideas, and skills safely and responsibly. Children

explore various artistic processes, express them, and appreciate works of art (Badan Standar, Kurikulum, Dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, 2022).

Science. Children are natural scientists. Children try to make sense of the world around them by making observations, asking questions, making predictions, designing, carrying out experiments, and discussing. What these children do can be said to be the scientific method. Through this method, children learn many things, such as finding patterns and making predictions to explain what they see, and collecting evidence to test their predictions (Hasbi, 2021). For example, when a child knows that stones will sink if put in the water, the child will try to put other objects such as leaves, paper, etc. into the water to see if those objects also sink like stones before finally realizing that some objects sink but some of them float when they are put in the water.

Technology. When we talk about technology, what comes to mind is cell phones and computers. However, this assumption is not correct. Technology is not only these two things but also all things made by humans. Simple tools, such as pulleys, wheels, hoes, and scissors, are also technology. This simple technology allows children to understand that technology is tools that can help us get the job done. An understanding of this greatly supports the cognitive development of children. Children can see the causes and effects of why and how these tools can function and help human life (Hasbi, 2021). For example, putting wheels in the table's legs will make it easier to move the table. Another example is a stone will roll quickly with the help of an inclined plane.

Engineering. This term can be intimidating and confusing. How is it possible for children to be engineer? Engineering is the application of science, mathematics, and technology to solve problems. Engineering includes creativity because in engineering there are three things that play a role, how to use various materials which are then designed, processed, and built. This helps us to understand how and why things work (Hasbi, 2021). Children can also be said to be a true engineer or technician. We often see children designing and building with blocks and Legos into various kinds of buildings, combining them into toy train tracks, palaces, and zoos. When children make tents out of pillows, or cardboard, they are solving problems related to the structure of the building. They know how to stack pillows, so they do not topple over and how to attach blankets to one another to form the roof of a tent.

Arts. Creative way of thinking is very important. Children need to innovate and solve problems creatively. Creativity awakens through painting, role-playing, music and drawing. Art is sensory exploration. The child can feel the paint on his or her hand and see the colors that adorn the paper. Children also include symbols in their art that represent objects, events, and

their feelings. Drawing and role playing provide opportunities for children to express what they know and feel. Music also relates to STEAM skills like pattern and number recognition. Research shows that early experiences with the creative arts can support children's cognitive development and increase their self-esteem(Hasbi, 2021).

Developing STEAM needs to be done from childhood at an early age. Hasbi, (2021) suggests some reasons for the benefits of STEAM learning in child development. First, STEAM integrates various things, makes connections or interconnections, builds and strengthens networks in the brain, so as to build higher order thinking skills (HOTS), because in reality in life, various disciplines and events are interrelated to each other. The second benefit of STEAM is that it allows children to gain learning experiences through play that is rich in exploration and positive stimulation to support brain growth and development. This is because children are in a golden period. It means that they are in a process of extraordinary development in every aspect. In this period the child's brain grows and develops very rapidly. The third benefit is that STEAM activities allow children to get hands-on experiences that are meaningful and fun. Children need direct experience to enrich their experience. Furthermore, STEAM provides an opportunity for children to cultivate a positive attitude towards various fields of knowledge, including science and mathematics. This can be a strong foundation for children to build an attitude of liking math and science, so that they can easily face academic assignments at school age. The next benefit, STEAM provides an opportunity for children to develop curiosity. Children naturally have curiosity, which is often not optimally stimulated because the approach to teaching is too rigid and traditional. In addition, various STEAM activities begin by building children's sensitivity to problems, empathy for the conditions around them, so that they develop sensitive and caring characters.

Children basically have the potential to do STEAM learning. Hasbi (2021) explains curiosity as one of the characteristics and forms of early childhood exploration is the basis for STEAM learning. Kids start using STEAM skills very early. When babies drop toys, they begin to learn about the law of gravity, that is, objects will fall. Children often pick up an object and hold it. Children know that the doll is soft while the rock is hard. Another example, don't we often see when babies put objects in their mouths? At that time, they were studying the various textures of an object. Therefore, Hasbi (2021) added that the role of parents and educators is to trigger, facilitate, strengthen and maintain children's curiosity through STEAM learning activities. Educators or parents can do scaffolding, which is to provide proper support and organize the environment to increase children's knowledge of STEAM learning. The existence of scaffolding from educators and parents can strengthen knowledge, correct mistakes, and

develop children's thinking. This helps children know more than when they learn on their own (Hasbi, 2021).

According to Gilligan et al. (2020) parents' attitudes and beliefs about STEAM learning in early childhood affect children's interest in STEAM. At an early age, parents have control over children's activities and interests. Children know the importance of a subject by observing how often opportunities are given by adults to study the topic. Likewise with STEAM learning, children will think STEAM is important if parents often discuss STEAM with their children and provide opportunities for them to learn it (Gilligan et al., 2020). Saçkes, Trundle, and Shaheen (2019) as cited in Gilligan et al. (2020) profiled parental preferences for various subjects. Unfortunately, they found that STEAM ranked low in subjects considered important. Few parents place STEAM in important learning (84 out of 1490 parents). Research conducted by Gilligan et al. (2020) in Dublin, Ireland with 85 parents of early childhood found that even though STEAM was considered important for them to teach their children from an early age, only 52% of them were confident in teaching STEAM to their children. 48% of parents were unsure and some were not even sure they can teach STEAM or be involved in STEAM activities with their children.

In the Indonesian context, a lack of parental understanding in teaching STEAM to early childhood was also found in several studies. One example is the research conducted by Sari and Rahma (2019). They conducted a study of 13 parents of children aged 3-4 years at an early childhood education center in the Cianjur area, West Java. The results showed that 65% of parents did not understand STEAM learning, 20% did not understand, and only 15% of parents understood STEAM learning.

Children's story books can be a way parents can introduce STEAM to early childhood. This is in accordance with the opinion of Crowley et al. (2021) as cited in Gilligan et al. (2020). However, Mohrweis (2020) argues that the introduction of STEAM through story books has not been widely linked or recognised. Therefore, in this occasion, the researchers tried to explore how to introduce Science, Technology, Engineering, Arts, and Mathematics (STEAM) to children through digital children's story books as a strategy that parents can use. After the introduction, the methods used in this study will be discussed. Then, the results of the research and discussion include children's digital books, children's story books and STEAM learning, and examples of digital children's story books that parents can use in STEAM learning will be provided by the researcher. Finally, the conclusions regarding the research topic will be given.

B. Method

The research method used is literature review using a qualitative descriptive approach. Literature review is a research method that is carried out by collecting material, information, and some research supporting data that originates from scientific books, journals, and even documents that contain the required information(Ningsih et al., 2021).

Qualitative descriptive is a research approach that seeks to describe a phenomenon with language and words using scientific methods (Moleong as cited in Yunita & Jamaludin, 2022). Data sources are in the form of books and articles related to critical reviews of studies related to Parenting Strategy: Science, Technology, Engineering, Arts, and Mathematics (STEAM) in Children through Digital Children's Story books. Data was collected through documentation of materials related to the research topic. The data analysis technique uses qualitative analysis by analyzing the data and then concluding it with an inductive mindset. The researchers Collected the data through tracing the selected data, then analyzing them to answer the problem. Last, the researchers draw conclusions (Moleong as cited in Yunita & Jamaludin, 2022).

C. Findings and Discussion

1. Digital Children's Story Books

Merriam-Webster Dictionary (2023) defines a digital book or ebook as "a book composed in or converted to digital format for display on a computer screen or handheld device" (a book that is compiled or converted to digital format for display on a computer screen or handheld device). Gischa (2022) defines digital books as publications consisting of text, images, video, and sound and published in digital form. A more detailed definition regarding digital books was presented by Kucirkova (2019). According to her, digital books refer to e-books, app stories, picture book apps, and iBooks, which offer fictional narratives in text, illustrations, sound, and interactive features, and which are available via touch screen technology.

Research on the use of children's digital books has developed rapidly in the last two decades both qualitative and quantitative research (Kucirkova, 2019). Several studies have shown the advantages of digital story books for children compared to printed story books. For example, a Canadian study of children aged 17 to 26 months showed that children learned more new words and were more engaged when reading digital books (Strouse & Ganea, 2017 as cited in Kucirkova, 2019). Research conducted by Gremmen et al. (2016) as cited in

Kucirkova (2019) compared the interaction of 3-4 year old children with digital and printed books. The result showed that children got higher vocabulary scores when they read digital books. However, it should be acknowledged that the results of the research related to the use digital books for children sometimes produce results that are not always positive. Lauricella et al (2014) as cited in Kucirkova (2019) in a study of 4-year-old children in America showed that children's understanding is almost the same when reading digital books and books.

In the context of this study, researchers prefer the use of digital children's books compared to printed books because access to reading books is still limited for the community. From the standards given by UNESCO, ideally one child accesses three books each year. However, in Indonesia one book was awaited by 90 people. The limited reading books in printed form need to be supported using digital technology, in this case digital books (Napitulu, 2022). Using digital books also helps children learn technology from an early age so they become digital natives.

2. Children's Story Book and STEAM Learning

Furner (2018) argues that the use of children's story books to teach mathematics can help children learn about child-friendly mathematical concepts and understanding. Furthermore, by using story books, learning mathematics is not intimidating, threatening, or turning off children's interest compared to if mathematics is taught with a traditional approach. Here are some of the benefits of using children's story books in teaching mathematics.

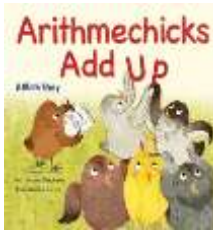
a. Mathematics is taught in the context of a story.
b. Combining integrated learning with reading, writing, speaking, listening, etc.
c. Developing mathematical thinking.
d. Eliminating math anxiety and create a less math-anxious classroom environment.
e. Children can provide flexible responses.
f. Allowing for historical, cultural and practical applications and connections.
g. Encouraging the use of certain math manipulatives as it relates to the story.
h. Teachers can evaluate children's understanding by reading/asking.
i. Currently there are various kinds of books that can be used in teaching mathematical concepts.
j. Suitable for problem solving and active involvement in the context of the story.

k. Providing a shared experience for children and teachers.

Although in his research, Furner (2018) focused more on using children's story books to teach mathematics. However, researchers argue that this also applies to STEAM because mathematics is part of STEAM. Mohrweis (2020) argues that children learn many things through story books. Unfortunately, when talking about STEAM, people do not associate it with children's story books. The use of story books to introduce STEAM to children also opens the insights of parents and educators that books are not only read to tell good and bad stories or exemplary and children's literacy and language.

There are many digital children's story books that parents can use to introduce STEAM. Below are several examples that parents can refer to but do not limit that parents can look for other examples.

Tabel 1. STEAM-theme Children's Digital Story Book

No	Title	Author	Story	Link
	The Reason for the Seasons 	Ellie Peterson	This book tells about how winter, spring, summer, autumn through the narrator Joulia Copernicus, a strong and adventurous child scientist.	https://www.youtube.com/watch?v=tnBFUvIEEvQ
	Arithmechick Add Up 	Ann Marie Stephens	This book explains eight arithmetic strategies through the characters of chicks that learning math for children	https://www.youtube.com/watch?v=yoH6jOAOX4U
	Be a Maker	Katey Howes	This book has an engineering theme. It encourages	https://www.youtube.com/watch?v=lp

			children's creativity through beautiful rhyming words, engaging illustrations and messages	YPEUJObQ0
	Cangkul dan n Cacing Hoes and Worm 	Yulianti Siantajani	This book tells the story of Ujang and Ijang who were gardening with their father and how they explored the garden with hoes	https://www.youtube.com/watch?v=e9Xj9IvEht4
	Pisang dan Musang Banana and Weasel 	Yuliati SIantajani	The story begins with the introduction of bananas, which have different characteristics and shapes from other fruit shapes. The shape of each fruit determines which fruit slides the fastest. This story becomes interactive when combined with STEAM games where children try various shapes of fruit and other objects that can slide on an inclined plane.	https://www.youtube.com/watch?v=nG1jkjr8UqY

D. Conclusion

In Indonesia, STEAM is one of elements in learning outcomes in early childhood education under Merdeka Belajar Curriculum. Parents need to use the right strategy to introduce STEAM to their children in a fun way and build their child's confidence. Digital-based children's story books can be one of the strategies that can be used, especially now that technology is becoming advance and accessible. Using digital based children's story book will also be relevant with children's abilities as digital natives. Parents can use STEAM-based children's storybooks both in English and in Indonesian that are relevant to the child's context. Using children's books makes a better connection between STEAM learning and the real world. However, parents maybe do not have confidence or understanding to use digital children's story book to introduce STEAM for their children. Teachers can provide some training for parents to support them. Parents are also suggested to look for the information how to teach STEAM to children using children's story books. STEAM is started by curiosity not only from children but also from parents.

References

Badan Standar, Kurikulum, Dan Asesmen Pendidikankementerian Pendidikan, Kebudayaan, Riset, D. T. R. I. (2022). Capaian Pembelajaran untuk Satuan PAUD (TK/RA/BA, KB, SPS, TPA). *Kemendibudristek*, 1–16.

Furner, J. M. (2018). Using Children's Literature to Teach Mathematics: An Effective Vehicle in a STEM World. *European Journal of STEM Education*, *3*(3). https://doi.org/10.20897/ejsteme/3874

Gilligan, T., Lovett, J., McLoughlin, E., Murphy, C., Finlayson, O., Corriveau, K., & McNally, S. (2020). 'We practise every day': parents' attitudes towards early science learning and education among a sample of urban families in Ireland. *European Early Childhood Education Research Journal*, *28*(6), 898–910. https://doi.org/10.1080/1350293X.2020.1836588

Gischa, S. (2022). Buku Digital: Pengertian, Karakteristik, dan Fungsinya Buku Digital: Pengertian, Karakteristik, dan Fungsinya. *Kompas*. https://www.kompas.com/skola/read/2022/06/15/150000169/buku-digital--pengertian-karakteristik-dan-fungsinya

Hasbi, D. M. (2021). Membangun Dasar STEAM Melalui Kegiatan Main. *Direktorat Pendidikan Anak Usia Dini*, 41.

Kucirkova, N. (2019). Children's Reading With Digital Books: Past Moving Quickly to the

Future. *Child Development Perspectives, 13*(4), 208–214. https://doi.org/10.1111/cdep.12339

Merriam-Webster Dictionary. (2023). *ebook*. Merriam-Webster Dictionary. https://www.merriam-webster.com/dictionary/e-book

Mohrweis, M. (2020). Literature as a Pathway to STEAM Careers. *Steam, 4*(2), 1–6. https://doi.org/10.5642/steam.20200402.15

NAPITUPULU, E. L. (2022). Akses terhadap Bahan Bacaan Terbatas, Digitalisasi Buku Diperkuat. *Kompas*. https://www.kompas.id/baca/humaniora/2022/01/18/akses-ke-bahan-bacaan-terbatas-digiltalisasi-buku-diperkuat

Ningsih, I. W., Widodo, A., & Asrin, A. (2021). Urgensi kompetensi literasi digital dalam pembelajaran pada masa pandemi Covid-19. *Jurnal Inovasi Teknologi Pendidikan, 8*(2), 132–139. https://doi.org/10.21831/jitp.v8i1.35912

Sari, D. Y., & Rahma, A. (2019). *Dengan Pendekatan Steam. 5*(2), 93–105. https://doi.org/10.22460/ts.v5i2p93-105.1566

Yunita, S., & Jamaludin. (2022). Gaya Belajar Mahasiswa di Era Cyber Pedagogy melalui Pendekatan Self organized Learning Enviroment. *PREDIKSI (Profesi Pendidikan Indonesia), Vol 2 No 2*(November), 121–127. https://jurnal.untirta.ac.id/index.php/prediksi/article/view/19331