STEAM Tales

Lesson plans

Rose Dieng-Kuntz

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Rose Dieng-Kuntz's biography

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Rose Sophie Fatima Dieng-Kuntz, born on March 27th, 1956, in Dakar, Senegal, was a trailblazing African computer scientist. Excelling in her studies, she won multiple prizes and graduated with the highest honours. At just 20 years old, she became the first African woman admitted to the prestigious École Polytechnique in France and later earned an engineering degree, then completed advanced studies (DEA) and a PhD in computer science.

Her career then started at INRIA (National Institute for Research in Computer Science and Control) in France in 1985, before she became the second woman to lead a research project there, focusing on early developments in the semantic web and knowledge sharing over the World Wide Web. Her dedication to knowledge management and the semantic web marked her as a leader in emerging technologies, such as artificial intelligence.

Rose Dieng-Kuntz passed away in 2008, leaving a significant legacy in science and technology. Through her groundbreaking work and advocacy, Rose continues to inspire future generations, particularly women, to pursue excellence in science and technology.

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Lesson plan 1

The World Wide Web game **Keywords: Semantic Web, information links, mind maps, AI**	
Duration: 70–85 min	**Age:** from 6 to 9 years old
Place: Classroom	**Related STEAM areas:** **T** (Technology): Relating the concepts of the Semantic Web and its Internet use, with simple connections between different types of information **A** (Art): Understanding the connections between different pieces of information; structuring, interpreting and visually organising information **M** (Maths): Recognising patterns and relationships between data
Description	This experiment helps children explore the connections between various topics by creating a web of related information. By linking different facts and discussing their relationships, this activity encourages critical thinking and helps children visualise how various pieces of information can be interconnected.

Learning objectives	At the end of this experiment, children will be able to: • Identify the relationships between pieces of information by connecting facts, concepts, and ideas and visually organising them to reflect the concept of the Semantic Web. • Use critical thinking skills to analyse causes, consequences, and patterns in data. • Develop teamwork and communication skills by discussing connections and reasoning through relationships with peers. • Understand how data structures work in digital networks by comparing the information web they create to how AI and the internet organise and retrieve information.
Connection to the female role model	The experiment connects to the work of Rose Dieng-Kuntz, who is known for her pioneering contributions to knowledge sharing and the concept of the Semantic Web, developing ways to structure and organise information on the World Wide Web. This activity introduces children to the process of creating a web of information by linking related topics, which was a focus of Dieng-Kuntz's work on technologies that help computers and AI understand how pieces of information relate to each other.

Individual or group	Group activity
Safety	No specific supervision required.
Materials	☐ 1 large poster or board ☐ Pins ☐ String or yarn ☐ Information cards (at least 10) ☐ Question cards (at least 5)
Lesson plan	
Introduction (10 min)	Start by discussing with the children how information is connected in the world around them. Ask them to think about how they learn new things – do they find answers in books, on the internet, or by talking to others? Explain that knowledge is not stored randomly but is linked together, just like how websites on the internet connect through links. Introduce the idea of the Semantic Web, where information is structured in a way that helps computers and people find related topics more easily. Give an example, such as searching for a historical event online and finding links to important dates, key figures, causes and consequences. Bring a connection to Rose Dieng-Kuntz's story: "Do you remember in the story where Rose wanted to

	explore how technology could help humans communicate and share information? Do you remember how she worked on something called the Semantic Web, which can be linked to online information sites like Wikipedia?"
Research question/hypothesis (5 min)	"How are different pieces of information connected, and how can we organise knowledge in a way that makes it easier to understand?" Children should be encouraged to give their answers, even the wrong ones. All opinions should be included and not discarded right away, even though the teacher knows they are not right. The experiment will serve to answer the research question, mimicking the scientific method.
Step-by-step instructions (55 min)	**Step 1: Setting up the information web** • Create cards which contain information on various topics, such as historical events, scientific concepts or literary facts. They can include dates, names, anecdotes, simple words or phrases. For example: information cards could be related to: – Animal's natural habitat (Africa, Asia) and typical diet (plants, fruits and leaves; meat). – Cities (Paris, Tokyo), countries (France, Japan) or continents (Europe, Asia).

	• Pin the information cards randomly on a large poster or board. • Many templates are readily available online. Here are many examples on StoryboardThat. **Step 2: Distributing the question cards** • Create cards which contain prompts about the relationships between the information on the board, such as causes, consequences, origins or evolutions. For example: “Where are giraffes/tigers found?”, “What do elephants/lions eat?”, “What is the capital of France/Japan?” or “What country is Paris/Tokyo the capital of?” or “What continent is France/Japan a part of?” • Distribute the question cards to the children. **Step 3: Connecting the information** Each child takes turns picking a question card, reading it out loud, and then using the string or yarn to connect the related information cards by pinning the string between them, creating a visible "web" of connections.

	For example: The question "Where can tigers be found?" would create a link with the continent of Asia, similarly to the question "What continent is Japan a part of?" which could generate a link with the follow-up question "What country is Tokyo the capital of?". Additionally, the questions "What do tigers eat?" and "What do lions eat?" would both create a link to meat. **Step 4: Analysing the web** After completing the web, the group discusses the connections they made and why they linked specific cards together. The discussion should focus on the logical relationships, patterns and structures that emerged.
Source	**Additional resources:** • "What is Semantic Web, One Minute Series" by Vowzee (video) • "What is Web 3.0? The Semantic Web of Cloud, Edge, AI & more" by Alejandro Saucedo (video) • "Semantic Map maker: Visualize Word Webs and Build Associations" by Creately • "Connecting Word Meanings Through Semantic Mapping" by Reading Rockets • "What are Semantic Maps?" by Goally

Conclusion (5 min)	Review the research question by discussing how the children connected different pieces of information to form a structured web. Ask them to reflect on how linking facts made it easier to see relationships between concepts, just like how the internet organises information. Encourage them to think about real-world applications: How does structured knowledge help in learning, searching for information, or even how AI and computers organise data? Highlight how their information web mirrors the way Rose Dieng-Kuntz worked on knowledge management and the Semantic Web, helping technology understand and organise information efficiently. Discuss how Rose Dieng-Kuntz's work in AI, knowledge sharing and the Semantic Web uses this principle to organise data. This final step links the hands-on activity with real-world applications of the Semantic Web and how it makes learning easier, helps solve problems, and improves communication, deepening the educational impact.
Explain the experiment	"Today, we learned how information is connected, just like a web. We started with different facts and topics,

(5 min)	then used strings to link them based on their relationships. By doing this, we discovered how knowledge is structured, making it easier to understand patterns and connections. This is similar to how computers and the internet organise information, just like Rose Dieng-Kuntz's work in developing the Semantic Web and how it influenced many websites and digital tools. She helped create ways for computers to 'think' about information and find connections, just like we did in our experiment today. Now, you can see how organising information properly helps us learn, search for answers, and even how artificial intelligence works to process knowledge!"
The science behind	This experiment introduces children to information organisation and knowledge networks, fundamental concepts in computer science, artificial intelligence, and the Semantic Web. By linking pieces of information into a structured web, children learn how relationships between data create meaning, just like how search engines and AI process knowledge. This hands-on approach makes abstract technology concepts more tangible, helping children grasp how digital networks structure and process information.

	The Semantic Web, a concept pioneered by Rose Dieng-Kuntz, allows computers to understand the connections between pieces of information rather than just reading words. This structured approach to data organisation helps computers retrieve, process, and analyse information efficiently, making it possible for technologies like AI assistants, search engines, and recommendation systems to function. **Why:** Understanding how information is linked helps in many real-world applications: • In technology, websites, search engines, and AI use knowledge networks to understand, organise and connect information. • In learning, structured information makes it easier to understand complex topics by breaking them down into related concepts and by acknowledging their causes and consequences. • In problem-solving, recognising connections between ideas helps us identify the roots of an issue and its ramifications and allows us to make better decisions and find solutions more effectively. By participating in this experiment, children develop critical thinking, pattern recognition, literacy, and

	information management skills, mirroring the way computer scientists and AI developers organise digital knowledge today and grasping how digital tools they will use are able to provide them with specific data. **How:** • **Information organisation:** The experiment begins with children receiving different information cards, each containing a fact, concept, or keyword. This mirrors how knowledge is stored in different sources, just like pages on the internet. By using string to connect information cards, children visualise relationships between ideas, demonstrating how data is structured in real-world networks, like Wikipedia or the Semantic Web. • **Recognising and visualising patterns and connections:** As children connect more pieces of information, they see how knowledge is grouped by causes, consequences, origins, or themes, similar to how AI and databases categorise related topics and how any and all information they will need can be broken down or linked with another. The completed information web also helps children understand how search engines, artificial intelligence, and digital knowledge systems work – by linking

	information efficiently to make it easier to retrieve and process. • **Critical thinking and discussion**: By analysing their web and explaining their choices, children develop logical thinking and problem-solving skills, just like computer scientists who design knowledge-based AI systems to process large amounts of information. This will help them navigate, process and use larger quantities of information and improve their understanding and analysis of what they learn and seek. **Historical overview**: In ancient times, information was stored in scrolls and books, shared through oral traditions, and organised in libraries. The invention of the printing press in the 15th century made knowledge more widely accessible, allowing ideas to spread faster. In the 20th century, the rise of computers and the internet revolutionised how we store and access information. However, the early web was just a collection of pages with text and links, requiring users to manually search for connections between information. Tim Berners-Lee, the inventor of the World Wide Web, proposed the idea of the Semantic Web in 2001, which

	allows computers to understand relationships between pieces of information – just like humans do, making it possible for search engines, AI, and digital assistants to find, link, and process information more intelligently. Rose Dieng-Kuntz was a pioneer in knowledge sharing on the web, specialised in artificial intelligence and Semantic Web technologies. She helped develop systems that allowed machines to organise, connect, and retrieve knowledge efficiently and laid the foundation for modern AI-driven search engines, recommendation systems, and online databases. Today, the principles of the Semantic Web are used in search engines like Google, virtual assistants like Siri, and AI models that organise knowledge. This experiment mirrors these concepts by teaching children how to structure and connect information, helping them understand how knowledge networks function in both human learning and digital technology.

Lesson plan 2

The emotional recognition game Keywords: AI, facial expressions, emotions	
Duration: 70 min	**Age:** from 6 to 9 years old
Place: Classroom	**Related STEAM areas:** **S** (Science): understanding how emotions are linked to facial expressions. **T** (Technology): understanding or using AI facial recognition software to analyse emotions. **A** (Art): drawing facial expressions representing various emotions.
Description	This experiment helps children draw and interpret facial expressions representing different emotions, helping them visualise and explore emotional awareness and empathy. Through drawing, acting and analysis, this activity encourages children to identify and express emotions while also comparing their interpretation with their peers and AI, developing their

	emotional intelligence through observation, self-reflection and technology use.
Learning objectives	At the end of this experiment, children will be able to: • Identify emotions based on facial expressions. • Develop self-awareness by comparing their facial expressions with their drawings. • Engage with AI tools to explore emotional recognition technology. • Develop communication and collaborative skills through group activities. • Practice fine motor skills and precision, such as drawing faces and using their own facial muscles to represent specific emotions.
Connection to the female role model	The experiment connects to the work of Rose Dieng-Kuntz, who is known for her pioneering contributions to artificial intelligence. This activity introduces children to AI's role in interpreting emotions, showcasing how technology intersects with human emotion and communication, which was a focus of Dieng-Kuntz's work.
Individual or group	Group activity (in pairs or small groups)
Safety	Supervision is recommended for activities involving the AI facial recognition software to ensure proper usage.

Materials	☐ 1 mirror ☐ Pieces of paper (at least 5 per child, large enough to draw faces on) ☐ Markers (at least one per child) ☐ 1 smartphone, tablet or computer ☐ AI facial recognition software or app
Lesson plan	
Introduction (10 min)	Start by discussing with the children how we can tell how someone is feeling by looking at their face. Show some simple emotions like happiness, sadness, and surprise. Ask questions: "Can you make a face that shows you're happy? What about sad?" Use videos of facial expressions to spark interest: • "Guess the Feelings and Emotions | Teach Emotions to Kids | Facial Expressions for Kids" by Kreative Leadership • "Your Different Facial Expressions! | Science for Kids" by Operation Ouch Bring a connection to Rose Dieng-Kuntz's story: "Do you remember in the story where Rose wanted to explore how technology could help humans communicate and share information? How do you think that can relate to expressing emotions? Do you

	think technology can recognise, understand or show emotion?”
Research question/hypothesis (5 min)	“How do people and technology (AI) identify emotions just by looking at someone's facial expression?” Children should be encouraged to give their answers, even the wrong ones. All opinions should be included and not discarded right away, even though the teacher knows they are not right. The experiment will serve to answer the research question, mimicking the scientific method.
Step-by-step instructions (50 min)	**Step 1: Drawing emotions** Each child should draw faces on pieces of paper representing different emotions, such as happy, sad, surprised, angry, confused, and disgusted. **Step 2: Interpreting and expressing emotions** Children gather in small groups or pairs. One child picks a drawing randomly, hides it from others, and then interprets and replicates the emotion by making the same face. The other children need to guess the emotion based on the expression.

	Step 3: Justifying the guesses After guessing, the children must explain which facial elements led them to their conclusion, such as a frown for sadness or raised eyebrows for surprise, breaking down the cues and components of each facial expression. To do so, ask them: "What made you think about that emotion? Which details of the face, the eyes, mouth, eyebrows, made you guess that emotion?" **Step 4: Self-reflection and analysis** The child who expressed the emotion uses a mirror to see their own expression and identifies the key facial features they used, then analyses the drawing to see if those same features are present. **Step 5: AI analysis** Use AI facial recognition software to analyse the child's expression and see if the AI identifies the same emotion as the children to compare human and digital interpretation and precision.
Source	**Example videos:** • "Guess the Feelings and Emotions | Teach Emotions to Kids | Facial Expressions for Kids" by Kreative

	Leadership • "Your Different Facial Expressions! | Science for Kids" by Operation Ouch • "Facial Expression & Emotion Recognizer Project in PictoBlox | AL and ML Project for Kids" by STEMpedia **Additional resources:** • "Can machines read your emotions? - Kostas Karpouzis" by TED-Ed • "Companies-And DARPA-Are Using AI To Predict Human Emotion" by Forbes • "How close is AI to decoding our emotions?" by MIT Technology Review
Conclusion (5 min)	Review the research question and discuss whether the children's facial expressions matched the emotions they intended and compare the human interpretation with AI recognition results. Discuss the importance of understanding emotions and the role of technology in this process. **Justifications:** Children should justify their interpretation with key visual elements: • **Happiness**: smile or upturned mouth corners, squinted eyes or wrinkles around the eyes, relaxed

	or raised eyebrows. • **Sadness**: downturned or neutral mouth, droopy or sagging eyes, furrowed brows raised in the middle. • **Surprise**: open mouth (parted lips), eyes wide open, raised eyebrows. • **Anger**: tight or pursed lips, narrowed eyes, intense stare, furrowed and downward eyebrows. • **Fear**: open or tense mouth, eyes wide open, pupils dilated, raised eyebrows (similar to surprise). **Disgust**: raised upper lip, scowl, squinted or narrowed eyes, furrowed and downward eyebrows, wrinkled nose.
Explain the experiment (5 min)	"Today, we learned how our faces can show different emotions. By making different facial expressions, we can tell how someone is feeling just by looking at their face. We also saw how technology, like AI, can recognise these emotions too, just like we do. It uses what humans have taught the program about patterns in our facial expressions, like a smile or raised eyebrows, to figure out how we're feeling, but it isn't always as precise as a human would be. Understanding these expressions helps us communicate better with others and understand their feelings."

The science behind	The Emotional Recognition Game promotes emotional literacy and provides insights into how facial recognition technology works, showing how interdisciplinary knowledge, from psychology to artificial intelligence, can work together to understand human emotions. In practice, it helps children learn how people express, interpret, depict and identify emotions through facial expressions and how AI systems are programmed to objectively identify subtle and precise elements to recognise those emotions. The first step allows children to visualise and represent what they think each emotion would look like as a face or emoticon, choosing certain visual cues. The phase of interpretation and expression shows how emotions can be represented and interpreted differently depending on how they are expressed, their intensity and subjectivity, as some emotions may seem similar or be mistaken depending on each person's perception. The justification allows children to break down facial expressions into observable components and understand why they interpreted them in a specific way, enhancing their emotional intelligence and

	helping them understand the non-verbal cues used in communication. The analysis encourages self-awareness and understanding of how facial expressions subtly or clearly convey emotions. Finally, the use of AI software demonstrates how AI analyses facial expressions and compares this process to human interpretation, highlighting the difference between subjective human analysis and objective AI analysis. The science behind this experiment integrates psychological research on human emotions with modern AI technology, involving the study of how humans use facial expressions to convey emotions and how these expressions can be interpreted both by humans and machines. While humans use subtle and contextual elements to identify emotions, AI uses algorithms trained on vast datasets to match facial features with emotions, offering an objective but less flexible way to understand emotions. **Why**: Emotions are an essential part of human communication. We use facial expressions, body

	language and tone of voice to convey how we feel. Studies have shown that humans can recognise certain basic emotions, such as happiness, sadness, anger, surprise, fear and disgust – based on facial expressions alone. **How:** • **Facial expressions and emotions**: The experiment focuses on how specific facial movements (such as smiling, frowning or raising eyebrows) correspond to different emotions. These movements are rooted in the muscles of the face, and each emotion is linked to distinct muscle patterns. • **Human interpretation**: Children observe and replicate facial expressions to identify emotions based on the science of facial expression recognition, a skill that humans develop from a young age. It involves interpreting the subtle changes in the face, like the position of the mouth, eyes and eyebrows, which correspond to different feelings. • **AI facial recognition**: Modern AI systems use machine learning algorithms trained on vast datasets of human faces to identify emotions, with deep learning models and patterns which allow

	them to understand and process visual data similarly to the human brain. They analyse facial features – the same that children use, such as the movement of the eyes, mouth and eyebrows – and compare them to patterns associated with specific emotions. AI emotional recognition provides an opportunity to discuss the differences between human perception and technology's objective analysis. **Key differences:** Humans interpret facial expressions with context and nuance and would notice subtle differences in the eyes and eyebrows, while AI focuses on facial features like mouth shape and eye position, leading to potential confusion between emotions like sadness, surprise and fear. **Historical overview:** The study of facial expressions and emotions has been a significant area of research in psychology. One of its key pioneers was Paul Ekman, who identified six basic emotions universally expressed through facial expressions: happiness, sadness, fear, anger, surprise and disgust. His research laid the foundation for understanding how facial expressions communicate emotions across

	cultures. Various scientific fields have then explored human emotions and their interpretation, including the field of technological communication and knowledge systems, which Rose Dieng-Kuntz was passionate about. As a pioneer in artificial intelligence, her work led to the birth of AI algorithms which have been used in countless ways, including emotional and facial recognition software, combining her interest with human languages and communication through technology and allowing machines to learn how to visualise, analyse and understand the subtlety of human emotions.

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