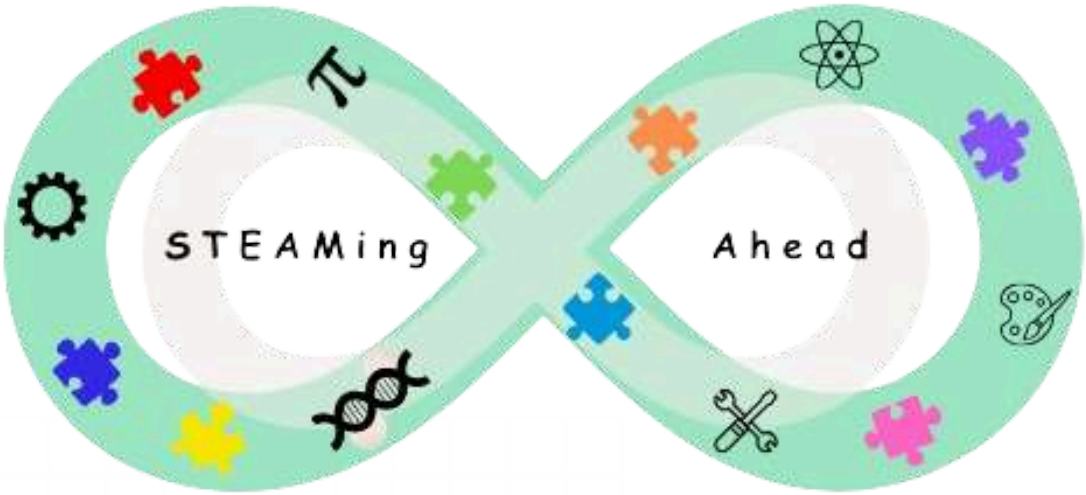

ACTIVITY BOOK

STEAM Activities for children with autism

Co-funded by the European Union

ViModo Research & Education Hub

THE HIVE

FOKU

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PARTNERSHIP

SINA SVETULKA

Sina Svetulka (Blue Firefly) is the project coordinator for an NGO in North Macedonia, aiming to improve the lives of individuals with autism and their families. The organization's focus areas include disability, autism spectrum disorders, human rights, education, and social inclusion. Their goals involve maximizing the potential of individuals with autism, providing treatment and support, and educating families and professionals. The organization is staffed by 10 dedicated members and supported by 55 others. Their activities include workshops, donations, Erasmus projects, seminars, publications, and providing support for parents, children, and professionals. For more information, visit their website: www.sinasvetulka.mk.

ViModo
Research & Education Hub

VIMODO

ViModo Ltd Cyprus is a research and educational organization in Cyprus focusing on sustainable solutions for social innovation and impact. They offer educational courses, conduct research, and provide specialised training programs in areas such as autism and applied behaviour analysis (ABA). Their staff includes experts in psychology, neuropsychology, and certified behaviour analysis. They primarily work with adults and professionals, delivering VET training and professional development programs.
For more information, visit their website: www.vimodohub.com

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The Hive is a training centre based in Greece, established in early 2022. It offers training services and consultancy for various target groups in topics such as Training & Education, Business & Social Innovation, Social Inclusion, Circular Economy & Sustainability. The courses are developed by experienced trainers, align with EU priorities, and incorporate digital tools and learning methods.
For more information, visit: thehivegroup.eu.

FOKU

FOKU AS

FOKU AS is a non-governmental organisation (NGO) from Norway that offers adult education and lifelong learning courses. They focus on providing easy access to training and education, including career counselling and tailored solutions. They offer various classes, including soft skills, basic skills, linguistics, business, economy, and ICT. They also provide courses explicitly tailored for immigrants, aiming to promote social equality and integration. FOKU stands out by integrating elements of STEAM and SEL into their classes, emphasising social and emotional training.
For more information, visit their website www.foku.no.

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OVERVIEW OF AUTISM SPECTRUM DISORDERS

Myths about autism

Although awareness about autism is growing, there are still many misconceptions which can lead to confusion, stigma, and barriers to understanding autism (Evans, 2024). As a result of autism's complicated history and the diverse spectrum of characteristics and behaviours, over time, many myths have developed. These myths can have a significant impact on the lives of individuals with autism spectrum disorder, their families and the way society views and supports them. (Bennett, Webster, Goodall, & Rowland, 2018)

These myths and misconceptions often originate from outdated information, media stereotypes, and limited diverse experiences (Evans, 2024). The media's role in spreading myths and misperceptions about autism is significant. By presenting speculations about individuals with autism and airing debates about the causes and treatments for autism without providing research or scientific evidence to support these stories, the media can significantly influence the public's attitudes and beliefs (Bennett et al., 2018).

Since autism was first identified, scientists and researchers have strived to understand its nature and the common characteristics of individuals with autism (Bennett et al., 2018). Experts have been working to correct misconceptions about autism (Novak, 2022). Transforming these myths into positive understanding will enable new insights and positive perceptions of future possibilities for individuals with autism and their families, which can counteract their current negative impact (Bennett et al., 2018).

OVERVIEW OF AUTISM SPECTRUM DISORDERS

Here are some myths and facts to better understand autism spectrum disorders.

Fact: Autism is a neurodevelopmental disorder

In the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) of the American Psychiatric Association, autism spectrum disorder (ASD) falls under the category of neurodevelopmental disorders (American Psychiatric Association, 2013).

Myth: All Individuals with autism are alike

Autism is a heterogeneous group with varying degrees of symptoms and profiles. No single intervention or approach for everyone would address the different social, communication, and behaviour concerns. (Wang & Krata, 2017).

Fact: There are more boys than girls diagnosed with autism

Autism is more commonly diagnosed in males than in females across age groups (Hull et al., 2020). Autism appears to be at least 3 to 5 times more frequent in boys, but the basis for these differences is still not understood (Volkmar & Wiesner, 2021).

One of the reasons that girls are being misdiagnosed, diagnosed later, or overlooked may be the female autism phenotype (Hodges et al., 2020). One aspect of the female phenotype is the phenomenon of camouflaging, which involves using conscious or unconscious strategies to minimise the appearance of characteristics related to autism in a social setting (Hull et al., 2020).

OVERVIEW OF AUTISM SPECTRUM DISORDERS

Myth: When speech starts, all the other difficulties disappear

One of the most common myths about autism is that if the child develops speech, all the other difficulties disappear.
ASD is commonly linked with language and communication challenges (Walenski et al., 2006). However, it is important to note that the spectrum of language abilities among individuals with ASD ranges from proficient use of complex sentences to non-verbal communication (Ganz, 2014).

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), the characteristics of autism spectrum disorder include persistent deficits in social communication and social interaction as well as restricted, repetitive patterns of behaviour, interests, or activities.

The deficits in social communication and social interaction can include:

- Deficits in social-emotional reciprocity include deficits in social approach and normal back-and-forth conversation, reduced sharing of interests, emotions, or affect, and failure to initiate or respond to social interactions.

- Deficits in nonverbal communicative behaviours used for social interaction include poorly integrated verbal and nonverbal communication, poor eye contact and body language, deficits in understanding and using gestures, and a lack of facial expressions and nonverbal communication.

- Deficits in developing, maintaining, and understanding relationships include difficulties adjusting behaviour to suit various social contexts, difficulties in sharing imaginative play or making friends, or absence of interest in peers.

OVERVIEW OF AUTISM SPECTRUM DISORDERS

Key characteristics of ASD include restricted, repetitive patterns of behaviour, interests, or activities. These patterns manifest in various ways, such as stereotyped or repetitive motor movements, insistence on sameness, and highly restricted, fixated interests.

- Stereotyped or repetitive motor movements, objects, or speech use, such as simple motor stereotypes, lining up toys or flipping objects, echolalia, and idiosyncratic phrases.

- Insistence on sameness, inflexible adherence to routines, or ritualised patterns of verbal or nonverbal behaviour, such as extreme distress at small changes, difficulties with transitions, rigid thinking patterns, greeting rituals, or the need to take the same route or eat the same food daily.

- Highly restricted, fixated interests that are abnormal in intensity or focus, such as strong attachment to or preoccupation with unusual objects, excessively circumscribed or perseverative interests.

- Hyper- or hypo-reactivity to sensory input or unusual interest in sensory aspects of the environment, apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, or visual fascination with lights or movement (American Psychiatric Association, 2013).

Individuals with ASD often face challenges in verbal expressive communication. These can include difficulties with articulation, abnormal use of words and phrases, and challenges using correct syntax and morphology. Many verbal individuals with ASD also struggle with asking questions, showing empathy, providing appropriate details, and expressing interest in others (Koegel & Ashbaugh, 2017).
Even if children with autism develop speech, they will still have difficulties in social communication and interaction and restricted, repetitive patterns of behaviour, interests, or activities.

OVERVIEW OF AUTISM SPECTRUM DISORDERS

Myth: Autism is just a type of learning difficulty

Autism is not a learning disability, although learning disabilities can co-exist in individuals with ASD. (Evans, 2024).

ASD falls across a broad spectrum, and the range of functioning and skills may fall at any point on a broad scale, meaning people who have ASD are a heterogeneous group (Ganz, 2014). Autism is characterised by varying degrees of difficulties in social interaction, verbal and nonverbal communication and repetitive behaviours, which affect an individual's functioning (Wang & Krata, 2017).

Many individuals with autism can also have learning difficulties. Usually, children learn new tasks similarly, but children with autism learn differently. They can have extreme differences in their learning process. For example, they can master a specific activity, but on the other hand, they can have difficulties learning the basics of a simple task (Sharma et al., 2015).

Children with autism demonstrate different cognitive skill development and processing profiles than their peers. They demonstrate cognitive peaks related to visuospatial skills or rote memory but struggle with abstract verbal concepts and comprehension tasks (Bennett et al., 2018). That is why individuals with autism are visual learners and can process visual information more quickly than verbal information (Duffus, 2023).

OVERVIEW OF AUTISM SPECTRUM DISORDERS

The deficits in social communication and behavioural issues that individuals with autism face present significant challenges for learning from very early on in life. Children, adolescents, and adults with autism may also face many challenges in learning because of their problems with executive functioning. They may often have difficulties in developing skills such as sharing a focus of attention, staying seated, or focusing on the teacher. These issues can seriously affect learning (Volkmar & Wiesner, 2017).

We already mentioned that the characteristics of individuals with autism include hyper (over) or hypo (under) reactivity to sensory input or unusual interest in sensory aspects of the environment.

As a result of the sensory issues that individuals with autism face, the children might have difficulties when learning new tasks, which can lead to a lack of self-confidence or self-esteem (Sharma et al., 2015). Anxiety related to sensory differences has been reported more widely. One of the reasons for developing and maintaining anxiety in individuals with autism is hypersensitivity. At the same time, hyposensitivity has been associated with difficulties with joint attention, emotion dysregulation and gross motor skills, all important for classroom behaviour and success (Jones et al., 2020).

OVERVIEW OF AUTISM SPECTRUM DISORDERS

Myth: People with autism always have a genius ability.

It is a common myth that people with autism always have a genius ability and extraordinary skills.

Autism is highly heterogeneous, presenting unique behavioural and cognitive characteristics (Torenvliet et al., 2023) that result in varying developmental profiles and trajectories (Clark et al., 2023).

It is a common misconception that all individuals with autism have savant abilities, but studies have reported that only 1%-10% of individuals with autism may have savant abilities (Sharma et al., 2015).

Savant skills may be referred to as skills that substantially exceed the skill level found in the typical population and usually fall within a specific range of domains (Clark et al., 2023) that include music, mathematics, calendar calculating, art and mechanical or spatial skills, as well as less often exceptional abilities with languages, atypical sensory discrimination, heightened awareness of time, knowledge in specific areas such as statistics or navigation and enhanced memory (Bennett et al., 2018).

These abilities can include exceptional reading and spelling abilities, exceptional playing of a musical instrument or singing in perfect pitch, exceptional visual-spatial skills, an ability to name the day of the week for any given date, exceptional mental arithmetic ability, and gross and fine-motor coordination (Clark et al., 2023).

OVERVIEW OF AUTISM SPECTRUM DISORDERS

Children with ASD have diverse cognitive skills; some have high intelligence but may struggle to judge others' attention, others may have short attention spans, have poor memory, and get easily distracted, and others may have savant skills (extraordinary skills)(Sharma et al., 2015).

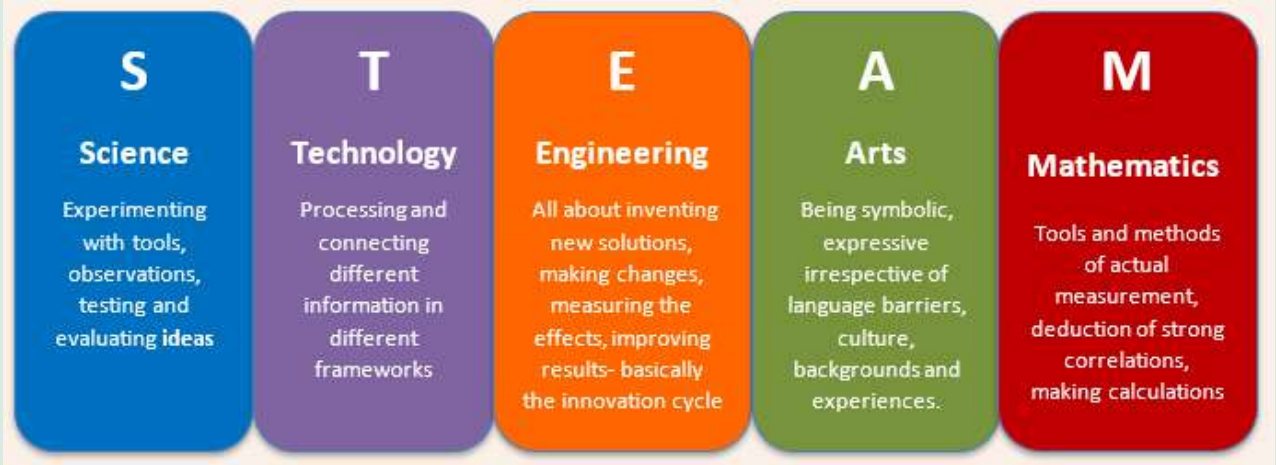
Many individuals with ASD have strengths or powerful skills in music, mathematics, or memory. These skills, though contrasting with their overall developmental level, highlight the potential and promise of an uneven profile of cognitive ability (Clark et al., 2023).

Here are some examples of the two sides of individuals with autism (Sharma et al., 2015):

- It can take up to 10 minutes to memorise the states in order, but packing a school bag can take hours.
- It can be easy for the individual to recite a whole poem but difficult to make up a story.
- It can be easy to line up the toys, but it is not easy to stay in the line.
- Can operate the remote control or the computer with zero instructions, but buttoning up pants needs intensive instructions.

UNDERSTANDING STEAM

STEAM is a unique approach to learning and teaching that combines all the disciplines of the education field- science, technology, engineering, arts, and maths- into the studies. It merges the technical approach with a creative one. It aims to ignite children's curiosity from a very young age and cultivate it for a lifetime. Studying these fields involves creative processes and does not rely solely on one approach of inquiry and analysis. It is crucial to teach kids current, in-demand skills that will enable them to become innovators in a constantly changing world. It focuses on project-based learning that integrates all five disciplines and creates a welcoming environment for all children. Unlike traditional teaching models, STEAM educators integrate the disciplines, taking advantage of the connections between math and science content and the modelling process to, for example, blur the lines between scientific and mathematical thinking and modelling techniques. It acknowledges the value of the arts, which act as a catalyst for fostering a sense of imagination, creativity, and critical thinking in students.



This approach focuses on the following areas (Arduino Education, n.d.):

- Inventing unique solutions and improving problem-solving skills
- The liberty to exhibit greater expressiveness, creativity, and innovation
- Gaining knowledge and abilities through practical experience
- Taking ownership of one's own learning process
- Working cooperatively and not competitively

UNDERSTANDING STEAM

Why STEAM is important?

To prepare students for success in the modern world, it is necessary to expose them to various subjects comprehensively, fostering the development of critical thinking abilities. The primary goal of STEAM education is to encourage students to become inventors rather than just consumers and assemblers of technology. This integrated curriculum's central strategy promotes the growth of logical and unified skill sets. This comprehensive method encourages pupils to develop their creativity and innovation. Though slowly, a significant paradigm shift in education is currently taking place. This change is required to meet the challenges of a technologically advanced world that is changing quickly and automating numerous tasks, causing a drop in many jobs and fields of labour.

Students will benefit from the STEAM approach by becoming more robust to the economic effects of automation. The STEAM education curriculum intends to make children more adaptable in a highly competitive world (Arduino Education, n.d.). Including the arts in the curriculum may improve students' problem-solving skills, creativity, and engagement.

STEAM Education: nurturing kids for future?

In today's world, providing STEAM Education for children has become one of the best investments due to its benefits (Robo Wunderkind, n.d.):

- **Critical thinking skills:** Because STEAM projects are interdisciplinary, they allow children to examine them from different perspectives. This, in turn, improves their ability to see a problem they are trying to solve from various viewpoints, weighing and evaluating its possible implications and all the different approaches and solutions one could apply.

UNDERSTANDING STEAM

- **Development of social and soft skills:** The STEAM curriculum's comprehensive, collaborative approach enhances students' social and emotional intelligence. They gain communication and teamwork skills and increased social flexibility.
- **Instills curiosity:** It teaches students to be curious about various subjects, and the guidance and support from parents and educators help them probe more deeply for explanations of how and why things operate.
- **Better collaborative approach:** Students are encouraged to work together rather than compete with one another, particularly regarding projects. They grow ready to function as a team by learning to contribute their expertise, abilities, and talent to accomplish shared objectives.
- **It creates a road to college:** Students who excel in STEAM fields are highly sought after for degrees and employment opportunities, making them feel valued.
- **Prepares for future job markets and industry requirements:** STEAM education ensures that students are well-prepared for the future job market, providing a sense of security. In the future employment market, more emphasis will be placed on skills than disciplines, the exact details of which we can only speculate about.

Importance of A in STEAM Education

The 'A' in STEAM Education is the Arts.

ARTS are essential to education and provide children with unique advantages. Engaging in artistic activities fosters creativity, enables learners to experiment with various forms of self-expression, and enhances emotional intelligence. For example, an architect must use all the disciplines—engineering, math, technology, science, and arts—to create stunning buildings and structures (Neese, 2023).

UNDERSTANDING STEAM

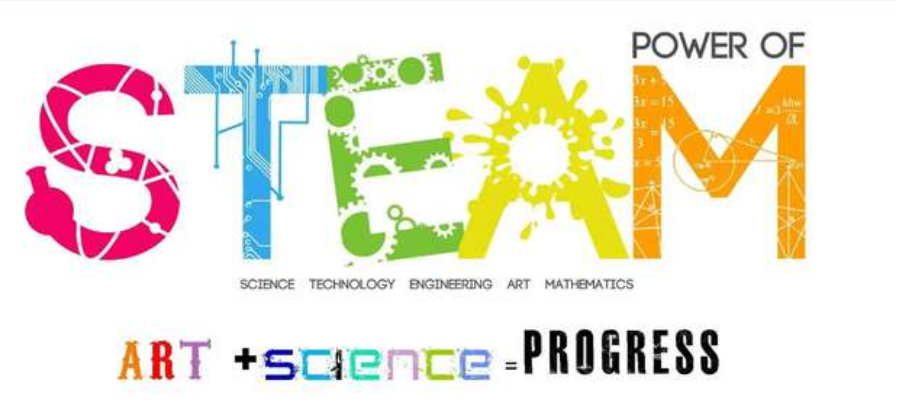
STEAM for Autistic Children

Educators recognise the importance of including students with developmental impairments, like Autism, in STEAM education. Traditional activities may not always work, but inclusive STEAM activities, such as emotional cards and sensory tasks, can enhance cognitive development. These engaging tasks are accessible, fun, and foster creative thinking. Here they are (Stevens, 2020):

- Exploring with Microscope: Introducing students to microscopes can open new opportunities for young children with disabilities. Microscopes are a tried-and-true method of intriguing children's curiosity about the world around them. Many student microscope kits contain learning aids such as books, experiment cards, and prepared slides.
- Matching numbers on Stick note: A Post-It Number Match Game is an excellent teaching tool for fundamental math concepts. Make a wall display by attaching a dot to every number and matching sticky notes to each number. Then, hunt for your children by hiding the numbers across your classroom. The satisfaction comes from helping kids locate each number, count the dots, and place each note properly! You may quickly adapt the activity to detect colours, shapes, or other learning objectives.
- Keeping Caterpillars or Tadpoles in the Classroom: Keeping a classroom caterpillar or tadpole can be an excellent option. Observing and tending to a living thing as it grows and develops can foster a lifetime love of the biological sciences. Students will learn about the life cycles of animals and be enthralled by the spectacular conversion of tadpoles into frogs or caterpillars into butterflies. This will support children's social and emotional learning by promoting the values of accountability and respect for all living things.

UNDERSTANDING STEAM

STEAM around the world



The STEAM curriculum is crucial for creating a solid foundation, encouraging creativity, and enabling people to progress in their jobs. Practical skills and critical thinking are prioritised in US and UK curricula. However, the theory is emphasised more in India. In contrast, science and mathematics are highly valued in China. Japan prioritises comprehensive development and finds a balance between theory and practice. In Europe, much emphasis is placed on project collaboration with the European Union and the adoption of STEAM-based learning activities in primary school curricula.

More skills are needed in the European Union (EU), particularly in the domains of information and communications technology (ICT) and STEAM (science, technology, engineering, arts and mathematics). In these fields, women are disproportionately underrepresented. The continuous shifts in society toward a greener and more digital economy are creating new demands for talent. To guarantee the ongoing development of skills necessary to maintain economic competitiveness on a global scale, the EU is championing the STEAM Approach; it has supported the harmonised graduate tracking.

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Integrating art into STEAM (Science, Technology, Engineering, Art, and Mathematics) education significantly benefits children with Autism Spectrum Disorder (ASD). Individuals with ASD often excel in environments that involve patterns, formulas, and predictable systems, making them well-suited for STEM subjects. Their unique characteristics, such as visual thinking and sensory perception, align naturally with the arts (Lee et al., 2020).

Art as a means of communication

Visual thinking, a common trait among those with ASD, involves categorising visual memories and images. When recalling an object or thing, these memories and images cycle through their mind, allowing them to visualise in detail and often transpose these images into drawings. Art can serve as a vital communication tool for visual and non-verbal thinkers, offering an alternative avenue for expression (Grandin, 2009). While not everyone with ASD excels in drawing and visual thinking, many can benefit from fine motor skills in art-making. Artistic activities can also help relieve excess stress or energy and aid self-regulation (Alter-Muri, 2017).

Incorporating art into educational subjects and non-educational environments provides individuals with ASD with a means to process information, enhance communication, and apply educational material in unique and meaningful ways. This holistic approach supports their academic growth and emotional and social development.

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Preparing for the Future

STEAM fields are proliferating and are expected to be some of the most in-demand fields in the coming years. Projected growth for STEAM-related jobs between 2014 and 2024 is 28.2%, compared to 6.5% for all occupations (Fayer et al., 2017). So, a strong foundation in STEAM subjects can set children up for success in their future careers. Regardless of any neurological or developmental disorder, every child deserves the opportunity to prepare for a future where STEAM-related skills will be in high demand.

Structured Learning Environment

STEAM activities provide structured frameworks for learning, which can be particularly beneficial for children with ASD who thrive in predictable and organised settings. The precise objectives, step-by-step instructions, and systematic approach to problem-solving in STEAM activities help children with ASD feel more comfortable and confident in their learning environment.

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Academic

Often, students with autism find the traditional classroom environment overwhelming, confusing, or even tedious. Studies show that 50-70% of children are "multimodal learners", meaning they are inclined toward more than one learning style (Palmer, 2015). They learn better when presented with information in various forms: Visual, Auditory, Reading and writing, and Kinesthetic. Therefore, STEAM activities' experiential and hands-on nature makes them more engaging and effective. This benefits kids who struggle with traditional lecture-style teaching methods, like students with autism.

Enhancing focus and concentration

STEAM activities often require sustained attention and concentration, as children engage in tasks that demand mental engagement and problem-solving. By immersing themselves in hands-on projects such as building robots, conducting experiments, or coding programs, children with ASD can practice focusing their attention for extended periods. This focused engagement enhances their ability to stay on task and improves their attention control and self-regulation skills. Additionally, the structured and goal-oriented nature of STEAM activities provides clear objectives and milestones, which can help children with ASD maintain focus and stay motivated throughout the learning process.

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Improving Social Skills/Team Building

Many STEAM activities involve collaboration, communication, and teamwork, providing valuable opportunities for children with ASD to practice social skills in a structured and supportive environment. Whether working on group projects, participating in coding challenges, or brainstorming creative solutions to problems, children learn to communicate effectively, share ideas, and collaborate with peers. These interactions promote social reciprocity, perspective-taking, and empathy, fostering positive relationships and a sense of belonging within the group (Murthi et al., 2024).

Moreover, STEAM activities often require individuals to work in teams with diverse skills and strengths, encouraging children to appreciate the contributions of others and recognise the value of teamwork. By collaborating with peers to achieve common goals, children with ASD learn the importance of cooperation, compromise, and collective problem-solving. These experiences enhance their social skills and promote a sense of mutual support within the group.

Enhancement of Communication Skills

STEAM activities allow children with ASD to practice and improve their communication skills in a non-threatening environment. Whether verbal or non-verbal, communication is integral to collaborating with peers, expressing ideas, and seeking assistance during STEAM projects (Estes, 2024). Engaging in discussions, asking questions, and explaining concepts to others can help children with ASD develop communication skills and build confidence in expressing themselves effectively.

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Boosting Confidence and Resilience

STEAM activities provide children with ASD opportunities to explore their interests, showcase their abilities, and experience success in a supportive and non-judgmental environment. As children engage in hands-on projects, solve complex problems, and create tangible outcomes, they gain a sense of accomplishment and mastery over their skills. This sense of achievement fosters confidence and self-efficacy, empowering children to believe in their capabilities and embrace new challenges with optimism and enthusiasm (Murthi et al., 2024). Moreover, STEAM activities often involve trial-and-error experimentation, where mistakes are viewed as valuable learning experiences rather than failures. This promotes a growth mindset, encouraging children to embrace challenges, persist despite setbacks, and learn from mistakes. As children with ASD overcome obstacles and progress toward their goals, they develop resilience and a sense of agency, further enhancing their confidence and self-esteem.

Promotion of Executive Functioning Skills

STEAM activities can help children with ASD develop executive functioning skills, such as planning, organisation, time management, and self-regulation. These skills are essential for success in academic settings and daily life tasks. STEAM activities often involve complex tasks that require children to set goals, break tasks into manageable steps, and monitor their progress, fostering the development of executive functioning skills in a structured and supportive environment (Read more).

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Critical Thinking

STEAM activities often involve hands-on experimentation and exploration, encouraging children to observe, analyse, and draw conclusions. This process stimulates critical thinking skills as children learn to identify patterns, make connections, and solve problems. For children with ASD, who may excel in logical and detail-oriented thinking, STEAM activities offer structured frameworks for applying these strengths in various contexts (Murthi et al., 2024).

Creativity

Contrary to popular belief, creativity is not confined to the arts; it permeates every aspect of STEAM. STEAM activities foster creativity by encouraging children to think outside the box, experiment with different solutions, and express themselves through various mediums (Estes, 2024). For children with ASD, who may possess unique perspectives and interests, STEAM provides a platform for channelling their creativity into tangible outcomes, whether designing a robot, composing music, or conducting scientific experiments.

Problem-Solving

STEAM activities inherently involve problem-solving, as children face challenges requiring logical thinking and innovative solutions. Whether designing a structure that can withstand a certain amount of weight, coding a program to achieve a specific task, or conducting experiments to test hypotheses, children with ASD can benefit from the structured problem-solving approach of STEAM activities. These activities provide a safe and supportive environment for practising problem-solving skills, fostering resilience and adaptability in facing challenges (Murthi et al., 2024).

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Analytical Reasoning

STEAM activities often involve analysing data, identifying patterns, and drawing logical conclusions, essential to analytical reasoning. Whether solving mathematical equations, conducting scientific experiments, or troubleshooting technical problems, children with ASD are challenged to think critically and apply logical reasoning skills to solve complex problems.

Through hands-on exploration and experimentation, children learn to observe phenomena, collect data, and analyse results to draw meaningful conclusions. This process encourages them to think systematically, break down problems into smaller components, and evaluate evidence to make informed decisions. Engaging in STEAM activities thus strengthens their ability to think analytically, approach problems methodically, and apply logical reasoning to real-world situations.

Fine Motor Skills Development

Many STEAM activities require hands-on manipulation of materials, tools, and equipment, which can help children with ASD improve their fine motor skills. Whether assembling intricate components, manipulating small objects, or using digital interfaces, engaging in STEAM activities challenges children to refine their hand-eye coordination, dexterity, and precision. This can be particularly beneficial for children with ASD who may experience difficulties with motor coordination and sensory processing, providing them with opportunities for sensory-motor integration and skill refinement (Schenkman, 2020).

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Encouraging Flexibility and Adaptability

STEAM activities often involve experimentation, trial and error and open-ended challenges with unpredictable outcomes, requiring participants to be flexible and adaptable. Children with ASD are encouraged to explore different strategies, experiment with new ideas, and adapt their methods based on feedback and changing circumstances (Estes, 2024).

In STEAM, there is rarely a single correct solution to a problem, allowing children to explore multiple pathways and perspectives. This fosters a mindset of flexibility, where children learn to embrace uncertainty, tolerate ambiguity, and welcome new challenges as opportunities for growth. Engaging in STEAM activities can be a source of joy and fun as children step outside their comfort zones, take risks, and push the boundaries of their knowledge and abilities.

Moreover, the interdisciplinary nature of STEAM encourages children to make connections across different subject areas and apply knowledge from diverse domains to solve problems creatively. This multidisciplinary approach promotes cognitive flexibility as children learn to integrate information from various sources, adapt to different contexts, and synthesise new ideas and concepts.

Can be Done at Home

Many STEAM activities require minimal materials and can be conducted using everyday household items, making them accessible and convenient for home-based learning. For example, children can perform simple science experiments using kitchen ingredients, build structures using household recyclables, or engage in coding activities using online resources and educational apps.

BENEFITS OF STEAM FOR CHILDREN WITH ASD

Reduction of Anxiety and Stress

Participating in STEAM activities can help reduce anxiety and stress levels in children with ASD by providing opportunities for structured engagement and sensory stimulation. The hands-on nature of STEAM activities allows children to focus their attention and channel their energy into productive pursuits, which can have a calming effect and help regulate emotions (Gehricke et al., 2022). Additionally, the predictable nature of STEAM activities, with clear instructions and achievable goals, can help alleviate anxiety associated with uncertainty and ambiguity.

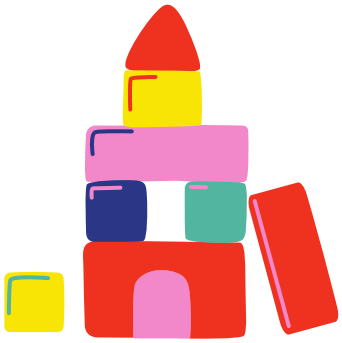
Facilitation of Sensory Integration

Many STEAM activities provide sensory-rich experiences that can help children with ASD improve sensory integration and regulation. From exploring different textures and materials to engaging in hands-on experiments that stimulate multiple senses, STEAM activities offer opportunities for sensory exploration and modulation. This can be particularly beneficial for children with ASD who experience sensory sensitivities or seek sensory input to regulate their arousal levels (Sillbird, 2024).

ACCESSING YOUR CHILD'S STRENGTHS AND CHALLENGES

Identifying your child's strengths and challenges, especially in STEAM, can be a valuable step towards supporting their educational journey. Understanding where your child excels and where they might need more support helps tailor learning experiences that cater to their needs. Following are practical steps and tools for parents to assess their child's STEAM-related interests and areas for improvement.

Children show parts of their skills and interests even at a young age through play and daily activities. By observing the child, a parent can recognise patterns in the types of games the child prefers, the questions they raise, and the topics that interest them. For instance, is the child more curious about building with blocks, drawing, experimenting with different materials, or using technology? Focus on how they interact with their toys and tools related to STEAM, such as construction sets, art supplies, science kits, educational apps, or multisensory games.



ACCESSING YOUR CHILD'S STRENGTHS AND CHALLENGES

School is a place where children socialise and explore their interests. Teachers organise many activities and are responsible for educating the children. Parents should form close relationships with their children's teachers to stay informed about their child's progress and latest interests. Working as a team, parents and teachers can plan ways to advance children's learning progress by customising methods. Teachers' feedback can provide insights into the child's strengths and weaknesses. Grades, assignments, and project reports can also reveal important clues about the child's interests in STEAM.

In addition, extracurricular activities can provide valuable information about the children's interests and promote their STEAM engagement. Participation in sports or art classes can unveil hidden talents, foster problem-solving skills, and enhance creativity. These activities can ultimately build confidence and enthusiasm in the child, indicating which activities they find most engaging and fulfilling. Furthermore, STEAM-related activities can include study visits to museums, art exhibitions, galleries, nature trails, and more. Even DIY projects at home can allow children to explore the STEAM world in an immersive way.

ACCESSING YOUR CHILD'S STRENGTHS AND CHALLENGES

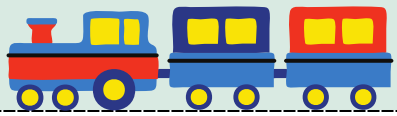
Another clue that parents should pay attention to is the overall emotional state of the child while participating in any activity. Observing body language, tone of voice, and level of engagement can provide valuable insights. Are they enthusiastic and focused, or do they become easily frustrated and disengaged? These behavioural cues can help measure their comfort and interest in different STEAM activities.

Talking to your child about their day and interests is also very important. Listening to the questions they raise and topics they are passionate about. Are they interested in how things work, why certain events happen, or even how to build something new? Continuous encouragement to express their thoughts and ideas can help you understand their interests and potential areas for development. Open-ended questions such as, "What do you enjoy most about your science class?" or "Can you show me how you built that?" can lead to meaningful discussions.

ACCESSING YOUR CHILD'S STRENGTHS AND CHALLENGES

In our digitally rich times, many interactive games and activities are available that can spark a child's curiosity about STEAM-related topics. Online tests, games, puzzles, and videos could prove your child's interest in these areas.

There are plenty of ways parents can discover their children's strengths and weaknesses in STEAM education. However, with all these available resources, it is easy to lose track of progress. A good solution is to begin noting significant milestones and achievements. This way, a clear path of progress can reveal the strengths and weaknesses and what worked well and what didn't. With this knowledge, parents can design a more targeted approach to benefit the child and advance their education.



In conclusion, understanding your child's strengths and challenges in STEAM education involves careful observation, active engagement, and strategic use of resources. Parents can gain valuable insights into their children's unique talents and areas needing support by paying attention to their interests, behaviours, and emotional responses in various activities. Engaging in meaningful conversations and providing diverse experiences inside and outside the home can further nurture their curiosity and enthusiasm for STEAM. Parents can create a supportive and enriching environment that fosters their child's growth and success in STEAM fields by documenting progress and adjusting approaches based on observed outcomes. Parents can help their children develop the skills and confidence needed to thrive in an increasingly technology-driven world through these efforts.

CHAPTER 1

Preparing your home for STEAM learning

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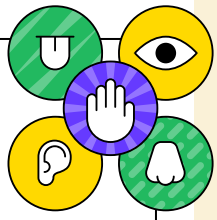
PREPARING YOUR HOME FOR STEAM LEARNING

Understanding hyper and hypo sensitivity to sensory stimuli

To create a sensory-friendly environment that supports the child's learning needs, first, we need to understand the hyper and hypo sensitivities to sensory stimuli that individuals with autism have.

As we previously said, the characteristics of individuals with autism include hyper (over) or hypo (under) reactivity to sensory input or unusual interest in sensory aspects of the environment. This can lead to distraction for the child and affect learning.



The hyper (over) or hypo (under) reactivity to sensory input or unusual interest can be presented as (Hilton & Ratcliff, 2022), (Sharma, Gokulchandran, Sane, Biju, & Shetty, 2015), (Duffus, 2023), (Volkmar & Wiesner, 2021):

Touch

Reacting emotionally or aggressively to touch, avoiding wearing shoes and socks, avoiding walking barefoot, having difficulty standing in line close to others, cutting out labels and tags, avoiding painting or sand play, decreased awareness of pain and temperature, not noticing when face or hands are messy, displaying unusual need for touching certain toys, surfaces, or textures, constant seeking specific clothing or food, or seeking more physical touch like a handshake or a hug.

Sound

The child may be oversensitive to noise that is not unpleasant to most typical individuals and will cover the ears to loud noises. Still, an under-sensitive child might hum or sing to screen out noises, put an ear close to noises to listen and enjoy the same sounds on repeat.

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PREPARING YOUR HOME FOR STEAM LEARNING

Understanding hyper and hypo sensitivity to sensory stimuli

Visual

They prefer to be in the dark, avoiding bright lights or preferring bright lightning, looking intensely, enjoying the visual movement of throwing, lining up or dropping objects, staring at spinning objects, liking to turn lights on and off, flicking fingers in front of eyes for visual stimulation or to block out other visual input. The child might enjoy the environment to look a certain way, for example, when drawers and doors are closed, or objects are placed precisely in the correct position. The child can have difficulties concentrating in an environment with too many visual inputs, like a classroom with many pictures on the walls and things dangling from the ceiling.

Taste

Restricted food preferences, feeding problems, resistance to trying new foods and eating certain flavours, colours, or textures; on the other hand, the child may lick or taste playdough, toys, and other objects.

Smell

They can have strong preferences for smells and may be interested in things with characteristic odors, like candies with strong scents, markers that smell, may sniff people, objects, or food, and may smell everything that the child touches. On the other hand, the child may hold the nose to avoid certain smells and respond dramatically to smells that are not too intense, and perfumes/colognes/aftershaves may be a distraction for the child.

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PREPARING YOUR HOME FOR STEAM LEARNING

Understanding hyper and hypo sensitivity to sensory stimuli

Vestibular

The child may seek body movements like rocking, swinging, bouncing, jumping, or experiencing roller coasters. It may also crave 'risky' sensations like balancing on thin supports or climbing to precarious heights. On the other hand, the child can be slower at changing the direction of movement when running, find it challenging to maintain a certain speed, and find it trickier walking and balancing. They may avoid movements such as fear of climbing down, experiences that lead to feeling dizzy like a roller coaster, or moving their heads when bending over. It can also feel sick when the car is moving.

Proprioceptive

The child may have trouble using the correct force for tasks such as pouring a glass of water without spilling or writing without your marks going through to the other side, may seem clumsy or bump into things, have difficulties with gross motor skills and may trip and fall, difficulty climbing, riding a bike or with fine motor skills. However, the child may also be jumping, running, teeth grinding, walking too hard, holding pencils too tight, or chewing objects like pencils, gums, sleeves, collars, etc.

Sensory overload

When the amount of sensory information that the child experiences is too much and overwhelming, it can lead to sensory overload, and the child may experience physical sensations such as a headache, feeling sick, feeling dizzy or sweating (Duffus, 2023).

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PREPARING YOUR HOME FOR STEAM LEARNING

Creating a sensory-friendly learning space

You can modify your home to create a sensory-friendly learning area for your child and avoid sensory overload. This will reduce the anxiety associated with sensory input and support your child's learning process.

When creating a sensory-friendly environment for a child, always remember to remove and reduce the source of the sensory overload or provide the child with the needed sensory stimuli. Every child is different, and you must adapt to the environment according to your child's sensory differences.

Here are some tips on how you can create a sensory-friendly learning space:

Light adjustment

If your child avoids bright light, you must adjust the light in the learning area. Do not use bright or fluorescent lights; you can use warm or dimmed lights. Change all the lights in the room that are not shining steadily (flickering) and produce a buzzing sound because this can also distract the child. If you have a light dimmer switch at home, you can adjust the light's intensity depending on your child's preference. For some children, even intense daylight can be overwhelming. Try to reduce the intense daylight by using curtains, shades or blinds. You can also give your child sunglasses to reduce unwanted bright light.

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PREPARING YOUR HOME FOR STEAM LEARNING

Creating a sensory-friendly learning space

Reduce visual distraction

The child can have difficulty concentrating if there is too much visual stimulation in the room. Ensure a clean learning area; always keep the learning space and materials well organised and remove unneeded materials and objects from the room. Reduce the potential visual stimulation that can distract your child from concentrating on the activity, like many pictures or posters on the wall. Organise the room according to the child's preferences, for example, by closing all the room doors.

Reduce loud noises

If your child is over-sensitive to sound, try to reduce the background sound of the home while learning, like switching off the TV, radio, washing machine or any other technology that can produce loud sounds, which can distract your child. Close the windows to reduce sounds from outside, like traffic jams; for some children, even sounds we ignore, like the clock ticking, can be distracting. You can give your child noise-cancelling headphones to block the noise in the learning area. You can arrange a sensory tent in one corner of the region.

Reduce or provide smell stimuli

If your child is overly sensitive to smell, consider not wearing scented solid perfumes or cologne. To avoid sensory overload, it is best not to have air fresheners or scented candles in the learning area. When choosing the materials you want to include in the activity, avoid materials and products with a strong scent. However, if your child is under-sensitive, you can include materials like scented markers or scented play dough, depending on your child's preference.

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PREPARING YOUR HOME FOR STEAM LEARNING

Creating a sensory-friendly learning space

Reduce tactile stimuli

Let your child wear clothes made of soft materials that are not too tight to reduce the child's stress. If the child is oversensitive to certain textures, learn your child's preferences and avoid materials that can lead to sensory overload (for example, if your child does not like the texture of finger paints, avoid using them during activities).

Learning space layout

Arrange your learning area to have enough space for your child to move around and to avoid bumping into different objects. Have a well-organized place in the room where you will keep all the materials. You can mark the spot with visual pictures where you hold each material or tool. With this, the child will know where to take and return every material they need, avoiding the frustration of not putting the things back in their proper place. When it comes to the colour of the room's walls, avoid having walls with different or bright colours.

Provide preferred items

Aside from the learning materials, you can provide many items to help your child reduce stress and anxiety if there is a sensory overload or items your child seeks. You need to know your child's preferences to choose the correct items. For example, you can provide fidget toys if your child likes to look at spinning objects, weighted blankets or lap pads if your child is seeking deep pressure, chew toys if your child constantly needs to put items in their mouth, etc. If your child is seeking constant movement like jumping or running, you can allow breaks for the child to move around or have a home trampoline and therapeutic ball. You can provide sensory balls, sensory bottles, or other quiet squeeze toys to reduce stress and anxiety.

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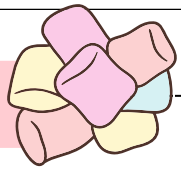
PREPARING YOUR HOME FOR STEAM LEARNING

List of materials and tools you can use for STEAM activities

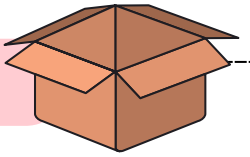
There are many materials and tools you can use for STEAM activities at home. You probably already have a number of materials. For safety reasons, it is recommended that you use hypoallergenic and non-toxic materials.

Kitchen products



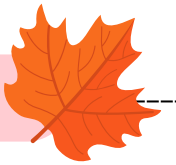
There are many kitchen products that you can use for STEAM activities, such as baking soda, flour, vinegar, oil, sugar, salt, water, food colouring, different foods (marshmallows, whipped cream, gummy drops, etc.), non-toxic soap, and others.

Reusable materials



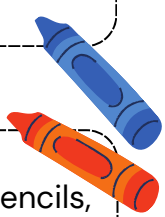
You can use reusable items such as jars and plastic bottles, egg cartons, cardboard boxes, toilet paper rolls, jar lids, and bottle caps.

Materials from nature



You can collect many materials from the environment, such as leaves, rocks, sticks, flowers, pinecones, and sand.

Budget friendly materials and tools



Other budget-friendly materials and items are non-toxic glue, crayons, pens, pencils, markers, watercolours, non-toxic play doh, non-toxic finger paint, paper, kids' scissors, sponges, paint brushes, popsicle sticks, pipe cleaners, tweezers, toothpicks, plastic spoons, plastic and wooden clothespins, plastic cups, Lego, blocks, googly eyes, pom poms, pipette, droppers, trays, straws, and others.

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CHAPTER 2

Science: Activities

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Science

S in STEAM stands for science.

The scientific method involves observing, asking questions, making predictions, designing and carrying out experiments and engaging in discussions. Even infants and toddlers naturally use a basic form of this process as they explore and discover their surroundings.

Children find patterns and create theories to explain what they see. Just like scientists, children also learn from others. They watch what other children or adults do and learn by trying to repeat what they've seen, or by asking questions and learn from the results (National Center on Early Childhood Development, Teaching, and Learning, n.d.).

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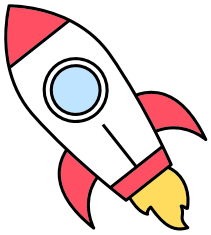
Subject: Science

Age: 1 -4 years old

Activity 1

Discovering Shapes & Textures



Objective

To introduce sensory exploration and basic sorting of different objects

Materials

- Ball pit
- Smaller teddy bears
- Various bath toys (e.g., duckies, frogs)
- Chunky blocks
- Separate containers for sorting

Instructions

- Fill the ball pit with the different objects and mix them so they can be covered.
- Place separate containers nearby for sorting.
- Introduce the activity to your child and encourage your child to explore the ball pit with the hands.
- Guide your child to sort the objects by type (e.g., teddy bears, bath toys, blocks) using the separate containers. Demonstrate how to place each object in the corresponding container.
- Talk about the colours, shapes, and types of objects. Encourage your child to repeat the names and identify the colours. Ask simple questions like, "Can you find a teddy bear?" or "Where does the ducky go?"
- After the end of the activity, ask your child to place all the objects back into the ball bit and clean up the space.

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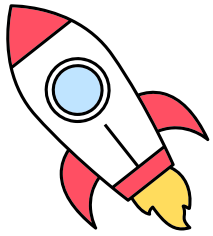
Subject: Science

Age: 1-4 years old

Activity 1

Discovering Shapes & Textures



How it works

Sorting objects helps children develop cognitive and motor skills by categorising items based on characteristics like size, shape, or colour. It enhances critical thinking, pattern recognition, and problem-solving abilities while supporting foundational concepts like grouping and sequencing. Sorting activities also improve fine motor skills and hand-eye coordination as children handle and organise objects. These activities build confidence and build blocks for more complex learning experiences, laying the foundation for future academic success.

Additional Information

- Praise the child for the effort and participation.
- Help your child understand the sorting process by giving an example.
- Be prepared to adapt the activity according to the child's special needs.
- While sorting, talk about the objects' characteristics, like their colours and shapes. Encourage your child to repeat the names of the objects and colours. Ask simple, structured questions like, "Can you find the yellow duck?" or "Where does the block go?" Reinforce language skills by encouraging your child to use short phrases.

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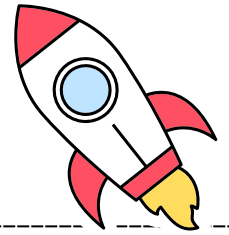
Subject: Science

Age: 1 -4 years old

Activity 1

Discovering Shapes & Textures



Adaptation

Environment

- Create a safe and inviting ball pit with objects that are easy to grasp and safe for handling, such as soft teddy bears, bath toys, and blocks.
- Ensure objects are made from sensory-friendly materials to accommodate different tactile preferences.
- Use bright colours and large objects for better visibility and a reassuring atmosphere.
- Minimize clutter in the ball pit to avoid overwhelming the senses and offer a quiet area nearby for sensory breaks if needed.

Materials

- Include sensory-friendly, soft, and safe objects in the ball pit to ensure comfort during exploration.
- Use clear visual aids like labelled bins or colour-coded containers for sorting.
- Provide visual schedules or picture boards to outline the steps of the activity.

Instruction

- Use simple, straightforward language to explain the activity.
- Introduce the activity visually and verbally, showing examples of objects and describing their shapes, colours, and types.
- Demonstrate sorting by guiding your child in picking up objects and placing them in the correct containers.
- Offer clear visual signals, like clean-up charts or visual timers, to indicate transitions between activities.

Sensory Considerations

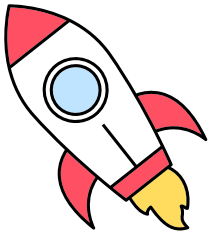
- Provide soft and tactile-friendly objects to cater to diverse sensory preferences.
- Use physical prompts or hand-over-hand guidance for children who need extra support during exploration.
- Ensure a quiet, sensory break area is available for children who may feel overstimulated.
- Reinforce positive behavior with praise or small rewards, like stickers, to motivate and reduce frustration.

Subject: Science

Age: 1 -4 years old

Activity 2

Magnetic Discovery



Objective

This activity aims to help children understand which objects are magnetic and which are not while practicing sorting skills and encouraging observational and descriptive language.

Materials

- Large, safe magnets (e.g. Magnetic wands or bars)
- Metallic objects such as metal spoons, toy cars, coins, etc.
- Other non-metallic objects include plastic toys, wooden blocks, teddy bears, etc.
- Carton
- Marker

Instructions

- Use the marker to divide the carton in half. Label one side as "Magnetic" and the other as "Non-Magnetic."
- Arrange all the objects on the table and place the magnets near them. This setup will make it easier for the child to access the materials and start the activity.
- Explain that your child will be discovering which objects stick to the magnets. Set an example so your child understands it better.
- Allow your child to explore the objects using the magnets. Encourage your child to test each object to see if it sticks to the magnet. Provide guidance and demonstrate as needed.
- Guide the child to sort the objects into two groups, magnetic and non-magnetic, using the carton. This activity will help the child practice classification and reinforce the concept of magnetism.
- Talk about what he/she is seeing and feeling. Please encourage your child to describe what happens when touching the magnet to different objects. Use questions such as "What happens when you touch the magnet to the spoon?" and "Can you find something else that sticks to the magnet?"

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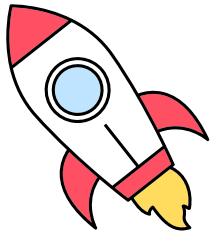
Subject: Science

Age: 1 -4 years old

Activity 2

Magnetic Discovery



How it works

Every magnet has a north and a south pole, where its magnetic force is strongest. Magnetic field lines flow from the north pole, curve around the magnet, and re-enter at the south pole. Opposite poles attract (north to south), as their magnetic fields align to complete the loop. Like poles (north to north or south to south) repel, as their field lines conflict. This attraction and repulsion are fundamental to many technologies, such as motors and generators, which utilize these forces to produce motion or energy.

Additional Information

- Praise the child for the effort and participation.
- Reinforce the learning objectives, such as understanding magnetism and practicing sorting.
- Be careful with smaller objects that could be choking hazards.
- Be prepared to adapt the activity according to the child's special needs.

Adaptation

Environment

- Create a calm, quiet space with minimal distractions to help the child focus.

Materials

- Use distinct colours or symbols on the carton to help children visually differentiate between "Magnetic" and "Non-Magnetic."
- Provide options for non-verbal children to communicate their thoughts, such as pointing to pictures or using alternative communication methods.

Instruction

- Be patient and repeat instructions as necessary.

Sensory considerations

- Offer breaks if they seem overwhelmed or need time to refocus.

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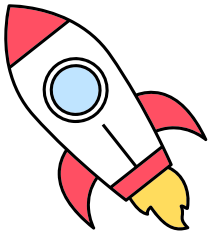
Subject: Science

Age: 4 -7 years old

Activity 3

Creating Colors



Objective

To teach the basic concepts of color theory and observation through a visual activity.

Materials

- Clear plastic cups or jars
- Water
- Food colouring in primary colours (red, blue, yellow)
- Plastic droppers
- Cardboards with the primary colours and the ones they'll create when mixing

Instructions

- Fill the clear cups with water and place them in a tray. Give your child the food colouring and the plastic droppers.
- Create a backup story to engage your children. For example, you can say that he/she is a scientist who need to mix colours to create something new.
- Show how to use the droppers to add the colouring to the water. Use an example of mixing red and blue to create purple.
- Allow your child to experiment with mixing colours in the cups. Please encourage the child to observe the changes and make predictions about what will happen when colours are combined. Let your child use cardboard to make the combinations.
- Ask open-ended questions to encourage thinking and communicate what is being created. Examples of questions that can be used are: "What do you think will happen if we mix red and yellow?" "What new colour did you create?" "How does the water change when you add more “drops of colour?" etc.
- At the end of the activity, the child should also participate in the clean-up and that teaches responsibility and organisation.

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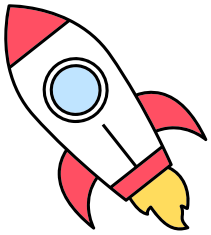
Subject: Science

Age: 4 -7 years old

Activity 3

Creating Colors



How it works

How Mixing Colors Works
Mixing colors is like combining magic to create something new. When we mix food coloring in water, the colors blend because they absorb and reflect light differently. For example:

- Mixing red and blue makes purple.
- Mixing blue and yellow makes green.

It's a simple way to show how colours change and create new ones, sparking curiosity and creativity in kids!

Additional Information

By using droppers, children practice hand-eye coordination, and making predictions enhances problem-solving abilities. Engaging them in conversations about their experiments helps improve their language and social interaction skills. Additionally, mixing colors introduces basic scientific concepts in a fun, hands-on way.

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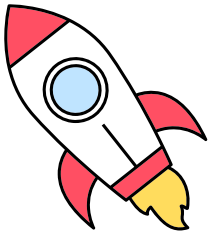
Subject: Science

Age: 4 -7 years old

Activity 3

Creating Colors



Adaptations

Environment

- Create a calm, quiet space with minimal distractions to help the child focus.
- Limit the number of colours available to reduce visual and cognitive overstimulation.

Materials

- Provide sensory-friendly tools, such as larger droppers or textured cups, to make the activity easier to handle.
- Use visual aids, like picture cards, to demonstrate the color combinations in a clear and accessible way.

Instruction

- Give clear, step-by-step instructions and repeat them as needed.
- Use simple language and visual demonstrations to ensure understanding.

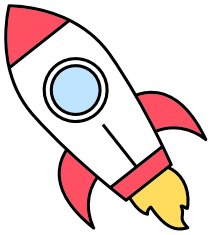
Sensory considerations

- Offer materials that cater to sensory needs, such as cups with tactile elements or non-glare surfaces.
- Allow extra time for the child to engage at its own pace, accommodating his/her sensory processing preferences.

Subject: Science

Age: 4 -7 years old

Activity 4
Ice Exploration



Objective

To enhance sensory processing and introduce basic scientific concepts about states of matter through a hands-on ice exploration activity.

Materials

- Ice cubes (some coloured with food colouring)
- Plastic trays
- Salt
- Magnifying glass
- Plastic droppers
- Warm water
- Small toys frozen in ice
- Towels for clean-up

Instructions

- Set up the activity. Place a plastic cloth or tray on the desks and put on various ice cubes, including those in different colours and with the toys in them.
- Explain that today, your child will work with ice and learn how it melts. Further explain the different types of matter (solid, liquid).
- Give time to the child to touch the ice cubes and familiarise with their textures and different colours. Then, the child can use the magnifying glasses to examine the ice more closely.
- Fill the plastic droppers with warm water. Show how to drop the water into the ice and watch it melt. Sprinkle salt on different ice cubes and let the child observe how this affects the melting rate.
- Encourage your child to find the frozen toys inside the ice. Encourage using warm water and salt to help melt the ice faster.
- Ask open-ended questions to engage your child in thinking and discussing the findings. Such questions can include, "What does the ice feel like?" "What happens when you put warm water on the ice?" "Can you see the colours mixing as the ice melts?" etc.

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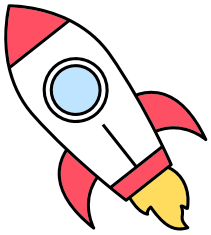
Subject: Science

Age: 4-7 years old

Activity 4

Ice Exploration



How it works

Water freezes at 0 degrees Celsius, which is known as the freezing point. When salt is added, it lowers the freezing point, preventing ice from forming. The molecules in salt move faster than those in water, causing this reaction. This is why grit is spread on roads during frosty, snowy mornings – it helps stop ice from forming, making the roads safer for both cars and the people walking.

Additional Information

- For children who may be sensitive to cold, provide gloves or mittens.
- Use visuals, stories, or even cartoons (e.g., Frozen) to prepare your child for the activity and explain each step.

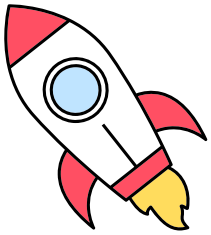
Co-funded by the European Union

Subject: Science

Age: 4-7 years old

Activity 4

Ice Exploration



Adaptations

Environment:

- Arrange materials visually to avoid clutter and reduce sensory overload.

Materials

- Use colourful ice cubes to increase engagement.
- Offer silicone droppers, glass droppers or spray bottles filled with warm water.
- Freeze small toys or items that the child likes to make the activity more engaging.

Instructions

- Explain to the child using simple language and visual aids.
- Use flashcards or illustrations to show the differences between solid ice and liquid water.
- Show the child how to use droppers filled with warm water to melt the ice.
- Provide positive reinforcement for the success.

Sensory considerations

- Offer gloves if needed for sensitive children.
- Allow the child to use a spoon to put salt on the ice.
- Ensure warm water is not too hot to prevent discomfort or fear of touching it.
- Provide a quiet corner for sensory breaks if needed.

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CHAPTER 3

Technology: Activities

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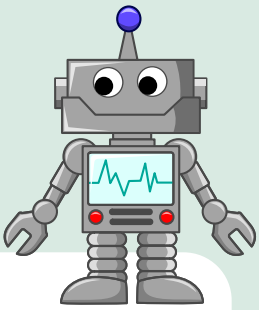

Technology

When we think about technology, we often picture devices like cell phones or computers. However, the "T" in technology also represents any human-made object. This includes simple tools such as pulleys, wheels, levers, scissors, and ramps. These tools play a role in supporting children's cognitive development. As children interact with them, they explore and learn about the principles of cause and effect.

Simple tools like these help children understand how we use technology to complete tasks. For example, they can observe how adding wheels under a large object makes it easier to move or how raising a ramp causes a ball to roll faster (National Center on Early Childhood Development, Teaching, and Learning, n.d.).

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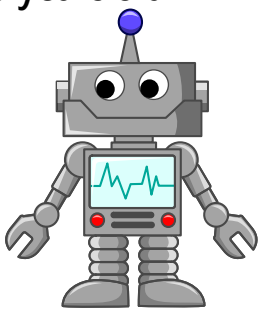
Subject: Technology

Age: 1-3 years old

Activity 1

Application learning



Objective

To learn about daily tasks through smart applications and gadgets

Materials

- Any smart gadget like a Phone or a tablet
- Smart application with subscription

Instructions

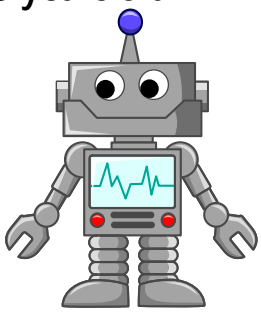
- Smart applications and platforms like GRID Pad Go and TD Snap Core are popular teaching tools that educational institutions and parents employ. This app includes different types of activities—there is a picture along with text depicting what is happening. The child can see the picture, understand, relate the question or statement to the picture, and try to memorise it. The words are related to core activities done in day-to-day life. They are carefully structured so that the child can remember easily.
- First, download the learning app on your phone. Then, register using the credentials and select the most suitable plan.
- The app contains pictures, videos, and animations that teach basic daily activities like counting and distinguishing between colours and textures.

Subject: Technology

Age: 1-3 years old

Activity 1

Application learning



Additional Info

How it works

This app is very user-friendly. On the home screen, one can see the tasks for the day and keep a check to complete them. There are also scheduled reminders sent for the activity completion and an option to track the progress. A child can quickly learn to handle the app and gadget within 7-10 days. **This activity can be set as a daily to-do task for 30 minutes.**

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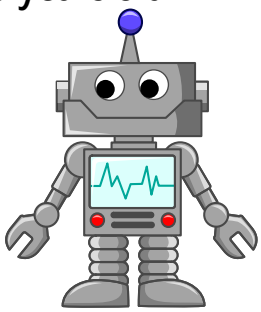
Subject: Technology

Age: 1-3 years old



Activity 1

Application learning

Adaptations

Environment

- Use the app in a calm, distraction-free environment to help the child focus on the activities.

Materials

- Use the app regularly to reinforce learning and create a consistent routine.
- Tailor the app's activities to the child's specific strengths and interests to increase engagement.

Instruction

- Make a difference between tablet for learning and tablet for playing games.
- Be patient, allowing the child to complete activities at their own pace.

Sensory considerations

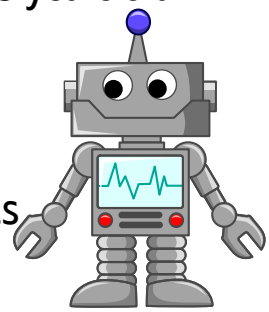
- Establish short sessions with breaks to avoid overstimulation.
- Adjust the device's brightness

Subject: Technology

Age: 1-3 years old

Activity 2

Deconstructing Computer and its Parts



Objective

To deconstruct the parts of the computer and identify them.

Materials

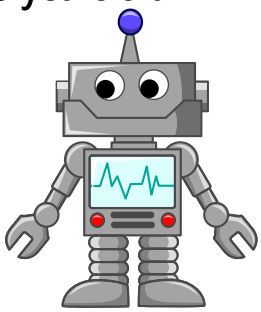
- Discarded computer parts
- Different screwdrivers
- Wire cutters
- Pliers
- Container to hold loose parts

Instructions

- Start by breaking the bigger parts like the monitor, keyboard or the parts into smaller parts.
- The main idea is to disintegrate the parts so the child can work on smaller parts.
- Then start to tell different part names to your child, like the keys, wire, screws and so on.
- Also, you can teach about the different computer types, like desktop and laptop.
- This will help the child understand how the parts are made of and how they even fit together.

Subject: Technology

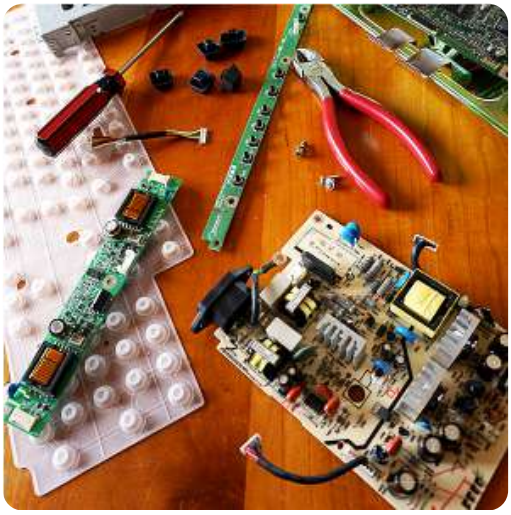
Age: 1-3 years old



Activity 2

Deconstructing Computer and its Parts

Additional Info



SAFETY NOTES:

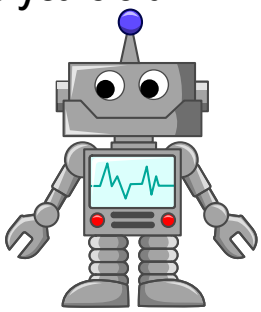
- All the tasks must be performed under strict adult supervision. No task can be handled by the child alone since they involve sharp objects.
- Do not use parts that can be harmful to health, such as the tubes and glass components inside.

How it works

This can also be called the Computer tinkering session, where you can learn after destroying something. Tinkering is a fantastic thing, especially for little kids. Its open-ended nature helps them experience true creativity and learn problem-solving. And it doesn't take much to have a successful tinkering session because kids are natural explorers.

Subject: Technology

Age: 1-3 years old



Activity 2

Deconstructing Computer and its Parts

Adaptations

Environment

- Set up a defined workspace with clear boundaries to help the child focus.

Materials

- Use large and durable parts that are safe for children to handle. Avoid using sharp or fragile pieces.
- Start with simpler devices, like keyboards, that are easier to disassemble and explore.
- Use inexpensive or unused computer parts for safe exploration without the fear of damaging valuable items.

Instructions

- Let your child work at its own pace, providing guidance and step-by-step instructions.
- Break down the task into small, manageable steps, focusing on one action at a time.
- Use real-life examples, such as showing the child a working computer, to link their tinkering session to a functional device.

Sensory considerations

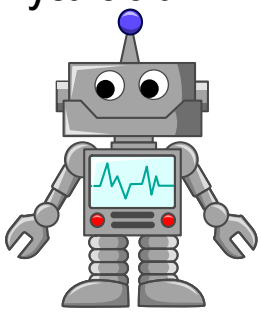
- Present only a few parts at a time to avoid overwhelming the child.
- Provide breaks during the session to avoid overstimulation, as tinkering can be overwhelming for some children.

Subject: Technology

Age: 4-7 years old

Activity 3

Potato- powered Clock



Objective

To build a potato battery for a clock

Materials

- 2 potatoes
- a copper wire (or copper nail)
- electronic clock
- zinc wire (you can also use a zinc-coated nail)
- crocodile clip wires (3 pieces)

Instructions

- Insert one copper and one zinc wire/nail into each potato.
- Use one set of crocodile clip wires to connect the zinc wire of one potato to the copper wire of the other potato.
- Use the remaining crocodile clip wires to connect the zinc wire to the "–" terminal and the copper wire to the "+" terminal. (Take reference from the picture on the next page!)
- Once all the connections are done, the clock should work!

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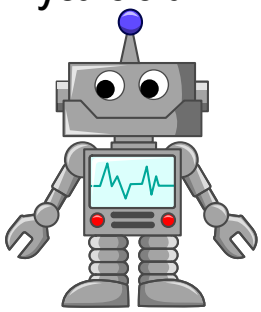
Subject: Technology

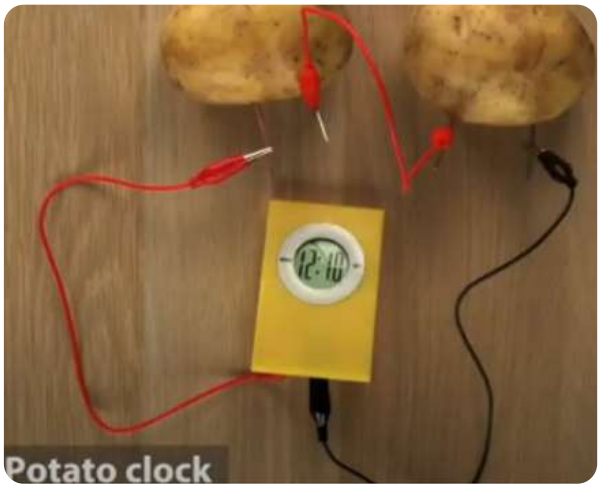
Age: 4 -7 years old



Activity 3

Potato- powered Clock

Additional Info



- This is how the circuit will look like once all connections are done
- All the steps to be performed under adult supervision.
- You can also use bananas, ap ples, oranges, lemons and many other kinds of food in place of the potatoes- they all can serve as the “battery.”

How it works

Besides nourishing living things, fruits and vegetables can also power electronic devices! Electricity is extracted from copper and zinc wire (a zinc-coated nail can be used). When we place these wires in any electrolytic medium (a substance that, once dissolved, acts as a good conductor of electricity), a closed circuit loop is formed, and we create a battery that can be used to power electronic items like bulbs or clocks.

Potatoes are high in carbohydrates and various soluble salts and acids, which act as electrolytes. Within our "battery," the copper wire functions as the cathode and the zinc wire as the negative electrode. The anode of this upgraded battery experiences an oxidation reaction. An oxidation reaction occurs on the anode, and a reduction reaction occurs on the cathode. Furthermore, an electrical current will flow through this circuit if we close it, powering the clock.

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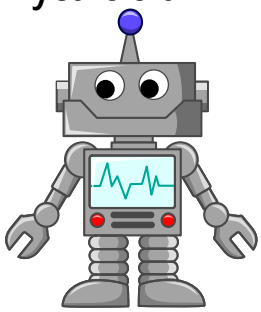
Subject: Technology

Age: 4-7 years old



Activity 3

Potato- powered Clock

Adaptations

Environment

- Keep the workspace clutter-free. Only have the materials needed for the activity on the table to avoid overstimulation.
- Place materials at eye level in open containers with labels.

Materials

- Use visual supports, such as step-by-step picture guides, to help your child understand the process.
- Provide extra potatoes and wires for trial and error without stress.
- Add labels to materials to assist identification.

Instructions

- Use clear and simple language.
- Divide the process into small, clear steps, with each step focusing on one action at a time.
- Incorporate visual aids to make the process more accessible and repeat the steps as needed.
- Demonstrate the activity.

Sensory considerations

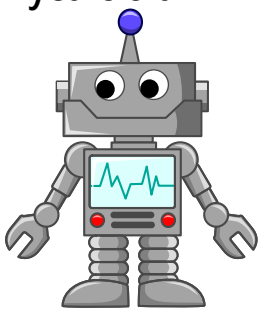
- Allow your child to work at its own pace and offer frequent praise and encouragement.
- Allow the child to step away or take a break as needed, returning when feeling ready.

Subject: Technology

Age: 4-7 years old

Activity 4

Minion Brush Bots



Objective

To build a Minion Bot just like the one in movies- they will run and circle.

Materials

- Motor from an electric toothbrush
- Angled head toothbrush
- 1.5V or 3V coin cell battery
- Electrical tape or other plastic tape
- Transparent tape
- Heavy paper
- Scissors
- Wire cutters

Instructions

- Cut the head off an angled toothbrush by pinching its neck with a pair of wire cutters and bending back and forth until it snaps off.
- Tape the motor to the toothbrush head with transparent tape. Check the motor placement and direction, as these affect how the brush moves.
- Take the two motor wires and tape each wire to a side of the coin battery using electrical tape. If the motor doesn't turn on, try to switch sides. Then, slide one wire out until you are ready to play with the Minion.
- Print and cut out the Minions on heavy paper. Wrap this paper print around the toothbrush head into a cylinder with the motor wires placed up through the cylinder. Tape closed with transparent tape. You want to ensure it's tight because the brush bot will slip out otherwise. Then, tape the bottom of the cylinder to the toothbrush head with transparent tape.
- Your Minion Bot is ready!

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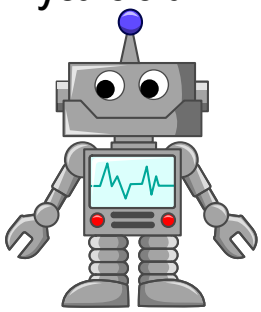
Subject: Technology

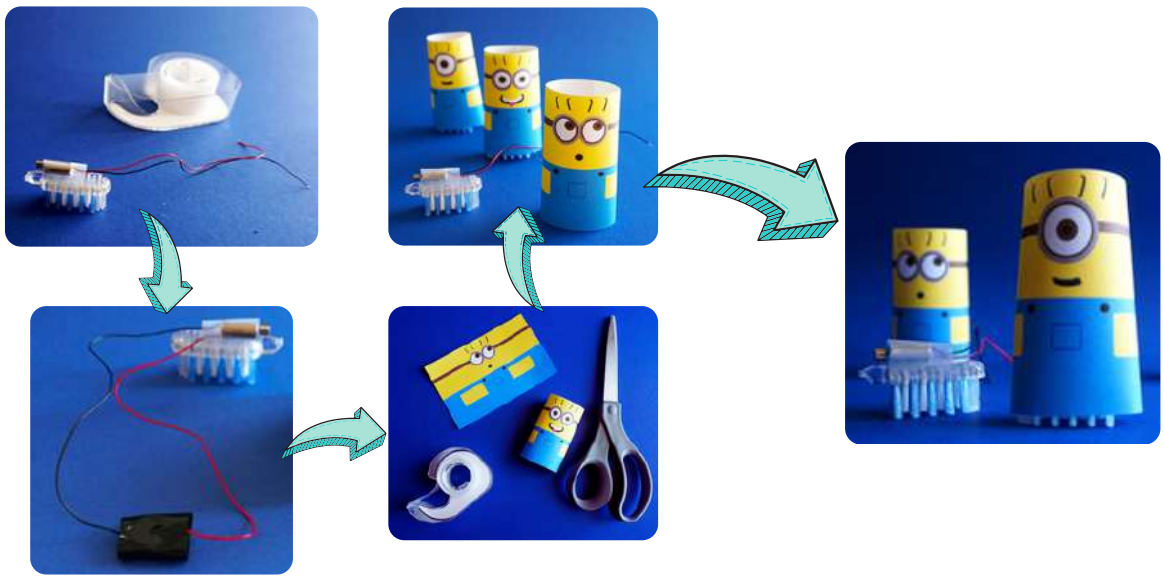
Age: 4 -7 years old



Activity 4

Minion Brush Bots

Additional Info

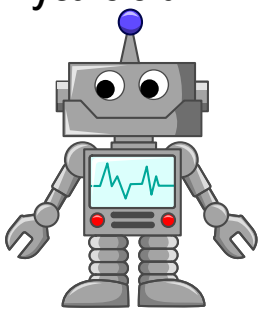


How it works

The objective of this activity is to understand the different components first, then assemble them to make a new object—a Minion Bot. This activity is derived from Technology as it uses electrical components, connections, and knowledge of circuits. The power for moving the minions is derived from the battery, and the motor gives the direction to movements. This activity will help understand how to guide the objects when motion is given to them.

Subject: Technology

Age: 4-7 years old



Activity 4

Minion Brush Bots

Adaptations

Environment

- Keep the workspace clutter-free. Only have the materials needed for the activity on the table to avoid overstimulation.
- Conduct the activity in a quiet and distraction-free area to support focus.

Materials

- If needed, cut the head off an angled toothbrush in advance to reduce difficulty with cutting.

Instructions

- Provide clear, visual instructions for each step to help the child follow along.
- Break the process into small, manageable tasks.
- Offer extra assistance with fine motor tasks, such as cutting or taping, if needed.
- Be ready to repeat instructions or show the process again for children who need more time to understand.

Sensory considerations

- Allow the child to step away or take a break as needed.
- Allow your child to work at their own pace, providing positive reinforcement for each completed step.

CHAPTER 4

Engineering: Activities

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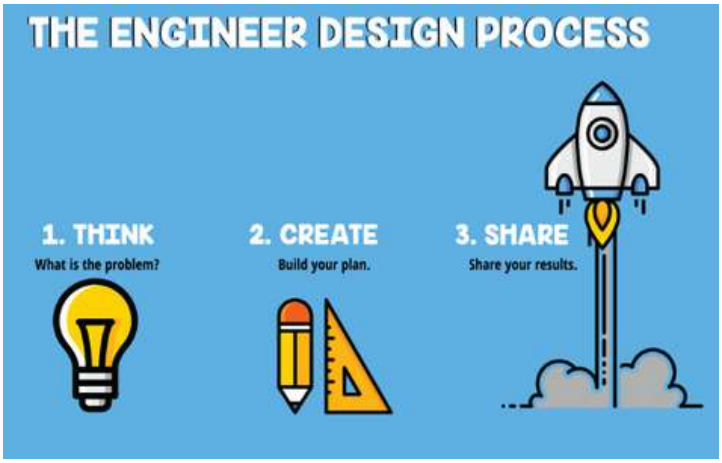
Engineering

The E in STEAM stands for Engineering and is a fundamental part of this holistic learning process. One of the essential aspects of STEAM Learning is that the children can relate the teachings to real-life situations and apply them correctly. It is about learning the design processes and building something based on the concepts. It starts with being curious and start exploring. The core of engineering is to turn an idea into a new product through manufacturing and offer innovative solutions to modern-day problems. This branch of STEAM is often combined with Science and Technology to give a complete perspective and is not taught as a standalone subject. Art is usually integrated with this subject, as Engineering involves designing and constructing objects, machines and structures. For example, in the study of ergonomics or Architecture, engineering principles and the arts go together as the buildings are required to be both structurally strong and aesthetically pleasing.

Kids can be introduced to engineering subjects at a very young age via playful games and activities like Lego sets, building blocks, and sand pit activities.

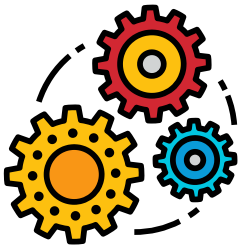


Subject: Engineering

Age: 1-3 years old

Activity 1

DIY Sundial



Objective

To build a sundial for tracking time using the movement of the shadow

Materials

- Paper plate
- Glue stick
- Bendy straw
- Compass
- A pair of scissors
- 1 Tape roll
- Sharpened pencil
- Sundial face print (optional)

Instructions

- Start by poking a hole through the centre of the plate using a pencil.
- Now, push the straw through the hole and tape the short end underneath to hold it in place.
- Place your sundial outside on a sunny day at noon on a flat surface.
- Point the sundial north using the compass, and tilt the straw slightly north so it casts a longer shadow.
- You can observe the sundial for a few hours. The shadow of the straw will tell you the time!
- Cut out the sundial print and glue it to the paper plate. This will give you an idea of the time, and you can confirm if your guess was correct.
- Tip: If you are in the Southern Hemisphere, you should use south anywhere the above instructions say north.

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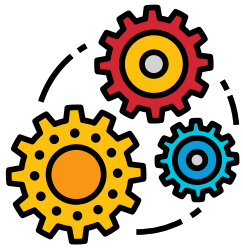
Subject: Engineering

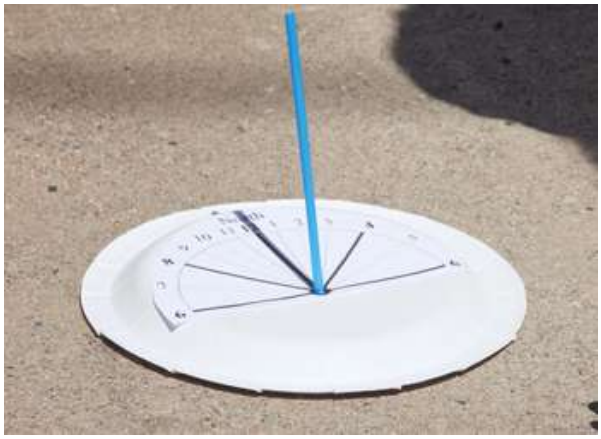
Age: 1-3 years old

Activity 1

DIY Sundial



Additional Info



You can use a pencil or some other wooden piece instead of straw for a sturdy sundial.

How it works

The sundial casts a shadow of the straw on the paper when it shines. In the morning, the shadow in the Northern Hemisphere faces westward. When the sun is almost overhead at noon, the shadow is brief and faces north. The shadow faces east at the end of the day when the sun is low. All that the sundial does is mark the passage of each hour as the Earth revolves. Recall that Earth is actually spinning, even though it looks like the sun is traveling across the sky!

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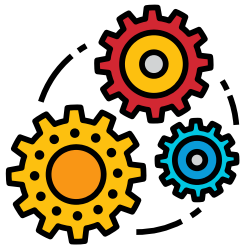
Subject: Engineering

Age: 1-3 years old

Activity 1

DIY Sundial



Adaptations

Environment

- Choose a quiet outdoor location free from excessive noise or movement, such as a backyard or quiet park.

Materials

- Use clear, bold visual aids and a simple sundial print with easily recognizable numbers to reduce visual complexity.
- For non-verbal children, use a communication board or visual aids to let them point to where the shadow falls on the sundial.

Instructions

- Give frequent, positive feedback, reinforcing their understanding of how the shadow tells time.
- Use step-by-step visual aids.

Sensory considerations

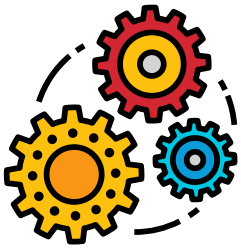
- If the child is overwhelmed by too much outdoor time, allow him/her to observe the sundial for shorter intervals.
- Provide optional sensory breaks if needed during the activity.
- Provide sunglasses if the sunlight is overwhelming.

Subject: Engineering

Age: 1-3 years old

Activity 2

Paper cup Phone



Objective

To build a cup phone and learn about more about sound transfer.

Materials

- 2 paper cups
- 20 feet string or yarm or a rope
- Sharpened pencil
- 2 paper clips

Instructions

- Start with poking a small hole at the bottom of each of your two cups using a pencil tip.
- Next, tie the thread string or yarn through the hole of one cup. Tie the knot on the inside of the cup to keep it in place. If it keeps slipping through the hole, tie it to a paper clip to help keep it in place.
- Pull the string through the bottom of your second cup, securing it with a knot on the inside.
- **To use your cup phones, the string must be pulled tight.** When one person whispers in their cup, the other should be able to hear their voice through their cup.
- Try this with your child 20 feet away! You can even try whisper singing into the cup; it will be a fun experience.

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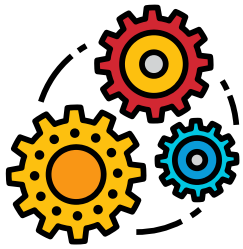
Subject: Engineering

Age: 1-3 years old

Activity 2

Paper cup Phone



Additional Info

You can also use plastic cups or tin cans instead of paper cups. See what the difference is and which phone works best. You can also experiment with replacing the string with a wire to see the effects.

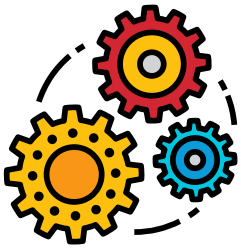
How it works

Sound waves are able to travel through liquids, solids, and air.
The vibrations you make when you speak into the cup are transferred into the string. As long as the thread is kept taut, they will continue to make their way to the receiving cup through the string. The whisper can be heard there because the vibrations are transferred to the air in the cup surrounding the listener's ear.
The whisper is considerably more audible from that distance than if you were to simply murmur into the air because the cup and string are solid, and solids really conduct sound waves better than air.

Subject: Engineering **Age:** 1-3 years old

Activity 2

Paper cup Phone



Adaptations

Environment

- Keep the environment clutter-free to reduce visual distractions and overstimulation.
- Choose an open space indoors with minimal external noise for testing the phone.

Materials

- Use colorful or textured materials to enhance sensory interest.
- Prepare the cups with pre-made holes if the child has difficulty or is uncomfortable handling a sharp pencil.

Instructions

- Be patient and offer multiple demonstrations to reinforce the concept.
- Provide positive reinforcement for each step to encourage engagement.
- Provide step-by-step cards with clear pictures and simple instructions for each part of the activity.
- Break the process into smaller, manageable steps.
- Use simple language and concise instructions.
- Encourage the child to follow the path of the waves with the fingers, reinforcing the connection between sound and vibration.

Sensory considerations

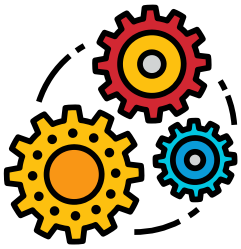
- Allow your child to work at his/her own pace.
- Allow sensory breaks if the child becomes overwhelmed.

Subject: Engineering

Age: 4-7 years old

Activity 3

Pencil Catapult



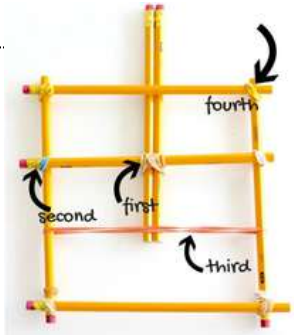
Objective

To build a catapult using pencils and see how it works

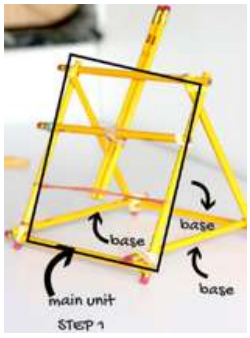
Materials

- Rubber bands
- Pencils

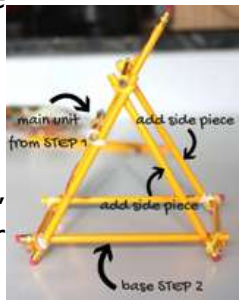
Instructions



STEP 1: Building the frame
Attach 2 pencils to the middle of 1 pencil. This will act as the lever arm/launcher. Attach that single pencil about a 1/3 of the way down 2 pencils (that are parallel to each other) for the frame. Slip a rubber band onto the frame as shown below. Remember, this is the tension that will affect the launch! Then, add a pencil to the bottom and to the top to complete the square shape. Note that the top pencil rests on top of the 2 pencils in the centre.



STEP 2: Building the base
Your pencil catapult will need a sturdy base! Here, we do that. Add 3 pencils around the bottom, connecting to the main unit and creating a square on the bottom.



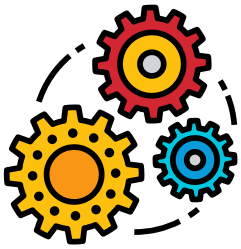
STEP 3: Adding the sides
Finally, you need to add 1 pencil diagonally to each side, creating a triangle shape on each side. This will keep your pencil catapult upright and ready to launch.

Subject: Engineering

Age: 4-7 years old

Activity 3

Pencil Catapult



Additional Info

Different materials will launch differently than others- some for shorter distances and others farther. Why is that? Because of their weight. Try experimenting with erasers, sharp paper rolls, and other school supplies.

The catapult teaches us about physics and mathematics. How does a lever arm work? Is there both potential and kinetic energy? All these questions are answered.

How it works

This is an excellent basic physics exercise for children. What is there in the field of physics to investigate? First, let's talk about energy, which includes elastic potential energy. Additionally, projectile motion can be studied.
According to Newton's Three Laws of Motion, an item in motion continues to move until an imbalance is created, and an object at rest remains at rest until a force is applied. There is a reaction to every action.
All of the potential energy is stored when the lever arm is pulled down! When it is released, the potential energy eventually transforms into kinetic energy. As gravity draws the object back down to the earth, it also plays a role.

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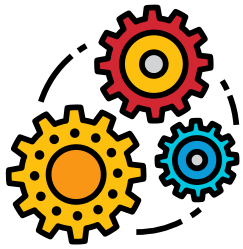
Subject: Engineering **Age:** 4-7 years old

Activity 3
Pencil Catapult



Adaptations

Environment

- Keep the workspace clutter-free. Only have the materials needed for the activity on the table to avoid overstimulation.
- Place materials at eye level in open containers with labels.

Materials

- Use thicker, durable pencils that are not sharpened.
- Provide rubber bands of various sizes and colors to make them easier to handle and visually engaging.
- Offer large rubber bands for easier manipulation.
- If assembling the catapult is too difficult for your child, you can prepare it in advance and let your child focus on testing and experimenting with it.

Instructions

- Use step-by-step visual aids and break down each task into smaller, manageable parts for easier understanding.
- Provide clear, simple instructions and repeat them as needed for children who need extra time or guidance.
- Demonstrate each step, allowing the child to mimic your actions.
- Offer positive reinforcement throughout the activity, praising effort and creativity.

Sensory considerations

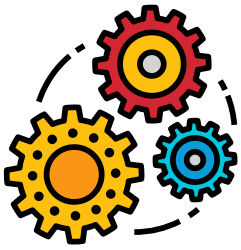
- Allow your child to work at its own pace and take breaks as necessary.
- Since building the catapult can be a very long and potentially overwhelming activity, consider breaking it into smaller steps spread over several days.

Subject: Engineering

Age: 4-7 years old

Activity 4

Toilet Paper Roll Balloon Car



Objective

To build a Toilet-paper roll balloon car and understand the machine concepts

Materials

- Toilet paper rolls
- Masking tape
- Paper straws
- Bamboo skewers
- Cardboard
- Scissors
- Glue gun
- Balloon
- Rubber band

Instructions

- Take a piece of cardboard and cut four circles out of it, each approximately 1 1/2" in diameter.
- Grab the bamboo skewer and carefully poke a hole in the centre of each cardboard circle. Then, cut the bamboo skewer into two 4" pieces.
- Take the paper straws and cut two 3" pieces of paper straw. Tape each piece onto the toilet paper roll at 90 degrees to the length of the roll. These will hold your wheel axles.
- Put the bamboo skewer inside the straws; this will be easy as skewers are thinner than straws. The cardboard wheel will be on each end. Hot glue the end of the skewer to the wheel for added sturdiness. If you'd like to have a sturdier car, you can use plastic cap wheels instead.
- Now, cut a 5" piece of paper straw. Take the balloon and place it over the neck to the end of the straw. Wrap the rubber band around the neck of the balloon and straw until secure. Then, tape the straw to the top of the toilet paper roll.
- Try blowing up the balloon and see if your car rolls! If you want it to move faster, more air needs to be filled inside. Try using different-sized balloons to see the difference in movements.

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Subject: Engineering

Age: 4-7 years old

Activity 4

Toilet Paper Roll Balloon Car

Additional Info

'If your car isn't steering smoothly, make sure air can pass easily through the straw. If the rubber band is not wrapped tightly, it is simple to stop the airflow. Make sure the wheels can spin freely as well. Try rolling the car without using the balloon power and adjust as needed.

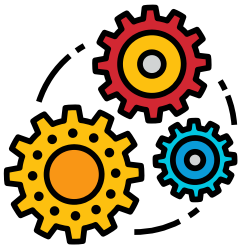
How it works

- When you blow the air into the balloon, the energy is stored in it.
- When this air is released, it pushes the car in opposite direction and hence the car rolls.

Subject: Engineering **Age:** 4-7 years old

Activity 4

Toilet Paper Roll Balloon Car



Adaptations

Environment

- Conduct the activity in a quiet area to reduce sensory overload and support concentration.
- You can place a sample completed car or printed visual aid in the workspace to provide a reference for the child, so the child knows what will be building.
- Set up a designated area for testing the car, such as a smooth, open surface.

Materials

- Pre-cut cardboard wheels, straws, and skewers to reduce the complexity of the activity.
- Offer pre-made plastic wheels (e.g., bottle caps) for children who may find attaching cardboard wheels challenging.
- Use colorful materials to keep the activity visually engaging and interesting.
- If the child struggles with building the car, you can prepare the car and let your child focus on testing the car or blowing up the balloon instead.

Instruction

- Use step-by-step visual aids and simple language to help the child understand each part of the process.
- Offer frequent praise and encouragement to motivate engagement.
- Demonstrate each step in real-time for the child to observe before trying on its own.
- Use simple language and keep instructions concise and clear.
- Break the activity into smaller, manageable steps.

Sensory considerations

- Allow your child to work at his/her own pace, providing assistance when needed.
- Prepare the child for potential popping sounds from the balloon and offer headphones if needed.

CHAPTER 5

Art: Activities

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Art

STEM stands for science, technology, engineering, and mathematics. Incorporating art into this interdisciplinary approach transformed STEM into STEAM. Art fosters innovative problem-solving, integrates principles, and presents information creatively. By including art in STEM education, educators believe that students can engage both their analytical and creative faculties, leading to the development of well-rounded thinkers.

Integrating arts into STEM education enhances its application. STEM subjects often follow rigid methodologies, which can lead to student disengagement due to perceived irrelevance to their personal lives. In contrast, art education encourages students to experience the world through sense perception, interpret these experiences, and represent them through various media. This process involves more profound engagement with the material, fostering creative problem-solving and critical thinking skills. The material becomes more relevant as it is applied to real-world contexts.

Individuals with Autism Spectrum Disorder (ASD) often excel in STEM environments due to their affinity for patterns, formulas, and predictable systems. Additionally, characteristics of ASD, such as visual thinking and sensory perception, align well with the arts. Visual thinkers store memories as images and can often translate these mental images into drawings. For non-verbal individuals, art provides an alternative means of communication. While not all individuals with ASD are skilled in visual thinking or drawing, many benefit from fine motor skill development and the stress relief that art can provide, aiding self-regulation. Integrating art into educational and non-educational settings can help individuals with ASD process information, enhance communication, and uniquely apply educational material.

Although scientists and artists have little in common, a deeper look reveals significant overlaps. Science has undoubtedly transformed creative fields through technological advancements, but artists' fresh perspectives significantly influence scientific progress. With technology becoming faster, smaller, and more complex, the sciences increasingly rely on the arts for innovative solutions and creative ideas.

The adoption of STEAM in classrooms has led to developing new teaching methods. Teachers can integrate the arts into STEM by incorporating graphics into projects or using performing arts to present STEM concepts. This approach allows students to use their artistic skills to foster innovative thinking.

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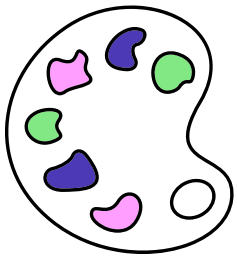
Subject: Art

Age: 1-3 years old

Activity 1

Magic painting



Objective

To learn how colours mix while experimenting with acid-base chemical reactions

Materials

- Watercolour paper
- Cups
- Liquid watercolours or food colouring
- Baking soda
- Water
- Vinegar
- Paint brushes
- Pipettes or spray bottles

Instructions

- Create your paint by mixing 1/4 cup baking soda, 1/4 cup water, and a few drops of food colouring in a small cup. Repeat for as many different colours as you like.
- Let your little artist paint away! Encourage your child to mix colours, paint different shapes and use a variety of brush strokes to fill the paper.
- Stir the paint now and then as the baking soda tends to settle.
- When the painting is complete, give your child a vinegar-filled pipette or spray bottle
- Watch the bubbly eruptions as the paint colours start to bubble, fizz, and mix together!

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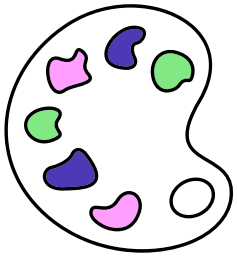
Subject: Art

Age: 1-3 years old



Activity 1

Magic painting

Additional Info

QUESTIONS YOU CAN DISCUSS:

- What happens to the paint when vinegar is dropped onto it?
- Why do you think it gets fizzy?
- What would happen if you added something else to the baking soda and vinegar solution?

How it works

- Baking soda is a base, and vinegar is an acid. When the two combine, they make a gas called carbon which becomes fizzy and bubbly in this experiment. By adding the colours, we have both a chemistry experiment and a painting.
- Colour theory: When the three primary colours (red, blue, and yellow) combine they create the secondary colours of green (blue+yellow), purple (blue+red), and orange (red+yellow).

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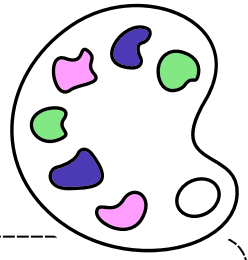
Subject: Art

Age: 1-3 years old

Activity 1
Magic painting



Adaptations

Environment

- Place the watercolour paper on a tray to help keep everything contained.
- Use visual supports, such as step-by-step picture guides, to help your child understand the process.
- Place materials at eye level in open containers with labels.

Materials

- You can use various vinegar-filled containers, such as glass pipettes, silicon droppers, basters, spray bottles, squeeze bottles, or spoons.
- Use cups with handles for easier grasp.
- Add a styrofoam ball, a grip tape or silicone bands to the brushes for easier grasping or use wide handles

Instruction

- Break down the steps into smaller, manageable tasks.
- Use positive reinforcement and praise to encourage participation and effort.
- Physically prompt (help) your child hold the materials.
- To make the activity easier, you can:

1. Cover paper in baking soda.
2. Add food colouring to the vinegar or drip a few drops of food colouring on the baking soda-covered paper.
3. Add the vinegar to the baking soda

Sensory considerations

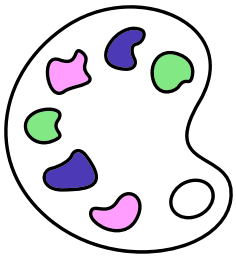
- You can turn this activity into a messy play by covering the surface of a tray with baking soda and then letting your child pour the coloured vinegar into the tray.

Subject: Art

Age: 1-3 years old

Activity 2

Moving Rainbow



Objective

To explore colour mixing, absorption and capillary action

Materials

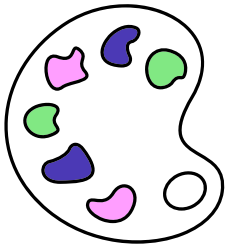
- six clear cups
- Paper towels
- Water
- Food coloring (red, blue, and yellow)

Instructions

- Fill three cups with water, leaving them about three-quarters full.
- Add several drops of red food colouring to one cup, blue to another, and yellow to the third. Stir each cup to mix the colour thoroughly.
- Arrange the cups in a circle, alternating between cups filled with coloured water and empty cups.
- Roll the paper towels into tube-like pieces and place one end in a cup with coloured water and the other in an empty cup.
- Repeat this process for each cup, ensuring that each paper towel connects a cup of coloured water to an empty cup.
- Watch the coloured water travel through the paper towels, blending together to create a beautiful walking rainbow effect.

Subject: Art

Age: 1-3 years old



Activity 2
Moving Rainbow

Additional Info

QUESTIONS YOU CAN DISCUSS:

Did you know that three basic colours—red, blue, and yellow—can combine to make any other colour? These three basic colours are referred to as primary colours. When two primary colours combine in equal amounts, they produce a secondary colour.

What colour do we get if we mix red and yellow? Red and blue? Blue and yellow?

What colour do we get if we mix all three primary colours?

How it works

- Capillary action happens when:

1. Liquid moves through thin tubes.
2. Liquid moves through a material with a lot of holes (like a sponge or a paper towel).

- For this to happen, 3 forces called cohesion, adhesion, and surface tension work together. Water molecules are considered cohesive (sticky to each other) and they adhere (stick) to the paper towel. As water molecules move up the paper towel they pull each other along like a drawstring.

- Colour theory: When the three primary colours (red, blue, and yellow) combine they create the secondary colours of green (blue+yellow), purple (blue+red), and orange (red+yellow), completing the rainbow.

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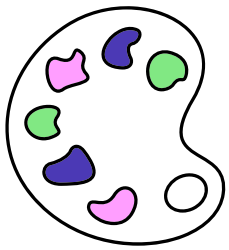
Subject: Art

Age: 1-3 years old

Activity 2
Moving Rainbow



Adaptations

Environment

- Make sure all materials are within reach of your child.
- You can tape the cups on the working surface to stabilise them.
- Use visual supports, such as step-by-step picture guides, to help your child understand the process.
- Place materials at eye level in open containers with labels.
- Mark the spot (with tape) where the cups should be placed

Materials

- You can use cups with handles for easier grasp.

Instruction

- Break down the steps into smaller, manageable tasks.

Sensory considerations

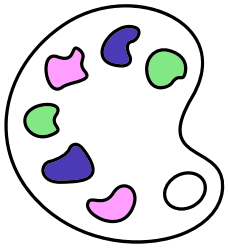
- Provide a variety of paper towels with different textures
- Use odourless food colouring

Subject: Art

Age: 4 -7 years old

Activity 3

LEAF RUBBING



Objective

To learn about leaves and explore different art mediums (chalk, crayons) and how they work with different papers

Materials

- Leaves
- Construction Paper
- Wax Paper
- Watercolor Paper
- Parchment Paper
- Aluminum Foil
- Chalk Pastels
- Oil Pastels

Instructions

- Gather some leaves. You can go on a nature walk and find leaves to bring back.
- Place the leaf under your paper
- Use the side of your chalk/crayon and lightly brush over the paper above your leaf
- Spot the different parts of the leaf as you rub
- Repeat the process using the other papers
- Reflect and compare your different leaves. Are there any differences? Which paper was easiest to use, and which was the hardest?

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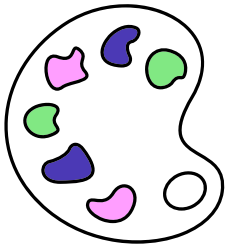
Subject: Art

Age: 4 -7 years old

Activity 3
LEAF RUBBING

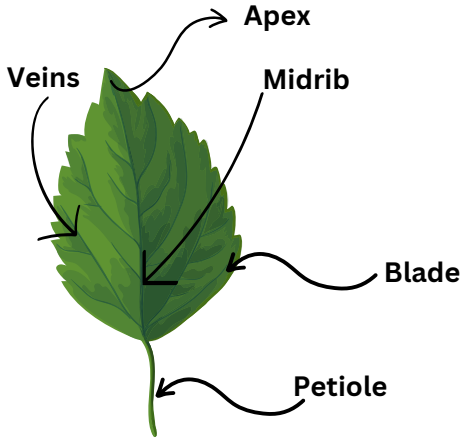


Additional Info

QUESTIONS YOU CAN DISCUSS:

What types of leaves did you find?
How many veins can you see on your leaf?
Why do you think leaves change colour?
What is the apex?
What is the midrib?
Why do leaves have veins?

PARTS OF THE LEAF



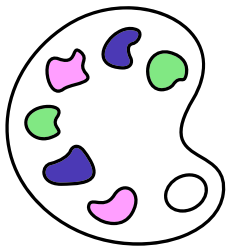
How it works

- Different papers (construction, wax, watercolour, parchment, and aluminium foil) have varied textures and surfaces, which interact differently with chalk pastels. This exploration helps children understand how materials can affect the outcome of their artwork.
- These art mediums deposit pigment particles onto the paper's surface. When rubbed over a textured object like a leaf, the chalk highlights the leaf's intricate details by leaving more pigment on the raised areas.

Subject: Art

Age: 4 -7 years old

Activity 3
LEAF RUBBING



Adaptations

Environment

- Set up a workspace with all the materials organised and easily accessible.
- Place materials at eye level in open containers with labels.
- Use visual supports, such as step-by-step picture guides, to help your child understand the process.
- Use tape to stabilise the edges of the paper on the table

Materials

- Offer a variety of papers with different tactile textures to accommodate sensory preferences.
- Use larger, thicker chalk pastels for easier handling.
- Add a pencil grip to the chalk/crayons
- Provide alternative tools such as sponge brushes or rollers if your child struggles with traditional pastels.

Instruction

- Break down the steps into smaller, manageable tasks.
- Encourage your child to choose their leaves and papers to foster a sense of control and interest.
- Use positive reinforcement and praise to encourage participation and effort.
- Physically prompt (help) your child to hold the chalk/crayon

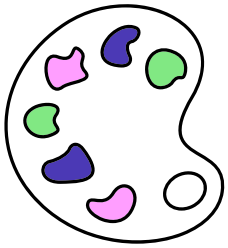
Sensory considerations

- Allow your child to explore the texture and feel of the leaves and papers before starting the rubbing process.

Subject: Art

Age: 4 -7 years old

Activity 4
Water Whistle



Objective

To create a water whistle while experimenting with the science of sound.

Materials

- Straws of different sizes
- Scissors
- Clear cups
- Water
- Tape (optional)

Instructions

- Using your scissors, make an angled cut on a straw, ensuring you do not cut all the way through!
- Bend the straw at the cut, making an “L” shape
- If you want, you can tape around it to hold it in place (without covering the open slit)
- Fill the glass with water until almost full
- Place the longer part of the straw into the water
- Gently blow into the straw, make sure that you keep it at the right angles

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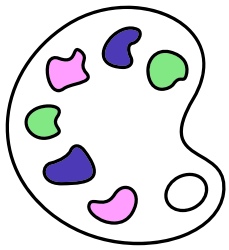
Subject: Art

Age: 4 -7 years old

Activity 4
WATER WHISTLE



Additional Info

- If you struggle to produce a whistling sound, try pinching the top of the long end of the straw
- If you manage to make a constant, steady sound, try raising or lowering the straw in the water. What happens to the pitch of your water whistle when you do this?
- Try experimenting with different straw sizes. Does the sound change?
- Try testing different amounts of water in your glass

How it works

- The science of sound is based on vibration.
- The water whistle works because the air inside the straw is vibrating. The submerged part of the straw is filled with both water and air. When you blow across the top of the more extended straw segment, you cause the column of air to vibrate. As this vibrates, it creates a whistling sound.

- The pitch of the sound depends on how much air is in the straw; the more air inside, the lower the pitch. The more water you have in it, the higher the pitch will be.

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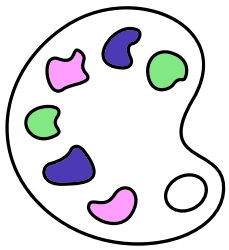
Subject: Art

Age: 1-4 years old

Activity 4

Water Whistle



Adaptations

Environment

- Keep the workspace clutter-free. Only have the materials needed for the activity on the table to avoid overstimulation.
- Place materials at eye level in open containers with labels.
- Use visual supports, such as step-by-step picture guides, to help your child understand the process.

Materials

- Use pre-cut straws if cutting is too challenging or provide safety scissors designed for children.
- Use cups with handles.

Instruction

- Provide visual step-by-step instructions with clear pictures or diagrams showing each step of the process. This helps children understand and follow the sequence of the activity
- Offer hand-over-hand prompts or assistance if needed to help your child make the angled cut or bend the straw properly.

Sensory considerations

- Offer different types of straws (e.g., silicone or rubber) for children with tactile sensitivities. Allow them to choose the one they are most comfortable with.

CHAPTER 6

Mathematics: Activities

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Mathematics

M in STEAM stands for mathematics.

Math represents numbers, operations, measurement, patterns, geometry, and spatial sense. Children, until age five, explore different aspects of mathematics informally, like “more” and “less,” shape, size, sequencing, volume, and distance.

Math is a tool children use every day. Babies and toddlers learn early math concepts like geometry and spatial relationships by exploring new objects with their hands and mouths. Also, infants start to use “more” when asking for more food or drink, and they begin to understand it (National Center on Early Childhood Development, Teaching, and Learning, n.d.).

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Subject: Mathematics

Age: 1-4 years old

Activity 1

Shape Hunt

Objective

To help children recognise and identify different shapes, enhance their spatial awareness through an interactive scavenger hunt.

Materials

- Shape cutouts (circles, squares, triangles, rectangles) in various colours
- Shape sorting board or mat with shape outlines, labelled each shape
- Pictures of the shapes and their names
- Markers

Instructions

- Prepare the shape cutouts and hide them around the room.
- Place the shape sorting board in the centre of the room.
- Introduce the activity. Explain that your child will now play a shape hunt and have to find and collect different shapes. Use the pictures of the shapes to show examples of each shape and where it will be placed.
- Set an example. Demonstrating finding a shape, picking it up and then placing it in the correct outline so that you can ensure that the goal of the activity is fully understood.
- Give your child time to explore the room and find the shapes. Provide guidance and support when needed.
- Guide the child to place each shape in the correct section on the sorting board. Use visual aids to help your child match the shapes and reinforce the understanding.
- When all shapes are gathered, talk with the child about the shapes that were found. Encourage the child to describe the shapes and their colours. Ask simple questions like, "What shape is this?" and "Can you find a red circle?"

Co-funded by the European Union

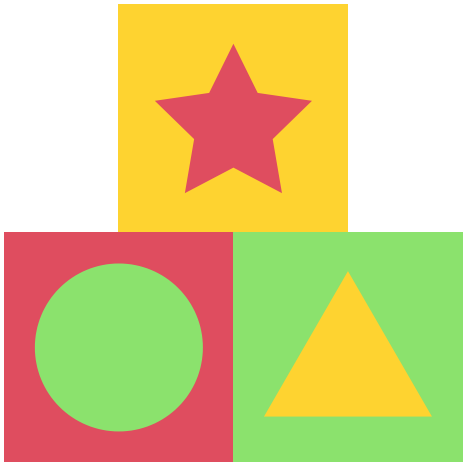
Subject: Mathematics

Age: 1-4 years old

Activity 1
SHAPE HUNT

Additional Info

If you don't have a shapeboard or mat, you can make one using a white bed sheet or a large piece of cardboard. Use markers to draw and label different shape outlines, creating sections where the objects will be sorted.



How it works

- Provides a multi-sensory experience through touch, sight, and movement, which is proven to be beneficial for children with autism.
- Helps children to recognize and identify different shapes.
- Promotes problem solving and critical thinking as children decide where to place each shape.
- Encourages verbal communication through discussions about the shapes, colours.

Subject: Mathematics

Age: 1-4 years old

Activity 1

SHAPE HUNT

Adaptation:

Environment

- Minimize distractions and ensure the room is tidy and organized.
- Hide the shape cutouts around the room, but ensure they are easily visible to avoid frustration. Consider limiting the number of shapes to prevent sensory overload.
- Introduce the child to the activity using a visual schedule or sequence cards that clearly illustrate each step: finding the shapes, bringing them back, and sorting them on the board.

Materials

- Make sure the shapes are large, brightly colored, and made of sturdy, tactile-friendly material that can easily be grasped by the children.
- You can use a sorting board with visual labels or color outlines matching the cutouts for additional guidance.
- Start with fewer and larger shapes if your child finds too many choices overwhelming.

Instruction

- Show laminated or printed pictures of the shapes, associating each one with its place on the sorting board.
- Demonstrate how to find a shape and match it to the correct place on the sorting board.
- Use clear and simple language.
- Point to both the shape and its corresponding spot on the board. Provide plenty of visual cues and physical prompts if needed (e.g., pointing or gesturing to the correct area on the board).

Sensory considerations

- Let the child explore the room at its own pace to find the hidden shapes. Make sure to provide encouragement and support when needed.
- If your child is sensitive to certain textures, use shape cutouts made from materials that are comfortable to touch.
- You can use textured shapes (e.g., bumpy, smooth, soft) to provide sensory feedback and increase interest.
- Keep the activity calm and structured, providing a quiet space for the child who may need a sensory break during the game.

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STEAMing Ahead

Subject: Mathematics

Age: 1-4 years old

Activity 2

GROCERY SHOP

Objective

To help children develop number recognition, counting and social skills through an interactive grocery shopping activity

Materials

- Large paper
- Markers or crayons in various colours
- Number flashcards (1-10)
- Price tags
- Cash register toy (optional)
- Pictures of foods and numbers
- Table for the grocery store

Instructions

- Place the toy food items on the table or the area where they will be used for the grocery store.
- Add the price tags to each item. Use simple numbers (1-5) and ensure the price tags are big enough for the child to read.
- Explain that your child will play “Grocery Shop”, where it will go to buy food.
- Provide small baskets or bags for the child to use as shopping baskets.
- Give the child a specific number of coins and count them while giving these.
- Demonstrate how to pick an item, look at the price tag, and put it in the shopping basket.
- Use the pictures to match the foods and their prices.
- Show your child how to count out the play money to match the item's price.

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Subject: Mathematics

Age: 1-4 years old

Activity 2
GROCERY SHOP

Instructions (continuation)

- If using a cash register, demonstrate how to use it to "buy" the items.
- Allow the child to explore the grocery store and pick items he/she wants to buy.
- When finishing shopping, ask the child what he/she bought. Encourage the child to describe the items, their colors and their prices.

Additional Info

- Provide guidance and support as needed, helping your child match the correct amount of money to the price tags.
- Use the pictures to review the numbers and food items.
- Provide different types of play money (coins and bills) and let your child select their preferred type.
- You can create the play money yourself out of cardboard. Cut out circles for coins and rectangles for bills and use a marker to write which number they will represent.

How it works

- This "Grocery Shop" activity is designed to be engaging and educational, helping young children learn basic math skills through pretend play.
- Children will practice counting, number recognition and basic arithmetic.
- Children will learn to match quantities and understand the concept of value.

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Subject: Mathematics

Age: 1-4 years old

Activity 2
GROCERY SHOP

Adaptations:

Environment

- Arrange the toy food items on shelves or in bins with clear labels to mimic a real grocery store and make selection easier.
- Conduct the activity in a quiet area with minimal background noise and visual clutter.
- Place items within the child's reach, ensuring easy access to all the toy food.

Materials

- Use big price tags with bold, high-contrast numbers and colors for easier readability.
- Provide large play coins or tokens instead of small coins that might be hard to handle.
- Use lightweight baskets or bags that are easy for the child to carry.
- Use laminated picture cards that show both the food items and their prices. Children can use these cards to help them identify the items on the table and match them with the price tags.

Instruction

- Use step-by-step visual picture sequence showing each stage of the activity.
- Demonstrate the activity and model each step in the process, such as selecting an item, checking the price, and paying with coins.
- Divide the activity into smaller parts.
- Use clear and simple language. Use short, direct instruction like "Pick a banana.", "Give two coins."
- Show your child how to count out the play money to match the item's price. Use clear hand-over-hand support if needed, allowing your child to practice matching the number of coins to the price.

Sensory considerations

- Limit the number of items available for shopping to prevent visual overload and keep the activity manageable.
- If your child is sensitive to certain materials or textures, use soft baskets or sensory-friendly coins and items to ensure comfort during the activity.

Subject: Mathematics

Age: 4 - 7 years old

Activity 3

COLORING NUMBERS

Objective

To help children develop number recognition and counting skills

Materials

- Large paper
- Markers or crayons in various colours
- Number flashcards (1-10)
- Ruler
- Pencil

Instructions

- Use the pencil and ruler to draw a grid with rows and columns on the large paper.
- Write numbers 1-10 randomly in the grids. Each number should appear multiple times throughout the grid.
- Lay the markers or crayons on the table along with the flashcards.
- Provide your child with one paper.
- Explain that your child will be drawing a flashcard, and depending on the number shown, they will have to colour the corresponding number on their grid using the same colour as the card.
- Demonstrate the activity to ensure clarity. Draw a flashcard, read the number and its colour out loud, and then find and colour the corresponding number on the grid.
- Repeat the process with different numbers, ensuring your child identifies and colours the numbers.

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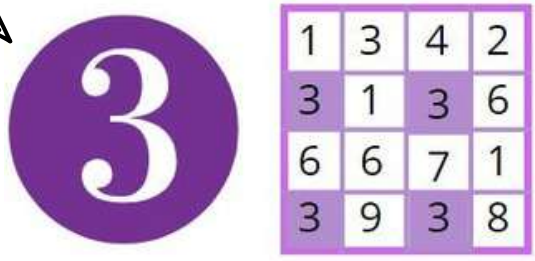
Subject: Mathematics **Age:** 4 - 7 years old

Activity 3
COLORING NUMBERS

Chart Example



Additional Info

- You can use UNO cards as flash carts or create your own with cardboard.
- If your child is non-verbal allow him/her to point to pictures or use alternative communication methods to share the discoveries.
- Be prepared to repeat instructions and provide additional demonstrations as needed.
- Use a variety of colours to keep the activity lively and exciting.

How it works

- The activity ensures that children learn through a combination of visual, auditory and kinesthetic activities, making the learning process engaging and effective.
- Children will practice counting, number recognition and basic arithmetic.

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Subject: Mathematics **Age:** 4 - 7 years old

Activity 3
COLORING NUMBERS

Adaptation:

Environment

- Place all materials within easy reach of your child.
- You can tape the paper grid on the working surface to stabilise it.

Materials

- Use large, bold numbers on the grid and flashcards for better visibility and easier recognition.
- Provide bigger and thick markers or crayons that are easier to grasp.
- Instead of markers and crayons your child can use finger paints.
- If you child has more interest to work on computer, prepare the same on the computer.
- Use a variety of colours to keep the activity lively and exciting.
- Use interactive talking buttons and add stickers with numbers on different colour.

Instruction

- Be prepared to repeat instructions and provide additional demonstrations as needed.
- Use visual supports, such as step-by-step picture guides, to help your child understand the process.
- Use simple and clear language.

Sensory considerations

- Allow the child to take sensory breaks if it seems overwhelmed.

Subject: Mathematics

Age: 4 - 7 years old

Activity 4

Circle Geometry Game

Objective

To teach children understand the concepts of radius, diameter, and how to divide a circle into equal portions through a hands-on, interactive game.

Materials

- Cardboard circles in pastel colors
- Scissors
- Markers or crayons
- One big cardboard square
- Single string
- Pin
- Different cardboard cutouts that will be used as labels (e.g., radius, diameter, ½, ¼)

Instructions

- Cut out several cardboard circles in pastel colors. Make sure the circles are large enough for your child to draw on.
- Prepare a big cardboard square to serve as the base for demonstrating concepts.
- Cut a piece of string long enough to span the diameter of the circles.
- Prepare labels from cardboard cutouts for the terms "radius," "diameter,"" ½," and "¼". Draw a small circle on each label to demonstrate each part you are referring to.
- Explain that your child is going to learn about the different parts of a circle and how to divide it in equal parts.
- Pin the center of a cardboard circle to the big cardboard square.
- Attach the string to the pin and stretch it to the edge of the circle to demonstrate the radius. Explain that the radius is the distance from the center of the circle to the edge and that a circle can have many radii.

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Subject: Mathematics

Age: 4 - 7 years old

Activity 4

Circle Geometry Game

Instructions

- Use the string to draw a line from one edge of the circle, through the center, to the opposite edge, demonstrating the diameter. Explain that the diameter is now dividing the circle in 2 equal parts. Use the string to show that the diameter is twice the length of the radius.
- Label the lines with the prepared cardboard cutouts.
- Give your child a cardboard circle and a marker or crayon.
- Have the child draw the radius and then the diameter using the markers.
- When finished, use the labels and ask your child to point at the radius or diameter, etc.
- When the activity is finished, ask the child to share the learning experience.
- Use visual aids and prompts to help your child express their observations during reflection.

Additional Info

- Ensure that the labels and drawn lines are bold and easily visible.
- Use different colors for the radius and diameter to help differentiate them.
- Be prepared to repeat instructions and provide additional demonstrations as needed.
- Allow your child to work at its own pace and provide breaks if overwhelmed.
- If your child is non-verbal allow him/her to point to pictures or use alternative communication methods to share the discoveries.

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Subject: Mathematics

Age: 4 - 7 years old

Activity 4

Circle Geometry Game

How it works

- The activity ensures that children learn through a combination of visual, auditory and kinesthetic activities, making the learning process engaging and effective.
- Children will practice counting, number recognition and basic arithmetic.

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Subject: Mathematics

Activity 4

Age: 4-7 years old

Circle Geometry Game

Adaptations

Environment:

- Ensure the learning space is calm and without distractions, with minimal noise and visual clutter to help the child focus.
- Use a stable base. Secure the cardboard square firmly to the table or surface to prevent it from moving during the activity.

Materials

- Provide larger markers for easier grasp for children with fine motor challenges.
- Use strings in different colors to represent the radius and diameter, making distinctions more visible.

Instruction

- Use simple and clear instructions.
- Show each step visually before asking the child to try (e.g., physically draw the radius while narrating the action).
- Break down the activity into smaller, manageable steps, such as introducing the radius first, then the diameter.
- Repeat the demonstration as needed.

Sensory considerations

- Allow your child to take breaks if needed.
- Let your child work at its own pace.
- Offer a choice between markers, crayons, or pencils to suit your child's sensory preferences.

Explain it in the kitchen 🍕

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CHAPTER 7

Integrating STEAM Disciplines into storytelling

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CHAPTER 7: INTEGRATING STEAM DISCIPLINES INTO STORYTELLING

The Power of Storytelling in Education

In the context of education, storytelling has been a powerful pedagogical tool that can turn difficult concepts into simpler ones, thus making learning more enjoyable. Therefore, integrating STEAM (Science, Technology, Engineering, Arts, and Mathematics) concepts into storytelling makes them more accessible and engaging for young learners. Research has shown that when new ideas are presented in the context of something familiar, as in well-known stories and fairy tales, they can be more engaging to young children. (NRC, 2000). For example, using the story of "The Three Little Pigs" to explore building materials and structural integrity makes the scientific principles more relatable and memorable.

Benefits of STEAM Story Time

Integrating STEAM into storytelling offers numerous benefits:

- **Better understanding**: As mentioned above, familiar contexts such as stories help children understand and remember complex concepts. Incorporating STEAM principles in narratives can improve learners' comprehension and retention.
- **Increased Engagement**: Stories captivate children's attention and imagination, making learning fun. Engaging narratives can spark curiosity and encourage exploration of STEAM subjects.
- **Development of Critical Thinking Skills**: Many stories involve problem-solving scenarios that require children to think critically and creatively. By integrating STEAM challenges into the stories, children can develop essential skills such as analysis, reasoning, and innovation. There are many possibilities, from building a sturdy chair for the baby bear in Goldilocks and the Three Bears to a house that can withstand strong wind in The Three Little Pigs.
- **Cross-Disciplinary Learning**: STEAM education inherently involves the integration of multiple disciplines. Storytelling can seamlessly weave together elements of science, technology, engineering, arts, and mathematics, promoting a holistic approach to learning.

Examples of Successful STEAM Story Time Implementations

"Fairy Tale Tech" at Baton Rouge Mini Maker Faire: At the Knock Knock Children's Museum, children's favourite fairy tales came to life as they created their characters using craft materials and cardboard tubes. They attached these characters to KIBO robots and programmed them to move, shake, dance, and sing. Additionally, they could take their characters to a stop-motion animation station to create short movies.

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Cardboard Challenge: Rapunzel's Tower: They also used the story of Rapunzel, children engineered a cardboard castle complete with a pulley system. This hands-on activity allowed them to explore engineering principles while solving a problem faced by the story's character.

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Humpty Dumpty's Wall: By using the nursery rhyme "Humpty Dumpty," children explored measurement, engineering, and the scientific method. They built and tested walls of various heights to see if they could prevent Humpty Dumpty (a boiled egg) from breaking when rolled off.

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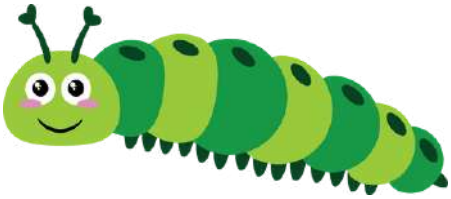
Examples of Successful STEAM Story Time Implementations



"The Very Hungry Caterpillar":
Art Projects: Children can create their own caterpillar props and butterfly costumes using craft materials. They can also illustrate the stages of the caterpillar's transformation.
Science Projects: Explore the life cycle of a butterfly by observing real caterpillars, discussing their growth, and documenting changes.

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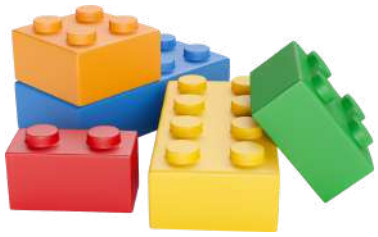
LEGO Duplo Farm Set Activities:
Exploring Farm Animals: Use the Duplo set to introduce children to different farm animals, their sounds, and habitats. Encourage children to create stories involving these animals.
Counting and Sorting: Integrate math by having children count and sort the Duplo pieces by colour and shape. Discuss concepts like more/less and compare groups.
Storytelling: Use the Duplo figures and structures to retell classic farm-related stories or create new ones. Engage children in designing farm layouts and discussing the roles of different characters.



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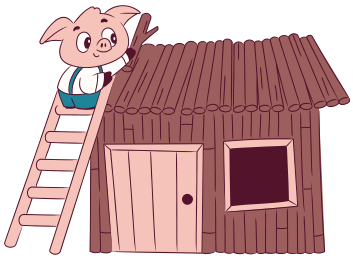
Choosing the Right Stories

Choosing the correct stories is essential when integrating STEAM concepts into storytelling. Ideally, it would be best if you looked for stories that naturally lend themselves to exploration and problem-solving within the context of STEAM. Here are some examples:

Classic Fairy Tales and Children's Books:

"Goldilocks and the Three Bears": This story can be used to introduce engineering challenges. For example, children can design and build a sturdy chair for Baby Bear that will withstand Goldilocks' weight. They can test different materials and structures to understand weight distribution and strength principles.

"The Three Little Pigs": This tale is perfect for exploring materials and structures. Children can build houses using various materials (straw, sticks, bricks) and test their durability against a simulated "wolf's breath" (a fan or hairdryer). This activity helps them understand the properties of different materials and the importance of construction techniques.



Jack and the Beanstalk": Use this story to explore growth, measurement, and scaling. Children can plant beans and measure their growth over time, learning about plant biology and the conditions necessary for growth.

Modern Children's Literature:

"Rosie Revere, Engineer" by Andrea Beaty: This book inspires children to embrace creativity and engineering. After reading, children can engage in their engineering projects, such as building a simple machine or structure.

"Ada Twist, Scientist" by Andrea Beaty: This story encourages curiosity and scientific inquiry. Children can conduct experiments related to the book's themes, such as exploring chemical reactions or making hypotheses and observations.

On this website, you can find a curated book selection: **CLICK HERE**

Guidelines: Incorporating STEAM exploration into storytelling

- **Identify STEAM Concepts or blend STEAM elements:**

Determine the specific STEAM concepts you want to teach through the story. If the story allows, you can naturally integrate all aspects (science, technology, engineering, arts, and mathematics) within the plot.
For instance, while building a tower for Rapunzel, children can measure dimensions (math), design structures (engineering), decorate the tower (arts), and understand pulleys and levers (science).

- **Incorporate Problem-Solving Scenarios:**

Add problem-solving questions.
For instance, children can explore different construction techniques and materials in a story about building a wind-resistant house for the Three Little Pigs.

- **Encourage Exploration and Experimentation:**

Let children experiment. For example, they can try designs for Baby Bear's chairs or test various materials for the pigs' houses. Please encourage them to make predictions, test their ideas, and refine their solutions.

- **interactive Storytelling Techniques:**

Interactive storytelling keeps children engaged and motivated and, as a result, enhances their understanding. Here are some techniques:

Incorporate Questions and Predictions: Ask open-ended questions that prompt children to think critically and make predictions throughout the story. For example, "What do you think will happen if the house is made of sticks?" or "How can we make the chair stronger for Baby Bear?"

Hands-On Activities: Integrate hands-on activities that relate to the story. After reading "Humpty Dumpty," children can build walls of varying heights and test them with a boiled egg to explore concepts of force and impact.

Collaborative Problem-Solving: If working with more than one child, encourage them to work together to solve the problems. This fosters teamwork and allows them to learn from each other's ideas and approaches.

Incorporating Visual and Sensory Elements

Visual and sensory elements can make storytelling more inclusive and engaging, particularly for children with autism or other sensory needs. Visual aids and props can significantly enhance the storytelling experience and help illustrate STEAM concepts. Their use is particularly beneficial for children with autism. Visuals and props can provide clear, consistent information, reducing confusion and anxiety. Creating a structured and predictable environment helps them maintain focus and understand better. Multimedia can also make the learning process more engaging and accessible. Below are some strategies incorporating visual and sensory elements.

Visual Aids

Visual supports can help children follow along and understand the narrative.

Use diagrams, illustrations, and charts to explain complex ideas. For example, when discussing the Three Little Pigs' houses, show a diagram of different types of materials and their properties.

For learners who require more support, use pictures, icons, and symbols to represent key elements of the story, as in the example below.

Physical Prompts

Incorporate physical props and models to bring the story to life. In the "Fairy Tale Tech" example, children used KIBO robots to animate their characters, enhancing their understanding of programming and robotics.

Story Box

Create a story box with items related to the tale. Story boxes are collections of items related to a story, which can significantly enhance engagement and support sensory needs. Gather items that represent the story's characters, settings, and critical elements. Please place them in a box or bag that children can explore. For example, a "Goldilocks and “the Three Bears" story box might include mini chairs, bowls, beds, and bear figurines. Allow children to handle and interact with props as the story unfolds, making the narrative more tangible and engaging.

Multimedia Tools

Utilise multimedia tools such as videos, animations, and interactive apps. For example, children can create stop-motion animations of their stories, combining artistic creativity with technological skills.

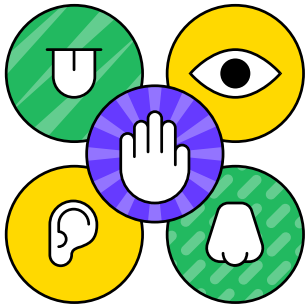
Adaptations for Inclusive Storytelling

Adults can use adaptations (e.g., family members, practitioners) to support STEAM learning and experiences in routines and environments. Specifically, they are changes to the environment, materials, and/or instruction that support child engagement and learning (Campbell, Milbourne, & Kennedy, 2012)

Environment/Activity:

Environmental, activity, and/or routine adaptations are changes and/or accommodations made in the setting and/or activity that support full participation in learning for all children. This includes room set-up, equipment, how an activity is done, and the length of time for activities. Examples include ensuring the working area/space is inclusive and materials are easily accessible.

Sensory-Friendly Adaptations: Create a sensory-friendly environment by adjusting lighting, minimising background noise, and providing quiet spaces for children who may feel overwhelmed.



Example: Use soft, dimmable lights and sound-absorbing materials to create a calm, inviting reading space. Provide noise-cancelling headphones for children sensitive to sound.

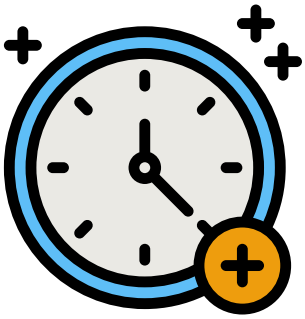
Adjusting the Reading Space: Limit background noise and distractions to create a quiet, cozy area for storytime. Create a clutter-free "reading" station with soft cushions, rugs, and bean bags to make the space inviting. Make sure materials are at eye level and within reach of the child.

Example: Set up a corner with bean bags, soft pillows, and a floor lamp with adjustable brightness to create a comfortable and inviting space for children to sit and listen to stories.

Adaptations for Inclusive Storytelling

Visual Supports and Schedules: Use visual aids such as picture cards, storyboards, and visual schedules to guide the reading session. These tools help children follow along and understand the sequence of events.

Example: Use a visual schedule to show the order of activities during storytime, including reading, discussing, and hands-on activities. Picture cards can represent different story parts, helping children visualise and anticipate what comes next.



Gradually Increasing Reading Time: Start with short reading sessions and gradually increase the duration as children become more comfortable and engaged. This approach helps build attention spans without overwhelming the children.

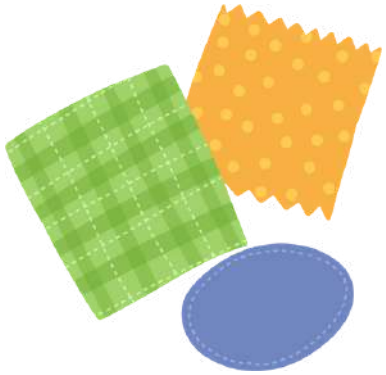
Example: Begin with a few-minute reading session and gradually extend the time by a few minutes each week, depending on the children's comfort and engagement levels.

Adaptations for Inclusive Storytelling

Materials:

Materials adaptations are changes and/or accommodations to materials that support full participation in learning for all children. This can involve adaptations to toys, materials, and assistive technology devices. Examples include assistive technology, grasping supports, various materials (different sizes, colours, shapes, and/or textures), and visual supports.

Sensory-Friendly Materials: Use materials that cater to sensory needs, such as textured props, scented items, or soft fabrics. These materials can help engage children who benefit from tactile experiences



Example: Incorporate textured fabric pieces and scented markers into storytelling props to provide sensory stimulation for children who benefit from tactile and olfactory input

Assistive Technology: Integrate assistive technology devices that support learning and engagement, such as speech-generating devices, tablet apps, and interactive software that provide alternative ways for children to interact with the story.

Example: Use a tablet app that allows children to manipulate story elements or create their story scenes digitally. Speech-generating devices can enable non-verbal children to participate in discussions.

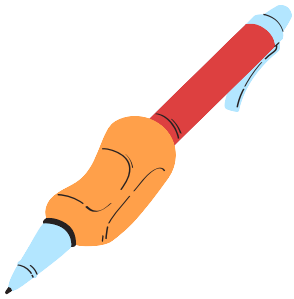
Adaptations for Inclusive Storytelling

Variety of Materials: Provide various materials in different sizes, colours, shapes, and textures to cater to diverse sensory preferences and learning styles. This variety keeps children engaged and helps them explore STEAM concepts through sensory modalities.

Example: Offer a range of building materials like foam blocks, wooden pieces, and plastic connectors in various shapes and colours for children to use in constructing models related to the story.

Grasping Support: Add additional material(s) to an object to make it easier to grasp, lift, or turn.

Example: Add a Styrofoam ball to pencils, crayons, and paintbrushes for easier grasping. You can also add page fluffers to book pages for easier turning.



Adaptations for Inclusive Storytelling

Instruction:

Instructional adaptations are changes and/or accommodations to the instruction or teaching that support full participation in learning for all children. This includes adding information, reducing steps, allowing more time, and providing communication supports, visual cues, visual schedules, and teaching practices.

Clear and Straightforward Language: Simplify the language used in stories to ensure it is accessible to all children. Avoid complex sentences and jargon. Use repetition and familiar phrases to enhance understanding.

Example: Use simple, direct sentences when narrating a story and repeat key phrases to reinforce understanding. For instance, "The big, bad wolf huffed and puffed" can be repeated to emphasise the main action in "The Three Little Pigs."

Multisensory Approaches: Incorporate auditory, visual, and kinesthetic elements into storytelling. For example, use background music, visual aids, and interactive activities to engage multiple senses.

Example: Play soft background music related to the story's theme, use hand gestures to act out parts of the story, and provide props for children to handle during the storytelling.

Adaptations for Inclusive Storytelling

Visual Aids: Adding visual aids to stories can help with comprehension and engagement, especially for children who benefit from visual learning. Use picture cards representing characters, objects, and actions in the story. These can help children visualise and understand the narrative.

Example: When telling the story of "Goldilocks and the Three Bears," use picture cards to show Goldilocks, the three bears, and the different bowls of porridge to help children follow the story.

Simplifying Questions: Simplifying questions ensures that all children can participate in discussions and activities.

Providing Choices: Offer multiple-choice questions to help children make decisions and express their understanding.

Example: Ask, "Which house do you think is the strongest? The straw house, the wood house, or the brick house?" and provide pictures of each option.

Yes/No Questions: Use yes/no questions for children who may find open-ended questions challenging.

Example: Ask, "Did Goldilocks eat the porridge?" and have the child respond with yes or no.

Direct Requests: Make direct requests for the child to repeat answers or point to specific items, supporting their engagement and comprehension.

Example: Ask the child to point to the picture of the wolf when you say, "Show me where the wolf is."

Book Adaptations for Inclusive Storytelling

Adapting books to meet the diverse needs of children is crucial for creating an inclusive learning environment. These adaptations ensure that every child can engage with the story, understand its content, and participate in related activities. Here are various strategies and tools for adapting books to support inclusive storytelling:

Page Fluffers

Purpose: To make turning pages easier for children with fine motor difficulties.

Materials: Use items like foam tabs, small pieces of sponge, or thick stickers.

Method: Attach these materials to the corners of the pages. This creates a small gap between pages, making them easier to grasp and turn.

Example: Attach foam tabs to each page of "The Very Hungry Caterpillar" so children can turn the pages independently, enhancing their physical interaction with the book.

Picture Cues

Purpose: To enhance comprehension and support children with communication difficulties.

Materials: Use picture symbols or photographs corresponding to the text's keywords or phrases.

Method: Attach these picture cues next to the relevant text or image in the book.

Example: In "Goodnight Moon", place a picture of a moon next to the word "moon" to help children associate the word with the image.

Book Adaptations for Inclusive Storytelling

Adapting books to meet the diverse needs of children is crucial for creating an inclusive learning environment. These adaptations ensure that every child can engage with the story, understand its content, and participate in related activities. Here are various strategies and tools for adapting books to support inclusive storytelling:

Binding Changes

Purpose: To make books more accessible and durable to handle.

Materials: Use spiral binding, large binder rings, or Velcro.
Method: Rebind the book using these materials to let the pages lay flat and turn quickly.

Example: Rebind "We're Going on a Bear Hunt" with spiral binding so it lays flat on the table, making it easier for children to follow along and interact with the pages.

Page Protection

Purpose: To increase the durability of books, especially those used frequently by young children.

Materials: Use laminate sheets, clear contact paper, or page protectors.

Method: Cover each page with these materials to protect against spills, tears, and general wear and tear.

Example: Laminate the pages of "Chicka Chicka Boom Boom" to protect the book from sticky fingers and ensure it lasts longer.

Book Adaptations for Inclusive Storytelling

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Text Simplification

Purpose: To make the content more accessible for children with language or learning difficulties.

Materials: Use a word processor and printer to create simplified text versions.
Method: Rewrite the story in simpler language, using short sentences and familiar vocabulary. Print and attach this text over the original.

Example: Simplify the text of "The Cat in the Hat" by using shorter sentences and more common words, making the story easier for young readers to understand.

Prop Boxes

Purpose: To enhance the storytelling experience through tactile and interactive elements.

Materials: Collect items related to the story, such as toys, costumes, and sensory objects.

Method: Create a box with these props that children can use to act out parts of the story.

Example: For "Goldilocks and the Three Bears," include miniature furniture, plastic bowls, and a bear costume in a prop box. Children can use these items to reenact scenes from the story, deepening their understanding and engagement.

Book Adaptations for Inclusive Storytelling

Adapting books to meet the diverse needs of children is crucial for creating an inclusive learning environment. These adaptations ensure that every child can engage with the story, understand its content, and participate in related activities. Here are various strategies and tools for adapting books to support inclusive storytelling:

Interactive Storyboards

Purpose: To engage children through interactive elements that they can manipulate.

Materials: Use felt boards, Velcro, and cut-out characters or objects.

Method: Create a storyboard with movable pieces that children can place and move as the story progresses.

Example: For "Brown Bear, Brown Bear, What Do You See?", create felt board characters that children can place on the board as each animal is mentioned.

Texture-Enhanced Pages

Purpose: To provide sensory experiences and support children with tactile sensory needs.

Materials: Use various textured materials like sandpaper, fabric, or foam.

Method: Attach these materials to the book's pages to correspond with different elements of the story.

Example: In "Touch and Feel Farm," add textures like fuzzy animal fabric, rough sandpaper for a barn wall, and smooth plastic for a tractor.

CHAPTER 8

Guidelines for Parents: Supporting Your Child

Co-funded by the European Union

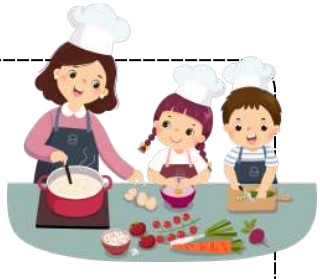
CHAPTER 8: GUIDELINES FOR PARENTS: SUPPORTING YOUR CHILD

Daily STEAM Moments: Integrating small, manageable STEAM activities into everyday routines

STEAM activities don't always need to be planned. Everyday routines with your child, like cooking, bath time, doing laundry, playtime, or walking in the park, can be excellent opportunities to encourage STEAM learning.

Here are some examples of how to integrate STEAM activities into everyday routines:

Cooking



Including your child, while preparing easy daily meals can be fun for you and your child. Preparing a meal can be a great way to incorporate STEAM into your daily routine.

While you are preparing the meal, the child will have an opportunity to learn about different components of STEAM.

Cooking is a great way for your child to observe and explore how different textures mix. For example, if you are making bread, when the flower and the water mix, you will create a dough.

If you use food colouring, your child can explore how the colour of the food will change or try to mix different food colours. For example, putting yellow and blue food colouring in the whipped cream will make it green.

The child can observe how temperature affects different products; for example, butter melts when put on the stove.

Cooking is a great way to practice basic math skills like counting or measuring, for example, counting how many spoons of sugar or glasses of milk he/she needs to put in the cake you are baking.

CHAPTER 8: GUIDELINES FOR PARENTS: SUPPORTING YOUR CHILD

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You can use visual support to help your child thrive and understand the steps he/she needs to take when preparing the meal.

You can create a visual recipe to help your child better understand the instructions you give them. You can also make first/then boards. For example, we wash the apples first and then cut them.

Remember that the kitchen can become messy and contain many overwhelming sensory stimuli. Adjust the room according to your child's sensory preferences. For example, if your child avoids loud noises, don't put on the cooker hood while you are preparing the meal.

Cooking together is an excellent activity for incorporating STEAM into everyday moments and practising life skills.

CHAPTER 8: GUIDELINES FOR PARENTS: SUPPORTING YOUR CHILD

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Taking a bath

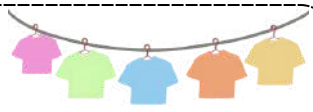
Another daily routine that you can incorporate for including STEAM is bath time.

During bath time the child can explore how to create bubbles. You can put different toys in the bathtub and observe which toys are light and will float in the water and which toys are heavy and will sink, for example the rubber duck will float on the water, but a car toy will sink.

You can make the toys in the water drop and splash. You can also incorporate basic math by counting the toys in the bathtub, for example count how many rubber ducks you put in the bathtub.

You can introduce colors while playing with the toys. You can explore the temperature of the water and introduce the concepts of warm and cold.

Sorting laundry



When sorting laundry during the day, it's a great time to include your child in practising matching and sorting skills. For example, you can sort all the white-coloured clothes together before starting the washing machine. You can also let your child match the socks when putting away clean clothes, pairing the socks with the same colour or patterns.

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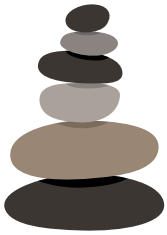
Outdoor activities

You can also incorporate STEAM into your everyday walks and visits to the park. While you are outside, you can do various activities with your child.

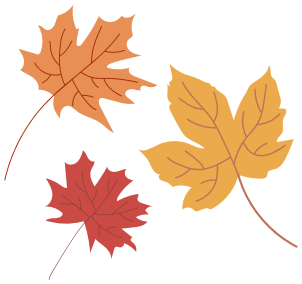
For example, if you are talking a walk in the park, you can collect rocks and see the difference between them. You can try to practice sorting the rocks by their size, for example small and big rocks. You can also build a tower from the rocks.



You can pick different flowers from the park and practice matching the same flowers or sorting them by colour.

You can collect tree sticks in the park. With the stick you can try to build different shapes like triangle, square, rectangle. You can model and show your child how to create the shape with the tree sticks.

You can also collect leaves and sort them by their different colors.



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Outdoor activities

You can use the time to include counting as well. You can count all the flowers you picked or the rocks, leaves, pinecones and sticks you collected. While taking a walk or going to the playground, you can include counting in many activities, like counting how many stairs the child climbed to get to the slide, how many times the child jumped on the trampoline or how many times the child got pushed on the swing.

Nature walks and play in the park offer various activities and possibilities for learning STEAM without the need for additional toys or materials. At the same time, they are fun for both you and your child.

These are only a few ideas for incorporating STEAM learning into your everyday routines and activities.

On this website you can explore more activities and ideas on how to include everyday meaningful STEAM moments:
https://stemielearningtrajectories.fpg.unc.edu/

RESOURCES

Resources – STEMIE Learning Trajectories (unc.edu)

8 Ideas to Incorporate STEAM Learning into Everyday Experiences - Colour My Learning

Nature-Inspired Outdoor STEAM Activities for Kids • RUN WILD MY CHILD

https://www.statped.no/ask/hva-er-alternativ-og-supplerende-kommunikasjon-ask/

https://www.preface.ai/kid-programs/scratchjr/#curriculum

https://www.create-learn.us/blog/scratchjr-project-ideas-for-kids/

https://codakid.com/scratchjr-review/

https://www.angelsense.com/blog/guide-to-assistive-technology-for-autism/

GLOSSARY

STEAM- Science, Technology, Engineering, Art and Mathematics
STEM- Science, Technology, Engineering and Mathematics
ASD- Autism Spectrum Disorder
ICT- Information and communications technology
EU- European Union
NGO- Non-governmental organization
VET- Vocational education and training

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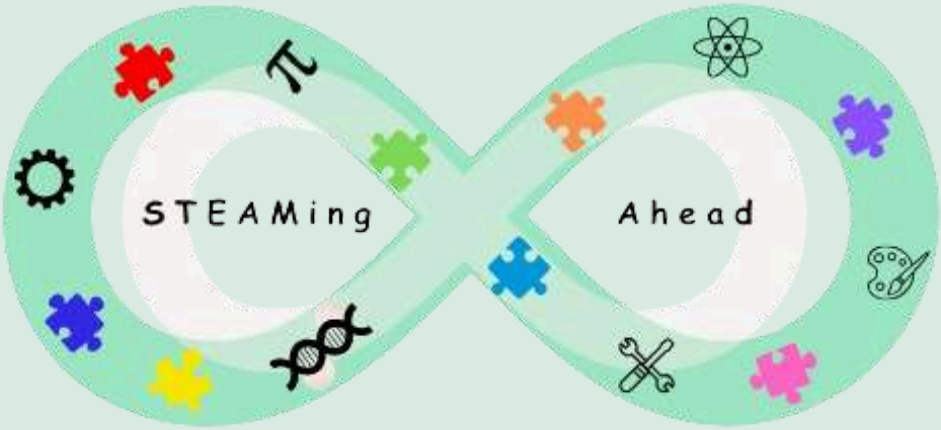

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