



*The impact of
light*

illuminating education

EMPOWERING MINDS



Author and presenter



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Built numerous outstanding play and learning environments for children from 0-11 years old.

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Includes content from:



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Specialising in bridging the gap
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for education and industry.



**INSTITUTE FOR THE SCIENCE
OF EARLY YEARS & YOUTH**

Today we will explore:



- What do we mean by sensory stimulation?
- How does the sensory experience in an environment impact children's focus, attention and wellbeing? Linked to their state of arousal.
- How does light impact behaviour?
- The impact of light on child development.
- The different appeal of resources that light and glow vs those that don't.
- What kind of environment spaces do you need to introduce them?





What do we mean by sensory stimulation/play?

We have eight senses, which are:

- **Vision.**
 - **Hearing.**
 - **Touch.**
 - **Smell.**
 - **Taste.**
-
- **Balance and movement sense** – our inner ears which helps us balance and remain upright. Think vertigo.
 - **Body movement and position (proprioception)** – mainly subconscious but helps us with our spatial awareness and the force we use when moving.
 - **Internal awareness (interoception)** - Noticing signals (stomach growling). Connecting signals to its meaning (I am hungry). Reacting to address the need (eating something).



Sensory processing is part of a child's development. Giving children opportunities to learn and develop through a range of sensory experiences helps them explore the world around them.

Everyone has their own sensory preferences for sounds, tastes, level of light etc.

The impact of light.

Lighting supports concentration, helps regulate emotions, and contributes to a calm atmosphere. It can be used for sensory exploration, storytelling or mindfulness, and has a direct influence on engagement, wellbeing and developmental outcomes.

Research shows that children are more sensitive to light than adults. Children's eyes have larger pupils and clearer lenses, meaning more light reaches the retina. This makes the effects of light — both beneficial and harmful — significantly stronger in young children than in adults.

Light offers a protective effect against myopia (short-sightedness), and cooler, brighter lighting is associated with better vision outcomes.

Every child deserves to feel safe, included and able to thrive — regardless of their needs or learning style. Schools should therefore prioritise flexibility and inclusiveness in how they design and manage learning environments.





Light in our play and learning spaces.

Strike the right balance between stimulating and overstimulating.

- Indoor lighting has a real impact on attention and behaviour, particularly in learning environments where children's sensory systems are still developing, making them more sensitive to their surroundings.
- For children with Special Educational Needs and Disabilities (SEND) or sensory sensitivities, lighting needs to support alertness while also allowing for self-regulation.
- Research from the Netherlands as far back as 2014 found that 69% of adults with ADHD reported hypersensitivity to light — a powerful reminder of how significantly poor lighting can affect neurodiverse learners.
- Flickering lights and harsh brightness can cause eye strain and overstimulation. Avoiding glare and using gentle contrasts helps maintain a balanced environment, it can meaningfully reduce unnecessary overstimulation and make learning easier for children.



Light in our play and learning spaces.

Supporting focus, concentration and engagement in students.

- A well-lit classroom is key to capturing and sustaining children's attention and encouraging active participation. Balanced lighting supports focus and concentration — natural light boosts alertness and mood, while artificial lighting gives educators the flexibility to adapt the space for different activities, from group discussions to independent reading.
- Lighting can also be used to create distinct zones within the classroom, such as a calming corner or sensory area — particularly valuable for children who need lower-intensity environments for sustained concentration.
- Higher colour temperature lighting, commonly used in classrooms, can support short bursts of focus and increase short-term alertness and energy. Getting light levels right also reduces visual fatigue, helping students stay comfortable and engaged for longer. Ultimately, effective lighting supports emotional wellbeing and helps children feel more connected to their learning environment.



Light in our play and learning spaces.

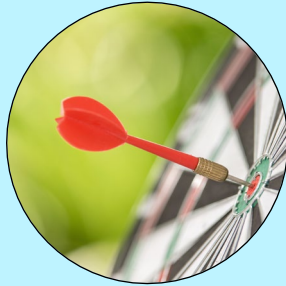
Creating a calm environment for learning.

- The right lighting helps children feel safe and secure, creating an atmosphere that's conducive to learning and supports calmer, less disruptive behaviour.
- While bright light is important for alertness, warmer and lower-intensity lighting is more consistently linked to a sense of calm. Soft, balanced lighting establishes comfort and emotional safety — both essential for effective learning, especially for children experiencing anxiety or stress.
- The tone of light — warm or cool — can significantly affect children's emotional states, influencing how motivated, safe or relaxed they feel. This in turn can improve mood, behaviour and overall wellbeing in the classroom, with particular benefits for children with SEND or neurodiversity.



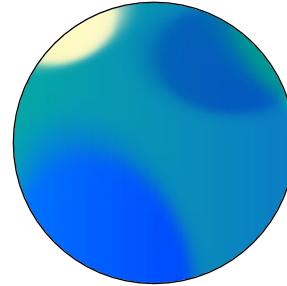


Light and the developing brain.



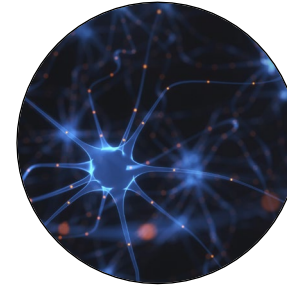
Attention allocation

Supporting children
to choose what to
pay attention to



Levels of stimulation

How light affects overall levels
of arousal



Contingency

How light helps young brains
become even stronger
'prediction machines'

Light vs attention capture and control.



Attention capture is what automatically captures our attention. Humans' innate fascination with light is a perfect example. Bright lights and colours immediately grab our attention. This is part of our evolutionary survival instincts.*

- The contrast between an object and its background increases the likelihood of attention being captured and controlled. Movement cues drive attention allocation; light can be used in the same way.*
- Light up resources enhance colour and brightness contrast and background isolation. The increased salience makes it easier for young children to follow and fixate on objects.*

Attention control = choosing what to focus on and managing to resist other distractions.*

- Brain networks involved in attention capture are some of the earliest to develop, whereas parts needed for attention control are the slowest and haven't fully developed even at 20 years old.*

**Cites book from Professor Sam Wass and Dr Gemma Goldenberg (2024.)*

Impact of attention.

Attention allocation = supporting children to choose what to pay attention too.*

- Attention is a limited resource.
- Research shows children focus for longer when they initiated interest in an object/activity/interaction.
- Use of light up resources which capture attention further enables educators to create child-led play and learning opportunities, boosts attention and brain synchrony.
- This fascination also increases likelihood of information retention. We learn more when we are truly engaged.

**Cites book from Professor Sam Wass and Dr Gemma Goldenberg (2024.)*

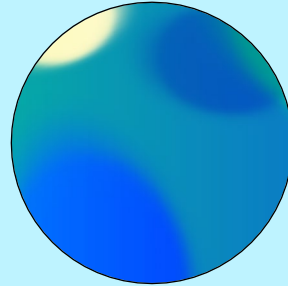


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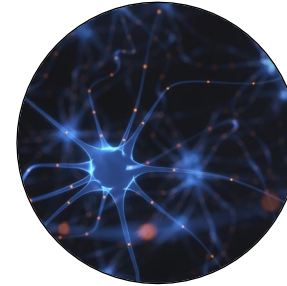
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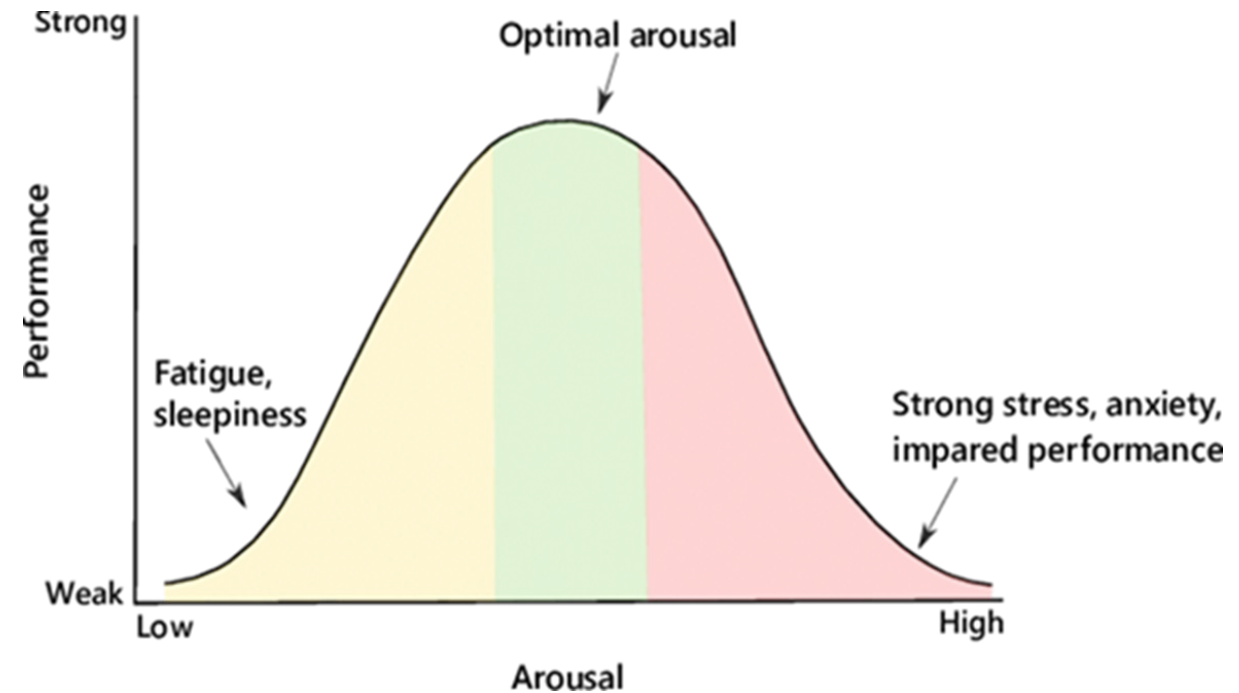


Contingency

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- Our level of arousal is how awake or alert we feel.
- The 'Goldilocks zone' is the optimal level. Being at the right level is a balancing act.
- Arousal levels is linked to how much sensory information we are processing and how we respond to it.
- Reaching the 'Goldilocks zone' is a unique journey for every person. If you are naturally more towards the lower end you will likely be helped by additional stimulation, whereas if you are naturally on the higher end then you could find additional stimulation overwhelming or distracting.
- This overwhelm increases the chance children become dysregulated and display certain behaviours.





Sensory ‘modulation’.

Modulation can be used to describe how our brain notices and either is able, or unable to ignore sensory stimuli to remain focused, on task and regulated.

We all process this stimuli differently. Our thresholds for overwhelm differ.

When getting dressed for example, there is a lot of different sensory information being inputted into our nervous system.

Thinking back to our base levels, for some, this could be too much sensory input.

Other examples where there is lots of sensory stimuli include: mealtimes, sleep times, group environments, events, transition times.

If you are unable to effectively modulate you are likely to become overloaded and dysregulated. This then presents as the fight-flight-freeze response. However, it is not just sensory overload that can lead to this response, other demands can also contribute to or cause a fight-flight-freeze response.



Fight

When overloaded, the child may hit out, kick, shout, scream and respond physically and confrontationally to the situation.

Flight

When overloaded, the child may run away and flee to get away from the situation.



Freeze

When overloaded, the child may not be able to move or act in response to a situation, this can include being unable to speak or communicate.



**Under-aroused
Or
Low levels of
arousal**



**Optimal (mid-level)
'Goldilocks zone'**



**Over-aroused
Or
High levels of
arousal**



Under-aroused

- Children who are naturally under-aroused, often need 'nudging up'.
- They might appear disinterested, fatigued, floppy.
- They might be sensation seekers – fidgeting, spinning, mouthing, humming, conflict seeking.



Over-aroused

- Children who are naturally over-aroused, often need 'nudging down'
- They might appear overwhelmed, dysregulated, 'in a tantrum'.
- They might 'shut down' to reduce stimulation – covering their eyes or ears, crawling under tables or into a ball.

Co and self-regulation.



Developing self-regulation is not something children do by themselves. It is a process that grows gradually out of co-regulation, which is the supportive process by which adults help young children manage their emotions, behaviour, and actions. Adults need to notice changes in behaviour and offer support.

- 'For young children, co-regulation also has both emotional and cognitive aspects. It includes the adult modelling calming strategies and naming and talking about feelings and ways to manage. This helps children learn to recognise their feelings and builds their cognitive awareness of strategies to reduce or manage extremes of emotion. At the same time, adults scaffold cognitive self-regulation by talking with children about thinking and learning and supporting them to focus, persist with challenge, choose strategies and so on.'
- 'A child who is experiencing very strong emotions will have difficulty in holding back impulses, focusing attention, or thinking in flexible ways to solve problems. Over arousal of the emotional part of the brain constrains the thinking part, so a child who is very upset will first need help through emotional co-regulation before they can begin to think about the situation.' [*Birth-to-5-Matters-Doc-Artwork-PT-LINKS-Aug-26.pdf*](#)

Self-regulation is not the same thing as compliant behaviour, such as sitting still and listening when expected to. A child who is stressed and struggling to resist the impulse to move or speak is very different from a child who is calm and alert, in a balanced state of feeling, thinking, and behaviour.

Self-regulation develops continually, with further development taking place in adolescence and into adulthood.



How does light impact behaviour?



Our response to light is instinctive — coded into our basic brain responses. We may not always be able to articulate it, but we recognise that light carries emotional weight. Think about the difference between a warm lamp in a reading nook and a bare bulb in a garage — they feel completely different, and there are three key reasons why.

- **Visual perception** — the practical element. This is our brain assessing whether there's enough light to see clearly. For most people, this is where thinking about lighting stops.
- **Personal interpretation** — the subjective layer. This is how light makes us feel: whether it seems comfortable or appropriate, what it reminds us of. While this varies by individual, cultural background and personal experience, there are patterns — warm, dim, yellow-toned light tends to calm us, while bright, white overhead light energises us.
- **Circadian rhythms** — the instinctive response. This is how our bodies' physiological processes react to light. We get tired earlier in winter when it gets dark sooner — that's our body adjusting mood and energy in response to light. In the classroom, managing overall light levels can influence this directly, with something as simple as dimming the lights at rest time being a great example.

When matched to a child's sensory needs, lighting can be used to both reduce and increase levels of arousal, helping children find 'optimal level'.

Fast moving, flashing, bright, multiple colours
= higher arousal

Soft lighting, calm colours, slow moving
= lower arousal.

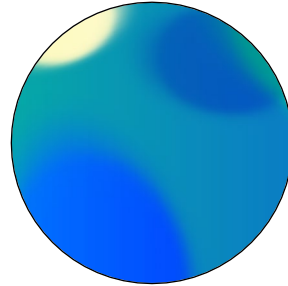


Light and the developing brain.



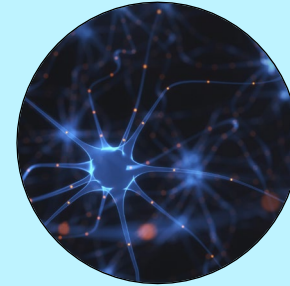
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- Brains are prediction machines – constantly making and testing predictions, readjusting internal models when predictions are incorrect.
- As children develop, and learn more about the world around them, they get better at making accurate predictions.
- When light responds to a child's action, it helps reinforce cause and effect learning. These contingent responses enable children to make accurate predictions.

Studies show that contingent toy interactions help boost early brain development.

- From as early as 2-3 months, children can detect when their actions produce changes in the environment.
- Object reactivity captures children's attention. (*Deak et al, 2014; Muentener & Schulz 2014*)
- Contingent interactions encouraged more reaching and led to more accurate looking and motor development in infants as young as 2-3 months. (*Williams & Corbetta, 2016*)

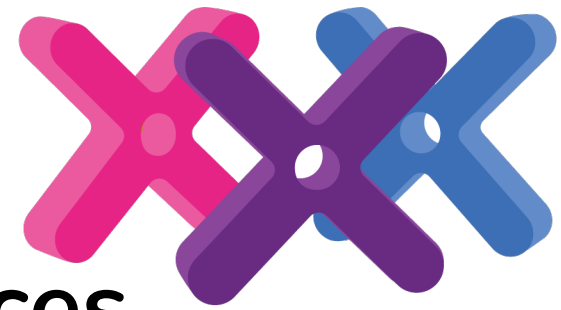
Younger children, need more predictable interactions.

- For babies, even when something is 100% contingent, they still only predict it correctly some of the time. Completely contingent interactions drive their engagement.
- As children get older, they pay best attention when they can predict something some, but not all, of the time.



The more opportunities that young children have to repeat activities and make accurate predictions, the more they build strong and stable pathways in the brain.





Light in our play and learning spaces.

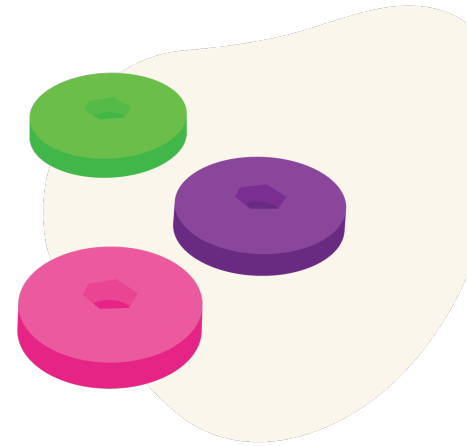
Glow resources are not just for sensory spaces.

Not every setting has a dedicated dark or sensory room. Many educators work in standard classrooms, open-plan spaces or shared environments where a permanent sensory setup simply isn't possible.

Encouraging curiosity and exploration.

- Children often learn through sensory experiences, and for those with SEND, opportunities to play and explore are especially important. Light and glow resources offer a distinctive way to engage with learning through both sight and touch, providing a safe and stimulating sensory outlet that encourages curiosity.
- Touch-activated glow resources can introduce children to cause and effect, building vocabulary around actions, reactions and outcomes — all while avoiding sensory overload. Incorporating resources with a glow or light element supports sensory-led learning and connects naturally to STEAM subjects, encouraging experimentation, problem solving and creative thinking.

3 ways to introduce glow resources:



There are three key contexts in which glow and light resources can be used — and it is worth being clear about all three:

1. **SEND and emotional regulation spaces** — whether that is a permanent calm corner, a temporary regulation station, or a flexible resource that can be brought out when a child needs support to settle, focus or regulate.
2. **Enhancements to everyday provision** — added to existing areas such as construction, small world, mark-making or maths to increase engagement, broaden appeal and add a new sensory dimension to familiar activities.
3. **The foundation for entirely new areas of provision** — creating dedicated light-focused learning spaces that invite children to explore, investigate and learn specifically through the medium of light itself.





Ideas on how light can be introduced into play and learning spaces:

Sensory and calming spaces - a dedicated calm corner or sensory area can be enhanced significantly with light and glow resources. Fibre optic strands, colour-changing resources, glow cushions and soft projectors can all contribute to a low-stimulation, emotionally safe space where children can co or self-regulate. These areas are particularly beneficial for children with autism, anxiety or sensory processing difficulties, giving them a retreat where light is used deliberately to soothe rather than stimulate.

Projectors can transform a plain wall or floor into an immersive, engaging environment. Educators can project moving images of nature, underwater scenes or abstract patterns to support storytelling, imaginative play or relaxation. They are perfect for younger children and those with SEND. Projected light that responds to movement and physical engagement is joyful, low-pressure play that doesn't require verbal or fine motor ability.

Projectors can also be used for light and shadow play. Playing with light and shadows helps children develop spatial awareness by learning about shapes, sizes and dimensions. It also builds an understanding of cause and effect, as children observe how moving an object in front of a light source directly changes the shadow it produces.



Ideas on how light can be introduced into play and learning spaces:

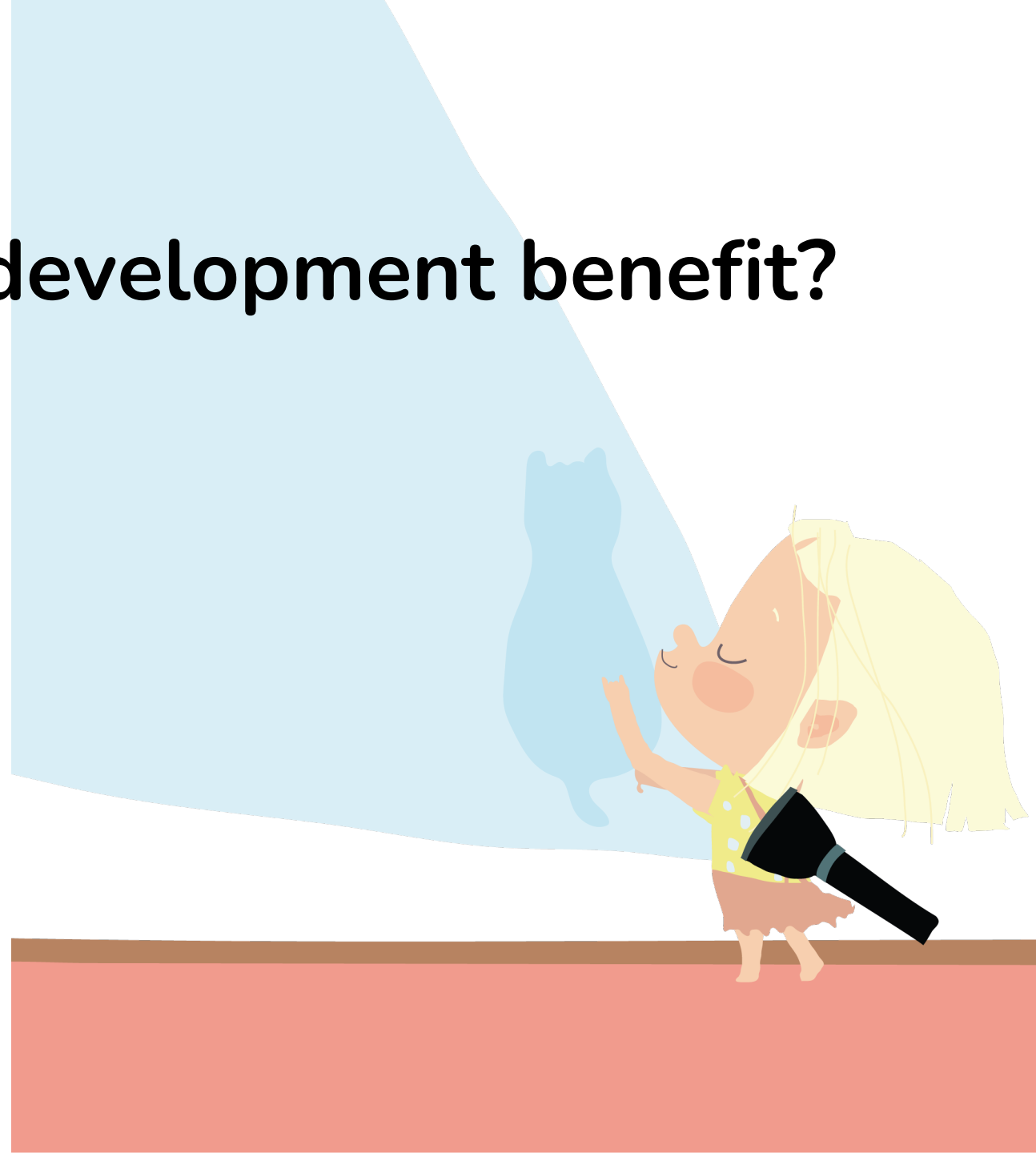
- **Light panels** - for children with SEND, the illuminated surface draws attention and provides a focused, contained space for exploration, reducing visual noise from the wider environment.
- **Storytelling and narrative play** – for children with communication difficulties or those who find traditional circle time challenging, the visual and sensory dimension of glow-based storytelling can increase engagement and make narrative more accessible and memorable. Example resources for this include glow remote control vehicle and wagons or glow small world.
- **Early mathematics and literacy** - glow resources can support curriculum learning in creative and inclusive ways. Translucent number tiles, alphabet shapes and counting objects placed on a light panel make early maths and literacy activities visually engaging and tactilely interesting. Mathematical concepts such as shape, size and construction can be supported through building and experimenting with our glow construction range or glow jewels too!





How will children's development benefit?

- Multi-sensory stimulation through sight, touch and movement.
- Improved concentration attention, focus and memory,
- Curiosity, creativity and independent thinking.
- Supports emotional regulation and the creation of a more calming environment.
- Enhanced communication and language opportunities, collaboration and new vocabulary.
- Allows the fundamentals needed for the future technological journey to be understood and mastered such as cause and effect and basic algorithms.
- Introduces new concepts and exposes children to fresh ideas and exploration e.g. mathematical skills, and scientific knowledge and experimentation through light and dark, colour mixing.





Why else use light in play and learning spaces?

- The awe and wonder that light stimulates entices different children to investigate and engage.
- Unexpected joy stimulates brain development and dopamine production ('happiness hormone').
- Builds on Piaget's theory of children learning via the interaction of their ideas and real-world experiences.

Engagement matters:

A child who isn't naturally drawn to construction or small world play may find that the addition of a glow element completely changes their relationship with that activity. Light can be the hook — the thing that draws them in — and once they are engaged, they begin accessing all of the developmental benefits of that type of play without even realising it. Light broadens the appeal and widens the door.



The neuroscience behind light up and glow resources

Meet our research partner, **Dr Gemma Goldenberg**. Gemma specialises in bridging the gap between neuroscience research and practice, translating research findings into meaningful insights for educators and the industry.

Here, Gemma explains the neuroscience behind light up resources and how they can be used to support early childhood development.



Dr Gemma Goldenberg
Research Partnerships
and Knowledge
Exchange Lead, ISEY

Gemma told us: “For children, attention control is very challenging as their brain networks are still developing, this means babies are completely driven by attention capture. In early development their attention is very scattered, and they need us to guide them to focus on one thing.

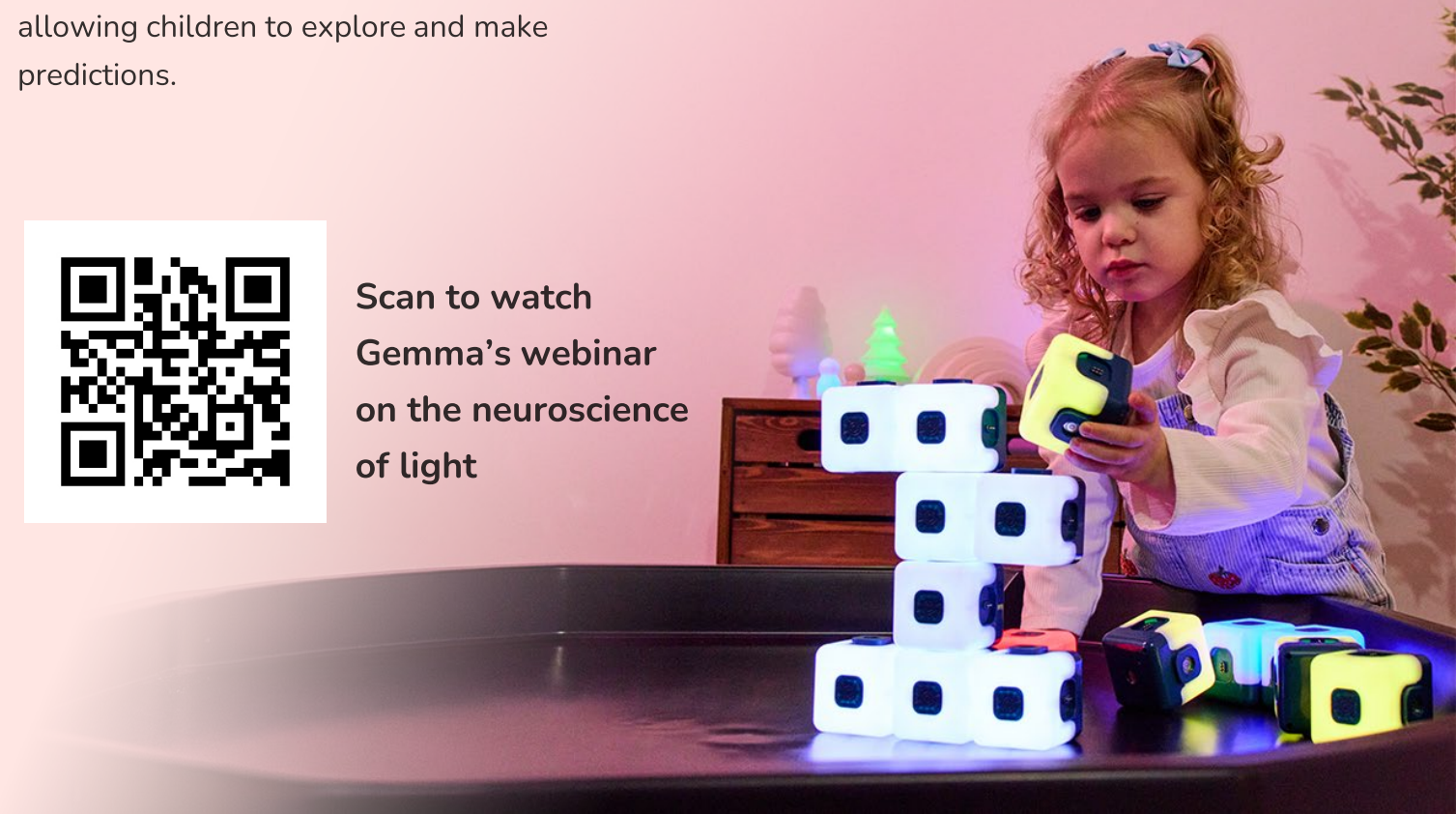
Light up resources create changes in the environment through light and shadows, allowing children to explore and make predictions.



Scan to watch
Gemma's webinar
on the neuroscience
of light

The more opportunities that young children have to repeat activities and make accurate predictions, the more they build strong and stable pathways in the brain.

Our research shows that infants pay attention for longer, when they initiate interest in an object. Light up toys can attract children's attention, enabling adults to create child-led interactions. This boosts attention and brain synchrony.”





Thank you!
