Science, Art, and Spirituality: A Sustainable Approach

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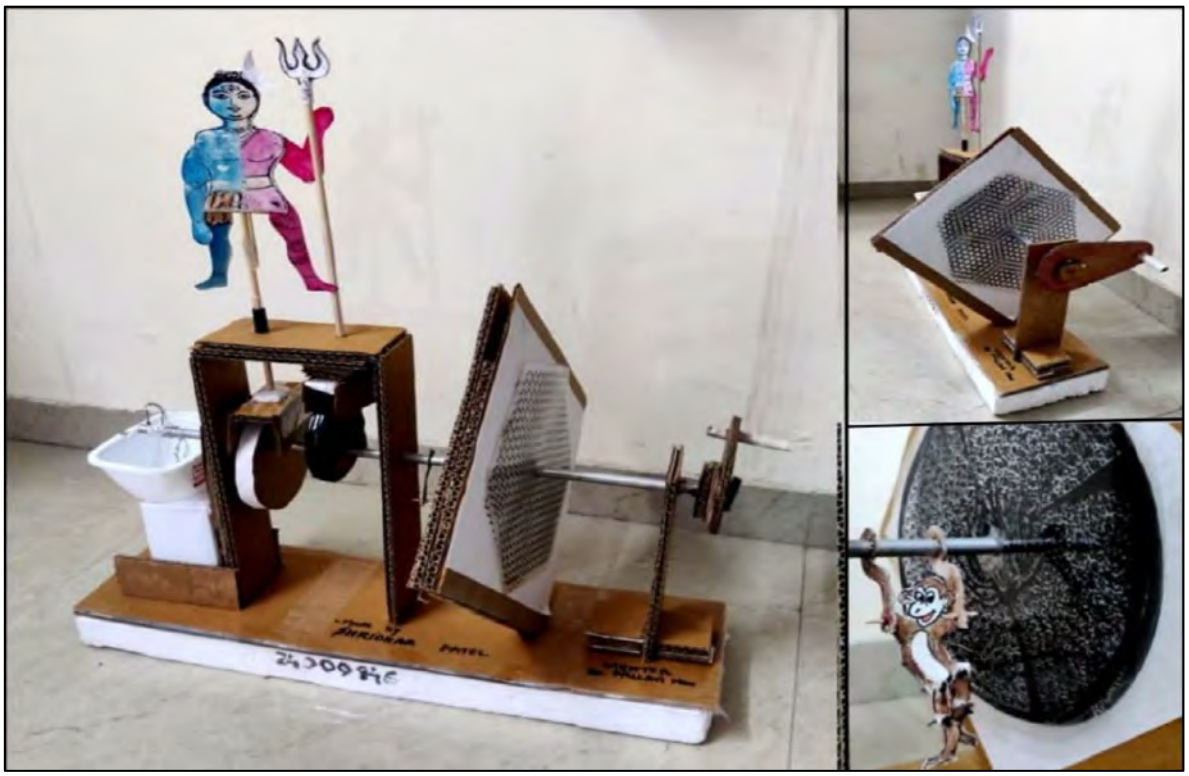

Figure 1: Picture of Scientific Toy -2nd version from different angles

Figure 2: Picture of Scientific Toy -1st version as End Sem Project of Course : Designing Scientific Toys

Abstract

Science, art, and spirituality—often seen as distinct—are, in truth, three lenses to explore a single reality: Who are we, and what is our place in this cosmos? This paper presents a practical and philosophical journey that interweaves these realms through the creation of a sustainable, low-cost scientific toy. Developed initially as the End Semester Project of a Choice Based Course 'Designing Scientific Toys' at Navrachana University. It was born from the author's own lived experience as an Artist, Engineer, Educator, Seeker, a Lifelong Learner, and a B.Ed Student. Then it evolved to the current 2nd version with Mentor's Vision, guidance, and author's hard work. The author also as someone who has personally battled the depths of depression and survivor of dark suicidal phase is on a mission to save students from suicides. The inclusion of suicide prevention and mental well-being is not an academic formality, but a life-and-death necessity.

This is not a definitive claim, but a perspective—a reflection of insights gathered while building, teaching, meditating, and living. As the Tao of Physics beautifully reminds us, "Modern physics has come to take a radical turn toward mysticism when it enters the atomic

and subatomic domain" (Capra, 1975). Just as quantum theory reshaped the boundaries of logic, so too must education transcend rote learning to become an integrated experience of head, hand, and heart.

The toy integrates scientific principles such as the cam-shaft-follower mechanism, Newton's laws, torque, and energy transfer, hinge-based motion, moiré interference patterns, and surface tension through bubble formation. At a deeper level, it opens doors to questions of consciousness—symbolized by the pineal gland and the third eye, rooted in both neuroscience and Vedic symbolism.

The learning design follows a constructivist path, incorporating Piaget's theory of cognitive development, Skinner's reinforcement theory, Thorndike's law of effect, and the 8 Learning Events Model by Leclerq and Poumay. These are mapped onto Bloom's Taxonomy to move beyond memorization towards application, analysis, evaluation, and creation. The toy-building activity uses discarded and recycled materials—pen refills, gift boxes, cardboard, bottle caps—echoing the principles of SDG 4 (Quality Education), SDG 3 (Good Health and Well-being), and SDG 12 (Responsible Consumption and Production).

The spiritual dimension unfolds through themes of Karma (action and consequence), Maya (illusion), impermanence, and unity of Shiva-Shakti (balance of cosmic energies). These are not religious abstractions but psychological truths. As **Carl Jung wrote, "Who looks outside, dreams, who looks inside, awakens."** Students are invited to explore these layers through reflection questions, journaling, and dialogue—linking the mind's mechanisms with the mechanics of motion.

By weaving together scientific thinking, spiritual depth, and artistic expression, this project transforms learning from a task into a personal journey. It invites students not merely to memorize formulas but to create, question, and contemplate. Through hands-on engagement and reflective practice, learners begin to see science as alive, art as purposeful, and spirituality as a lived experience—not an abstract ideal. The use of recycled everyday materials does not just reduce environmental impact; it nurtures values like mindfulness, resourcefulness, and harmony with nature. Ultimately, this approach helps create a learning environment where knowledge is not just acquired but lived. **Aligning with the vision of the United Nations' Sustainable Development Goals: "peace and prosperity for people and the planet." It lays**

the foundation for a future that is not only sustainable, but also compassionate, creative, and deeply aware.

Keywords

Sustainability, STEAMS Education (Science, Technology, Engineering, Art, Mathematics, Spirituality), Spirituality in Education, Sustainable Pedagogy, Constructivist Approach, Hands-on Learning, Experiential Learning, NEP 2020, Critical Thinking, Higher Order Thinking Skills (HOTS), Scientific Toy Making, Upcycled Educational Tools, Sustainable Development Goals (SDGs).

Introduction

Can a toy made from scrap materials do more than demonstrate physics? Can it also help a learner discover the rhythm of life, the balance of mind, and the beauty of interconnectedness?

This paper emerged from such a possibility. The choice-based course ‘Designing Scientific Toys”, offered as part of all UG PG programs at Navrachana University, became the seed for a larger inquiry. It invited pre-service teachers and future educators, engineers, artists, architects, lawyers, and managers to connect scientific principles with creativity, sustainability, and deep pedagogical reflection. What began as an exercise in craft turned into a journey of integrating science, art, and spirituality. The Scientific Toy built in this project became not just a tool, but a metaphor—a bridge between Newton and the Upanishads, between mechanisms and meaning.

While traditionally seen as separate, science, art, and spirituality often seek the same truths through different paths. As the author reflected on the process, it became evident that creating a simple toy can reveal the interconnectedness of reality. The author echoes what Fritjof Capra described in The Tao of Physics—that the essence of the Eastern worldview is the awareness of unity and mutual interrelation of all things (Capra, 1975).

Modern physics, especially at the quantum level, has discovered a reality so subtle, interconnected, and mysterious that it begins to sound strikingly like the language of mystics. As Capra noted, When the concepts of space, time, and matter break down, we are left with relationships, with movement, with flow—a Tao. This realization mirrors the author's

experience through this case study: true knowledge comes not only through reason, but also through intuition, contemplation, and engagement.

This work is not definitive proof, but a perspective. The author's intent is to reach fellow educators, students, parents, scientists, and mystics alike—those who may never have considered the overlap between quantum mechanics and Vedantic philosophy, between wave interference and Maya. And just as Capra cautioned that mysticism is ultimately an experience beyond words, so too is the transformative potential of education. One must build, reflect, and experience.

Aligned with India's National Education Policy (NEP) 2020 and National Curriculum Framework (NCF) 2023, this paper advocates a shift from rote learning to constructivist, holistic education. Ancient Indian thought encapsulated this through Apara Vidya—worldly knowledge—and Para Vidya—inner wisdom. When learners apply both, they don't just solve problems; they begin to understand themselves (Radhakrishnan, 1953; Vivekananda, 1896).

In the hands-on act of making, theory meets experience. A rotating cam becomes a model of karma—action setting changes into motion. Moiré patterns from plastic sheets echo the illusion of perception. A shimmering bubble becomes a silent teacher of impermanence. These aren't just craft ideas; they are philosophical gateways.

Modern learning theories validate this method. Piaget emphasized active learning to construct mental models. Skinner highlighted the role of feedback and reinforcement. Thorndike's law of effect pointed to satisfaction as the driver of habit. The 8 Learning Events Model by Leclerq and Poumay ensures exploration, experimentation, and expression. Bloom's Taxonomy moves the learner from recall to creation—exactly what happens when a child designs, tests, and refines a working model.

The toys themselves demonstrate powerful scientific principles: Newton laws, torque, mechanical motion transfer, wave interference, and surface tension (Norton, 2009; NCERT, 2023; Adamson & Gast, 1997). But more importantly, the way they are built—using discarded pen refills, old cardboard, and reused plastic—promotes sustainability and resourcefulness. This supports United Nations Sustainable Development Goals Like SDG 4 (Quality Education), SDG 3 (Good Health and Well-being), and SDG 12 (Responsible Consumption).

The spiritual dimension comes alive through reflection. From Bhagavad Gita principle of selfless action (Ch. 2, V. 47) to the Mandukya Upanishads map of consciousness, to the symbolic Third Eye—these timeless ideas find space in this learning journey. Echoes of this integration can even be found in modern physics. Heisenberg spoke of physics losing its solid ground. Einstein said, it was as if the ground had been pulled out from under one… (Capra, 1975).

This paper is not presented as absolute truth. It is a perspective, shaped by lived experience and educational exploration. It is the author's attempt to ask—not just how we teach science—but why, and with what impact. It is a call to teach not just to the mind, but also to the soul.

So now let us dive deeper. This exploration will follow a unique outline: #***Experience and Learning of the Author, #Need of Art, and Spirituality in Modern Education: Path to Holistic Learning, #Narrative of Story—From Scientific and Spiritual Perspectives, #Methodology and Mechanism, #Reflective Exercises, #Scope of Improvement, #What Students May Learn ending with Conclusion.***

Experience and Learning of the Author

Since this is a case study cum perspective, it's vital to know the background of the author. The author’s journey into the intersection of science, art, and spirituality began not in a classroom but in the coastal town of Veraval–Somnath (Prabhas Kshetra): a land known as much for ancient temples as for crashing waves and whispered myths. Raised in a home shaped by three powerful influences: a deeply spiritual father, a devout yet flexible mother, and a strictly religious grandmother, the dinner table often became a battleground of ideas: ritual versus reflection, belief versus experience. These early dialogues planted the seeds of curiosity that would later shape the author’s unique pedagogical path.

Over time, the author’s professional experiences as an engineer, creative artist, a B.Ed student, and later as a STEAMS educator were all colored by this early exposure to philosophical debates. The course Designing Scientific Toys, undertaken during the B.Ed. program at Navrachana University, became a turning point. It provided not just tools for teaching science but a canvas for exploring consciousness.

Through toy-making, the author witnessed how something as simple as a discarded pen refill or a bottle cap could be transformed into a tool of learning. It was not about physics anymore. It was about perception. Students, when invited to work with recycled materials, did not just build toys; they built insight. They began to question waste, value, and the meaning of creation itself. This hands-on process teaches critical thinking, design thinking, and ecological thinking—not in isolation, but in harmony.

Incorporating art and spirituality deepened this experience. When toys were used to illustrate abstract spiritual ideas—karma as motion, illusion as Moiré patterns, consciousness as wave collapse—the classroom turned into a living laboratory of inner and outer worlds. Meditation activities and creative reflection helped students slow down, look within, and connect ideas beyond the syllabus. The blend of artful learning and mindful inquiry created a rare, healing space—one where logic met silence.

The author's exploration was enriched by reading works like The Tao of Physics, which echoed the same vision: that science and spirituality are not two paths, but two languages speaking the same truth. As Capra writes, **"The mystic and the physicist arrive at the same conclusion; one starting from the inner realm, the other from the outer world" (Capra, 1975).**

This belief was reinforced by the legacies of great thinkers—Nikola Tesla, who was inspired by the Vedas; Heisenberg, who acknowledged the limits of objective science; and Schrödinger, who turned to Vedanta to understand consciousness. Their lives are a reminder that true knowledge transcends the textbook.

The author has learned that sustainability is not only a scientific challenge but also a spiritual responsibility. It asks us to see the earth not as a warehouse of resources but as a shared home. And education, to be complete, must teach students how to care—not just calculate; how to observe—not just obey.

This journey continues—not as a finished method, but as a living inquiry. The author no longer sees science, art, and spirituality as subjects to be taught separately, but as streams of the same river, flowing toward one ocean: wisdom.

Need for Art and Spirituality in Modern Education: Path+ to Holistic Learning

Modern education tends to prioritize Science, Technology, Engineering, and Mathematics (STEM), aiming to build logical reasoning, analytical thinking, and technical skills. However, this focus often neglects other vital aspects of human development, such as emotional intelligence, creativity, and inner awareness. To bridge this gap, the author proposes a more inclusive approach called **STEAMS**—which adds **Art and Spirituality To** STEM. This model addresses the need to educate not only intellect but also the heart and soul.

Art provides an outlet for expression, creativity, and emotional connection. Research shows that artistic activities can significantly reduce stress, improve emotional balance, and support mental health (Stuckey & Nobel, 2010). Similarly, incorporating spirituality through mindfulness, meditation, and quiet reflection has been linked to better focus, lower anxiety, and greater resilience (Davidson et al., 2003). Students equipped with these inner skills are more likely to handle academic challenges without internalizing failure as personal defeat. Instead, they develop perseverance, patience, and a healthier m+indset toward growth.

What if students are unable to accept failures and rejections as part of growth and see them instead as a dead end? An untrained mind, under pressure, can collapse—and tragically, many do. When the author began researching this topic, he came across data that was deeply disturbing. According to the **Accidental Deaths and Suicides in India (ADSI) 2022**report by the National Crime Records Bureau, **13,044 students died by suicide in 2022**—almost double the number from 2012. Thats an average of about **38 student suicides per day**. Assuming the same trend continues, between December and May—the period during which this paper was written and revised—over **6,522 students may** have lost their lives to suicide in India alone.

Social media, academic pressure, and family expectations create a perfect storm for mental strain. Students often compare themselves with curated versions of others' lives. Their self-worth becomes entangled with digital validation and external opinions. When life doesn't align with their expectations, and there are no tools to cope, the mind spirals.

The author himself experienced such a spiral. Once joyful and motivational, he sank into silence and isolation, losing the ability to feel happiness or hope. After repeated setbacks, he began considering suicide—not out of weakness, but from a desire to escape overwhelming

pain. A suicide note was drafted. But then a different question arose: *What happens after death? Does suffering end—or start again in a different form?*

These questions led him to ancient Indian wisdom. He turned to the **Vedas and** later to the **Upanishads**, which explore life, death, and consciousness through a dialogue between teacher and student. He began with the **Mandukya Upanishad**, which explains four levels of consciousness, and continued with the **Brihadaranyaka Upanishad**, gradually discovering clarity and hope. He found profound support in the **Bhagavad Gita**, where Arjuna—representing the modern confused and disheartened youth—is on the verge of giving up. In Chapter 2, verses 62–63, Lord Krishna outlines a psychological chain reaction:

Bhagavad Gita – Chapter 2, Verses 62–63

Sanskrit:

ध्यायतो विषयान्पुंसः सङ्गस्तेषूपजायते। सङ्गात् संजायते कामः कामात्क्रोधोऽभिजायते॥ 2.62॥
क्रोधाद्भवति सम्मोहः सम्मोहात्स्मृतिविभ्रमः। स्मृतिभ्रंशाद् बुद्धिनाशो बुद्धिनाशात्प्रणश्यति॥ 2.63॥

Translation:

While thinking about sense objects, a person gets attached to them. From attachment comes desire (*kāma*), and from unfulfilled desire comes anger (*krodha*). From anger arises confusion, from confusion comes loss of memory. When memory is lost, intelligence is destroyed—and when intelligence is lost, the person falls into ruin.

"While contemplating the objects of the senses, one develops attachment. From attachment comes desire, from desire arises anger. From anger comes delusion; from delusion, loss of memory; from loss of memory, destruction of intelligence; and from destruction of intelligence, one perishes. (Bhagavad Gita 2.62–63)

This chain reflects both ancient wisdom and modern psychology: **Attention → Attachment → Desire → Frustration → Anger → Confusion → Memory Loss → Collapse.**

Spirituality is not about rituals or religion. It is about understanding one's own mind, thoughts, and emotional patterns. In truth, **spirituality is the science of the mind**. Swami Vivekananda once said, *Education is the manifestation of perfection already in man.* Adi Shankaracharya

echoed this in *Vivekachudamani*: *The mind is the root of bondage and liberation. Even* Carl Jung, the pioneering psychologist, asserted, *"Who looks outside, dreams, who looks inside, awakens."*

The wisdom of **Stoicism**, followed by thinkers like Marcus Aurelius and Epictetus, aligns with this view. Stoicism teaches that happiness is not based on external events, but on our internal state. *You have power over your mind—not outside events. Realize this, and you will find strength, wrote* Aurelius. Stoicism is spirituality in action: a disciplined mind meeting a chaotic world with calmness. Its core idea is simple yet profound—**focus only on what you can control and let go of the rest**. This mirrors the **Taoist principle of Wu Wei**, or effortless action. It emphasizes inner stillness and flowing with the natural rhythm of life, making decisions with clarity instead of resistance.

Science, too, reaches similar conclusions. **Albert Einstein said**, "*The most beautiful experience we can have is the mysterious." Werner* **Heisenberg**, father of quantum mechanics, admitted, *the first gulp from the glass of natural sciences will turn you into an atheist, but at the bottom of the glass, God is waiting. And* **Max Planck**, founder of quantum theory, observed, *all matter originates and exists only by virtue of a conscious and intelligent Mind.*

These voices—from Vedanta to Stoicism, from psychology to quantum physics—point to a single truth: **education must nurture the whole being**. From personal experience, the author strongly believes that schools and colleges need to create space for **mental and spiritual training**. Just as physical education builds strength and stamina, inner training develops emotional resilience and clarity. Meditation corners, reflective journaling, storytelling through ancient texts, or expressive art sessions can all be valuable tools.

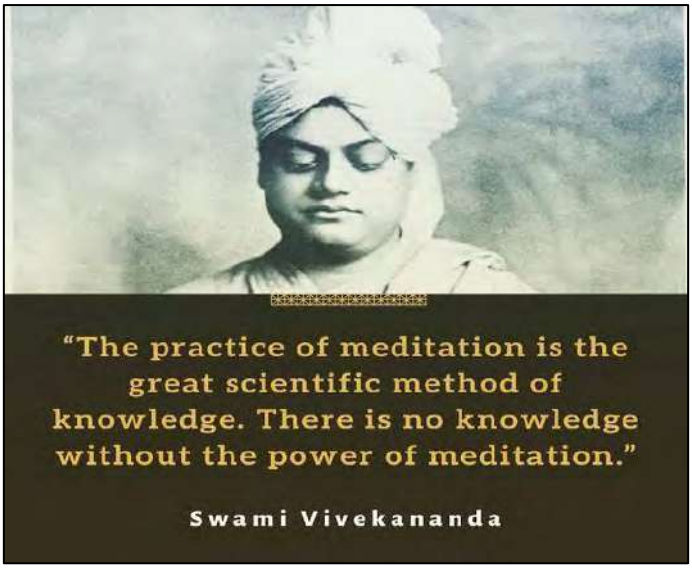

Figure 3: Swami-Vivekananda quote on meditation and knowledge

Retrieved from https://vivekavani.com/swami-vivekananda-quotes-meditation/ Quote is an excerpt from lecture *Delivered at the Washington Hall, San Francisco, April 3,1900*

Figure 4: Swami Vivekanand and Nikola Tesla connection

Retrieved from https://www.facebook.com/sagarworldmultimedia/posts/did-you-know-swami-vivekananda-inspired-nikola-tesla-with-vedasnikola-tesla-and-/3718381091554376/

We all know Swami Vivekanand and Nikola Tesla, but how many of us know that they both met, and Swami Vivekanand and his teachings greatly influenced Nikola Tesla? Very few. The author found this link while doing research on Swami Vivekanand's influence on education and modern science.

Moreover, as outlined in the National Education Policy (NEP) 2020 and2020and the National Curriculum Framework (NCF) 2023, there is a clear push toward holistic education. These policy documents emphasize not just academic knowledge but also the development of life skills, ethical values, emotional well-being, and creativity. The NEP 2020 calls for education that nurtures the whole individual, while the NCF 2023 encourages schools to focus on experiential learning, mindfulness, critical thinking, and socio-emotional growth.

This means that spiritual education is not a luxury, it is a necessity. Integrating it with art and science through the STEAMS model could equip learners not just to succeed in careers but to lead balanced, meaningful, and resilient lives.

Education should not only prepare students for careers and exams should prepare them for the most precious gift: life itself. And life deserves awareness, attention, and care—from within.

Narrative of the Story - From a Scientific and Spiritual Perspective

In Navrachana University, focused on holistic development, an elective course titled *"Designing Scientific Toys"* offered a transformative learning experience. The course encouraged learners to move beyond traditional textbook knowledge and engage in experiential, hands-on exploration of scientific principles. It emphasized creativity, sustainability, and deeper reflection, creating a space where science education could transcend its conventional boundaries. While designing toys that embodied concepts such as energy transformation, motion, and balance, participants began to see parallels between scientific mechanisms and philosophical insights. The construction of a single toy often involves multiple interconnected scientific principles—such as torque, motion conversion, and wave interference—mirroring the interconnectedness of life itself.

These realizations prompted deeper contemplation about the nature of existence, leading to spiritual insights grounded in ancient Indian wisdom, such as the ideas of *Apara Vidya* (practical knowledge) and *Para Vidya* (inner wisdom). This journey culminated in the creation

of a toy that not only demonstrated mechanical and physical concepts but also served as a metaphor for consciousness, duality, and the cyclical nature of life. Inspired by texts like the *Bhagavad Gita*, the *Upanishads*, and the philosophies of Advaita Vedanta, the project evolved into more than just a teaching tool—it became a symbol of the fusion between scientific inquiry and spiritual understanding. The toy invited reflection on themes like balance, cause and effect, illusion and reality, and the unseen forces that govern motion, both in matter and in the mind.

Here we will first see the scientific principle, then see its spiritual perspective.

1. Cam-Shaft-Follower Mechanism: From Motion to Meaning

Scientific Principles

A **cam-shaft-follower mechanism converts rotational motion into reciprocating motion**. The **cam rotates**, and its shape controls how the **follower moves**—either smoothly or in jerks. This setup is common in internal combustion engines, automatic machines, and textile looms (Norton, 2009).

The principle follows **Newton's First Law of Motion**: an object continues in its state unless acted upon by an external force (NCERT, 2023). In rotational terms, **torque (τ)** creates **angular acceleration.** More precisely, torque is a measure of the force that causes an object to rotate around an axis, and its magnitude can be calculated using the formula $\vec{\tau} = \vec{r} \times \overrightarrow{F}$. This is a **vector cross product**, which means torque has both **magnitude** and **direction. $\vec{\tau}$ (Torque vector):** This tells us *how much* rotational force is being applied and *in what direction.* **$\vec{r}$ (Position vector)**: This is a vector from the **axis of rotation (pivot point)** to the **point where the force is applied**. **$\vec{F}$ (Force vector)**: This is the **force being applied** at that point, its magnitude and direction matter. (often called the lever arm or moment arm).

A simple analogy? Try opening a stuck door. If you push near the hinge, it hardly moves. But the farther your hand is from the hinge, the less effort you need. That's **torque in action**: *more distance, less force*. Engineers design cams with this idea in mind, using motion to control timing and efficiency with minimal energy.

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Figure 5: Shaft Handle

Figure 6: Cam , Shaft and Follower

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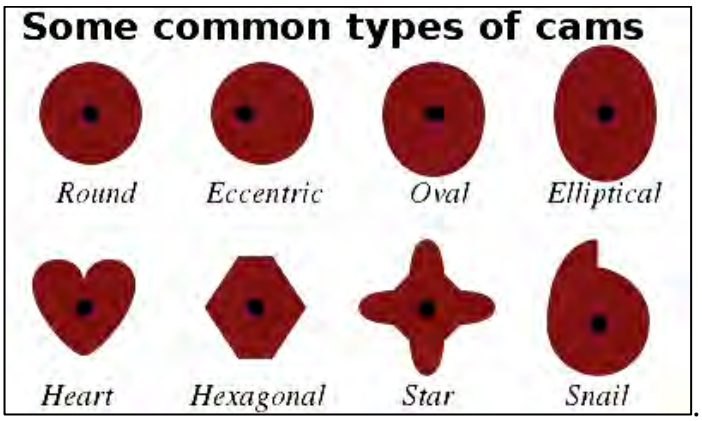

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Figure 7: Common Types of Cam

Retrieved from https://www.explainthatstuff.com/cranks-and-cams.html

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Spiritual Perspective

What if life, too, had a cam guiding our motion?

Imagine the **handle** as our **mind**—where thoughts begin. **Desire** turns the cam; **thoughts become actions**—our **karma**. The **shaft** carries this energy outward, shaping our experiences.

Just as each type of cam shape creates a unique pattern, when rotated, every person's spiritual journey has its own rhythm—some steady, others unpredictable.

When life jerks or flows, do we resist—or trust the design?

In Hindu and Buddhist philosophy, this mirrors the law of **karma**—our actions shape our path. The cam doesn't choose the followers response; it sets the rhythm. We choose how to walk it—with confusion or clarity, fear or faith.

So next time something in life feels off-track, ask:

Am I pushing too close to the hinge?
Do I need to step back to gain strength?

Mechanics teach motion. **Spirituality teaches meaning**. Together, they remind us: while we may not control the cam, we can always choose how we follow.

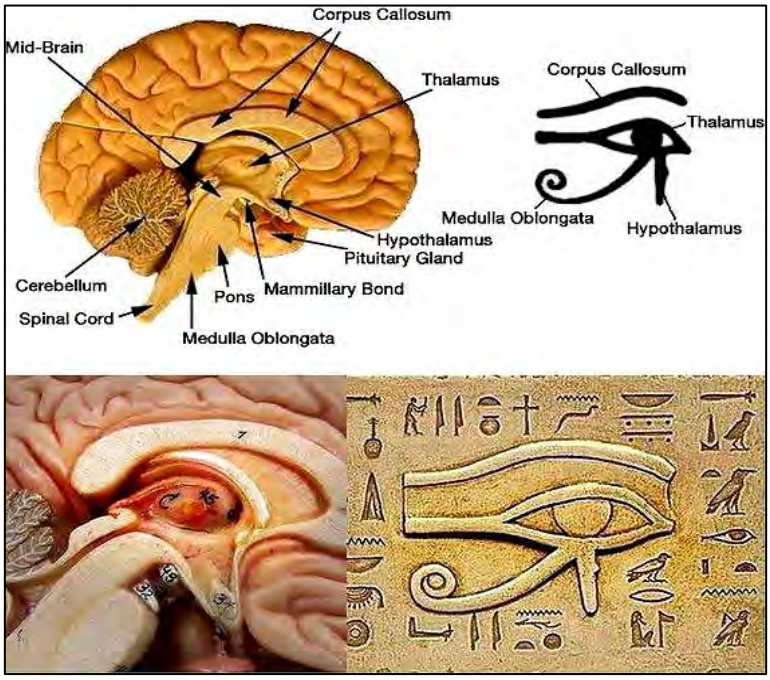

Figure 8: Pineal Gland in Brain and Egyptian Culture

Retrieved from https://en.wikipedia.org/wiki/Pineal_gland

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2.2 Moiré Pattern, Constructive and destructive - graphene interference patterns

Scientific Principles

A **Moiré pattern** appears when two grids or patterns are overlaid with a slight twist. The result? A new, often beautiful pattern emerges—seemingly complex but born of simple structures (Hecht, 2017).

Graphene is a two-dimensional allotrope of carbon showing unique properties like high tensile strength and very high electron mobility. When two Graphene sheets, each having a honeycomb lattice of carbon atoms, are twisted against each other, beautiful Moiré patterns are generated. It was shown that one graphene sheet overlaid above the other with a twisted magic angle of 1.1° graphene becomes a superconductor.

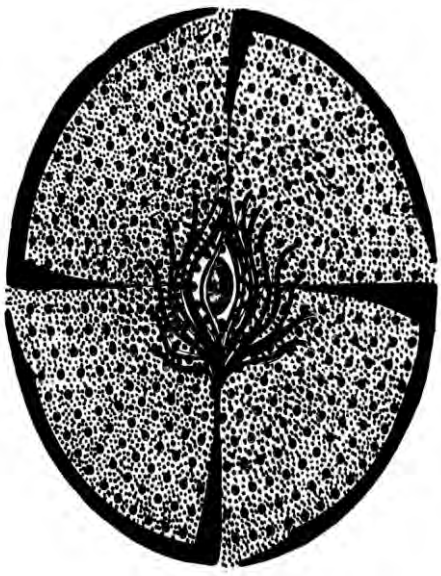

Figure 9: Third Eye with Peacock Feathers

Figure 10: Moiré-Graphene interference pattern

Spiritual Perspective

Life is like a Moiré pattern.

We look at the world through layers of belief, desire, and emotion. What we see is not always what it is, but what appears. Vedanta calls this Mithya—illusion. The Brahman, or the ultimate reality, lies beyond the shifting patterns of perception.

Graphene's twisted symmetry reminds us: simple truths, when layered and rotated, create beauty—and sometimes confusion. What if the mind's restlessness is just misalignment? What if a small shift in attitude, awareness, or attention—can reveal a higher pattern?

The Moiré toy becomes a metaphor. As students rotate layers, they observe how new forms emerge. With mindfulness, they begin to understand: What looks complex may come from something very simple.

And just like that, physics becomes philosophy. A toy becomes a teacher.

3. Hinge Mechanism and the Dancing Monkey: Unlocking Movement and Mind

Figure 11: Hinge mechanism : Dancing Monkey

Scientific Principles

A **hinge** is one of the simplest mechanical systems—yet its applications are everywhere, from doors and boxes to robotics and toys. It allows two connected parts to **pivot** around a common axis, enabling controlled motion in a single plane.

In this toy, **toothpicks and thread knots** are cleverly used as makeshift hinges to give movement to the monkey's limbs. These joints offer **degrees of freedom**, making the monkey appear playful, animated, and lifelike.

From a physics perspective, hinges are about **constraint and flow**—permitting motion, but within limits. They are essential in building systems that mimic natural movement while maintaining structure.

Spiritual Perspective

But what does a **dancing monkey have** to do with the mind?

In the **Upanishads**, the mind is described as *Markatasya Manah*—like a monkey. It **leaps from one thought to another**, rarely still, easily distracted, never satisfied. This restless mind, if left unchecked, becomes the biggest hurdle in learning, focus, and self-growth.

Just like a monkey swinging through trees, our untrained mind jumps from **desire to fear**, **past to future**, rarely pausing in the present.

Now imagine the monkey's joints held together by **hinges**. Each hinge limits chaotic motion and brings **grace to its movements**. Similarly, when we **tie our thoughts to awareness**—through mindfulness, meditation, or deep focus—we begin to dance with clarity, not chaos.

Ask yourself:

- What hinges have I built in my own mind?
- Do my thoughts swing wildly, or do they flow with rhythm and control?
- What holds me together when everything feels scattered?

This toy teaches more than mechanics. It reminds us: **freedom without structure leads to frenzy**, but freedom with awareness becomes a dance.

4. Surface Tension and Bubbles: Seeing the World in a Drop

Scientific Principles

What keeps a bubble from bursting instantly? **Surface tension**—a subtle, invisible force acting like a stretched skin across the surface of a liquid. Molecules at the surface experience a cohesive pull inward, minimizing area and forming the most efficient shape possible: a **sphere**.

This is why soap bubbles always round out, regardless of their initial shape. The force balances inner air pressure with external atmospheric pressure, creating delicate, iridescent forms that float and shimmer… for a moment.

But science doesn't stop at the *how*. It's in the *why* that wonder truly begins. The world thus appears to be a complicated tissue of events, in which connections of different kinds alternate or overlap or combine and thereby determine the texture of the whole. *Werner Heisenberg*, as quoted in *The Tao of Physics* (Capra, 1975)

Figure 12: Soap bubble mechanism

A Wire is rolled into a loop, so it creates a closed boundary for soap film. The wire is attached to the shaft

Figure 13: Colorful Soap bubbles

Retrieved from https://pikbest.com/backgrounds/soap-bubbles-three-small-placed-in-black-background_9473549.html

Spiritual Perspective

A bubble is a **miracle** in midair—a translucent, temporary universe. It lives briefly, reflects light beautifully, and then... *pop*. Gone.

Isn't that also life?

The **Bhaja Govindam**, composed by *Adi Shankaracharya*, says:

Punarapi jananam punarapi maranam, punarapi jananī jaṭhare śayanam... Again birth, again death, again lying in the mother's womb—this cycle is endless unless one seeks liberation.

Just as a bubble arises from still water and vanishes into air, so too do we emerge, shine briefly, and dissolve back into the cosmic flow. Life is fragile, vibrant, and short—and that is precisely what makes it meaningful.

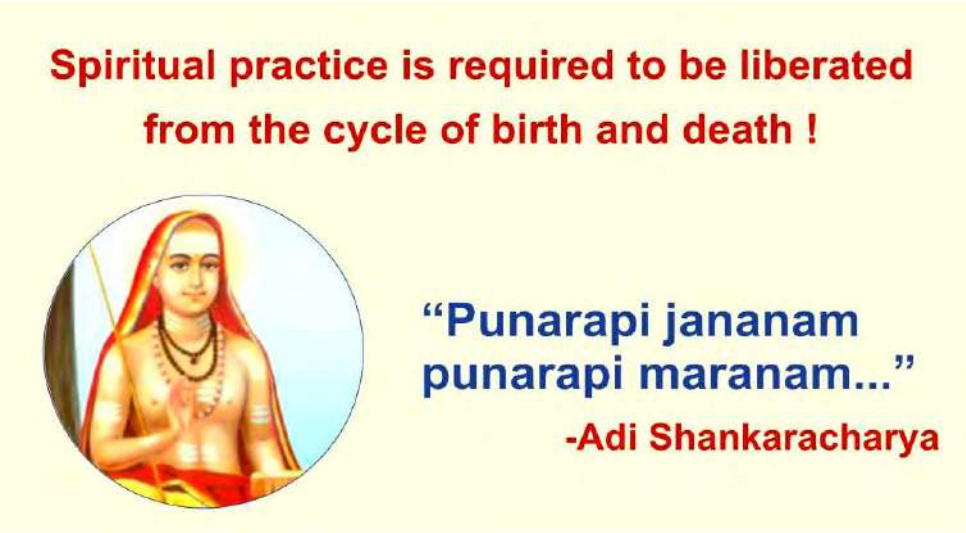

Figure 14: Adi Shankaracharya's Thoughts on Life

Retrieved from www.sanatan.org/en/a/110659.html/englishpravachan_part2_12

In **Vedanta**, the world is often described as *Maya*—a constantly shifting illusion, never permanent. A bubble teaches the same: *do not cling*. Enjoy the play of light, the color, the motion—without losing yourself in it.

What we observe is not nature itself, but nature exposed to our method of questioning. — *Werner Heisenberg*(Capra, 1975)

Physics teaches form, but *spirituality teaches impermanence*. Together, they reveal a truth we often miss: reality is always in motion, held briefly by forces we barely understand.

Figure 15: Artistic Representation of Life Cycle and Rebirth

Retrieved from https://www.bvashram.org/from-death-to-immortality/

So, ask yourself:

- What bubbles am I chasing? Can I find joy even in what is short-lived?
- Am I clinging to form, or am I watching the dance?

Life, like a bubble, is not meant to last—but it is meant to shine.

As C. Rajagopalachari beautifully wrote in his commentary on *Bhaja Govindam*: When intelligence matures and lodges securely in the heart, it becomes wisdom. When that wisdom is integrated with life and issues out in action, it becomes devotion.

In this toy, children blow bubbles, watch them float, and then disappear. But in that play, a quiet lesson unfolds: **everything beautiful must pass, and that's what makes it sacred**.

5. Consciousness and Energy : Shiva Shakti Dance and the Cosmic Rhythm (Taal)

Figure 16: Shiva-Shakti, Consciousness and Energy

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Scientific Principles

Outside CERN—the world's leading particle physics laboratory—stands a statue of **Lord Nataraja**, symbolizing the **cosmic dance of creation, preservation, and destruction**. This is not merely an artistic display; it is a conscious acknowledgment that **science and spirituality together help us understand the deeper patterns of reality**. As stated by CERN, the dance of Nataraja is a beautiful metaphor for the rhythms of the universe observed in particle physics (CERN, 2004).

Fritjof Capra, in *The Tao of Physics Book* (1975), explains that the **dynamic dance of subatomic particles is** remarkably similar to the Tandava dance of Nataraja. In both cases, movement is fundamental—not just to existence but to creation itself. Nataraja's form,

encircled by a ring of fire, represents **energy in perpetual motion**, and his posture symbolizes **balance amidst chaos**—an image mirrored in the behavior of particles in quantum fields.

This imagery becomes even more relevant when seen through the lens of Einstein's **theory of relativity**, which radically changed how we understand **space, time, and mass**. In relativity, the absolute space and time are no longer constants; they are dependent on the observer. The realization that **mass is a form of energy**, summarized by the famous equation $\mathbf{E = mc^2}$, echoes the Shiva-Shakti Principle. In Indian philosophy, Shiva represents stillness or pure consciousness (mass or potential), and Shakti represents energy and motion (dynamic creation). Together, they form the **cosmic balance of being and becoming**—just as mass and Energy is not separate, but deeply interconnected aspects of reality.

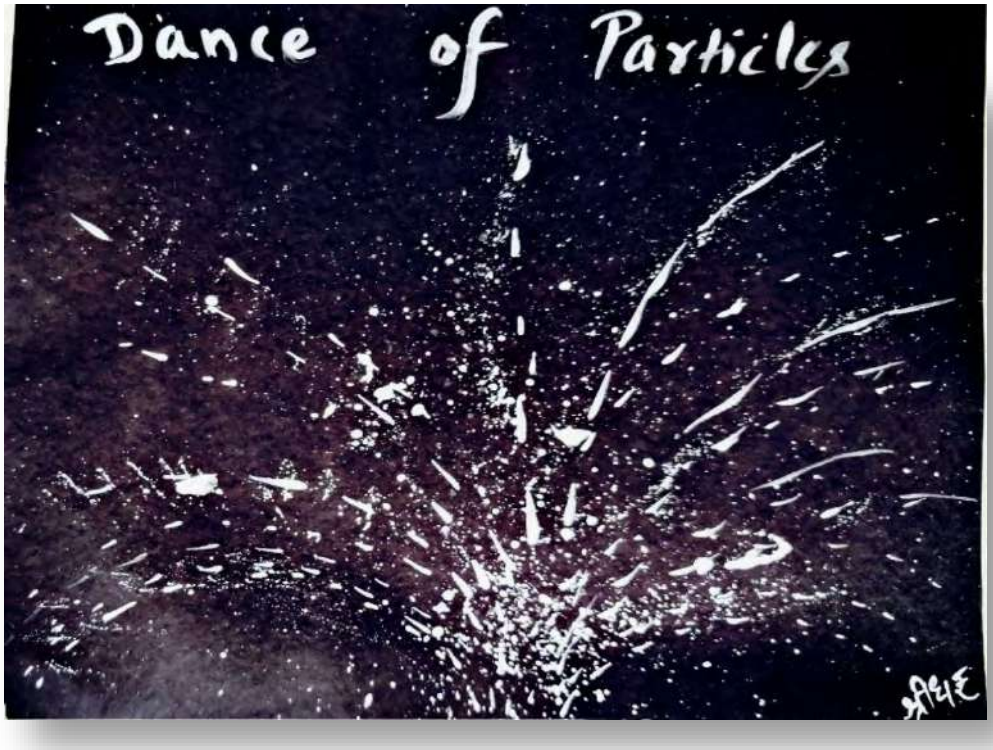

Figure 17 : Art made by author with white paint on black paper, representing dance of particles. Inspired from an image of bubble chamber, pg 236 Tao of Physics book. Image captured a shower of about 100 particles produced by a cosmic ray which found its way into a bubble chamber by accident. The roughly horizontal tracks in the picture belong to the particles coming out of the accelerator

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An unexpected cosmic-ray shower, accidentally captured in a bubble chamber at CERN during an experiment, provided a magnificent visual of this energy dance.

For modern physicists, Shiva's dance represents the dance of subatomic matter. This continual cosmic dance of creation and destruction, mirroring Hindu mythology, underpins all existence and natural phenomena. Centuries ago, Indian artists beautifully depicted dancing Shiva in bronze. Today, physicists use advanced technology to visualize these cosmic patterns. Bubble-chamber photographs of interacting particles, testaments to the universe's constant rhythm of creation and destruction, are as beautiful and profoundly significant as the ancient Indian artworks. Thus, the metaphor of the cosmic dance seamlessly unites ancient mythology, religious art, and modern physics, proving, as Coomaraswamy noted, to be "poetry, but nonetheless science."

Spiritual Perspective: The Cosmic Dance

In Indian philosophy, Shiva's Tandava is the dance of cosmic cycles—creation, preservation, and destruction—while Shakti's Lasya is the dance of grace, nurturing, and renewal. Together, they create **Taal—the eternal rhythm of existence.**

The ancient image of Shiva Nataraja—the Lord of the Dance—is not merely artistic; it is deeply philosophical and uncannily aligned with modern scientific understanding of reality. In Hindu thought, Shiva's cosmic dance is the eternal rhythm of creation, preservation, and destruction—the pulse of the universe itself.

Ananda Coomaraswamy described it powerfully:

"Dancing, He sustains its manifold phenomena… This is poetry, but nonetheless science."

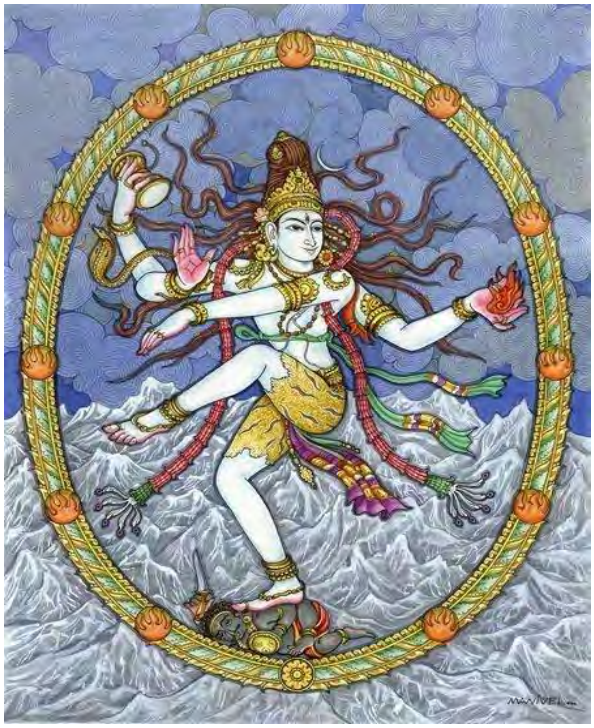

Figure 18: Shiva in Nataraja pose Retrieved from https://www.wikiwand.com/fr/articles/Tandava

Figure 19 : The statue of Nataraja at CERN

Retrieved from https://cds.cern.ch/record/768796 CERN provides the image free of charge for educational and informational use.

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Heinrich Zimmer echoed this sentiment, writing:

"His gestures… are the continuous creation-destruction of the universe, death exactly balancing birth, annihilation the end of every coming-forth."

Bronze sculptures from 10th–12th century South India bring this symbolism to life. Shiva's upper right hand holds a drum—the primal sound of creation. His upper left bears fire—symbol of destruction. The balance of these opposites is reflected in the serene, detached face at the center: calm amid chaos.

His lower right hand, raised in the abhaya mudra (fearlessness), represents protection and reassurance. The left-hand gestures toward the lifted foot—liberation from illusion (maya).

Underfoot, the god dances upon a demon, symbolizing ignorance. Only by transcending this ignorance can one be free.

In this image, spirituality meets science. As Capra (1975) notes in The Tao of Physics, the dynamic balance of Shiva's dance parallels the quantum world's fluctuations: "The dance of Shiva is the dance of subatomic matter… the rhythm of creation and destruction, of energy and form."

Shiva's dance, then, becomes a universal metaphor—bridging mysticism, cosmology, and art. It invites learners not only to observe the world, but to feel its rhythm. Through this lens, education expands—beyond information—toward awareness.

This perspective is not evidential—it is experiential. It reflects the author's learning journey within the *Designing Scientific Toys course*, where **spiritual understanding emerged naturally through scientific creation**.

Methodology and Mechanism - Educational Theories

Educational theories help us understand how people learn—not just what they learn. In this project, the author explored how key theories by Piaget, Skinner, Thorndike, Bloom, and the 8 Learning Events Model could be naturally integrated into the toy-making process. These theories not only supported the construction of toys but also made the entire learning journey more thoughtful, engaging, and reflective.

Jean Piaget's cognitive development theory states that learners, especially during the concrete operational stage, understand concepts best through direct interaction with physical objects. In this project, building the **cam-shaft-follower mechanism helped** the author visualize Newton's laws and torque by observing how rotary motion transformed into vertical motion (Norton, 2009; NCERT, 2023). Physical experience made abstract concepts more real and memorable.

Application: In schools, this model can help middle-grade students grasp motion through manipulation. In colleges, it can aid pre-service teachers in learning pedagogy through STEAM. At home, parents can use it as a DIY physics model with storytelling.

B.F. Skinner's reinforcement theory suggests that behaviors followed by positive outcomes are more likely to be repeated. During the iterative toy-making process, every time a model worked as intended—like the **hinge-based monkeys swinging** smoothly—it provided a sense of achievement. This success reinforced accurate understanding and encouraged further experimentation (Halliday et al., 2013).

Application: In classrooms, teachers can use small toy successes as immediate reinforcement tools. In colleges, it encourages project-based learning. At home, children can be motivated to build and improve through small wins.

Edward Thorndike's Law of Effect states that actions leading to satisfying outcomes are remembered and repeated. This was experienced while aligning patterns in the **Moiré interference model**. After repeated trial and error, the correct visual effect appeared, making the principle of constructive and destructive interference clearer (Hecht, 2017; NCERT, 2023). The joy of seeing it work encouraged repeated attempts, leading to mastery.

Application: In schools, it can support science labs and design thinking tasks. In colleges, it is useful in teacher education for reflecting on learner behavior. At home, it promotes persistence through trial-based learning.

Bloom's **Taxonomy Provides** a layered model for learning—starting from remembering and understanding, and moving towards applying, analyzing, evaluating, and creating. This process was clearly seen as the author recalled scientific principles, applied them to build toy prototypes, analyzed mechanical failures, and ultimately created new designs. Each toy-making step involves a higher level of thinking and problem-solving.

Application: In classrooms, it can guide lesson planning and assessment. In colleges, it provides a structure for inquiry-based or STEAM learning. At home, parents can use it to encourage creativity in children by letting them invent their own toys.

The 8 Learning Events Model (Leclercq & Poumay) outlines a full cycle of learning: receiving knowledge, exploring it, practicing skills, getting feedback, and creating something new. It reminds us that real learning happens when learners are active participants, not just listeners. *Making the toy*: This entire model unfolded naturally during the toy-making process. First came the intake of knowledge (receiving), followed by trying out materials (exploration),

assembling parts (practice), testing and reflection (feedback), and finally, creating a functional, meaningful learning toy. These stages were not only academic, but they were also emotional and philosophical too.

Application: In school or home environments, this model promotes deep learning through doing. In colleges, it supports reflective teacher training through making and critique.

These theories naturally came alive during the creation of the toy. This toy-making journey was more than just a task or assignment, it became a space for thinking, feeling, and exploring. The educational theories provided a kind of scaffolding; they helped make sense of each step. Scientific principles acted as tools—guiding how things move, react, or connect. But it was the process of making, failing, adjusting, and creating that brought everything together. It was not just about understanding a mechanism; it was about seeing how an idea becomes real, how a motion mirrors a thought, or how a pattern reveals something deeper. In this quiet space of hands-on learning, the author found a way to connect classroom ideas to life, and perhaps more importantly, to the self. In short, Pedagogical theories shaped how the toy was built. Science explained how it worked. Reflection gave it depth. And spirituality gave it meaning.

Methodology and Mechanism - Build, Observe, Reflect

This model brings science alive through hands-on exploration. Instead of ready-made kits, the entire system is built using upcycled materials—an approach that mirrors both *engineering ingenuity and spiritual mindfulness*. Below are step-by-step guides for creating the models using basic household waste. Each activity is paired with reflective prompts to deepen understanding.

1.Cam-shaft-follower mechanism*:*

Scientific Concept: Converts rotary motion into up down or back-and-forth motion using offset cams and followers.
Theme: *Cause and Effect, Motion and Karma*

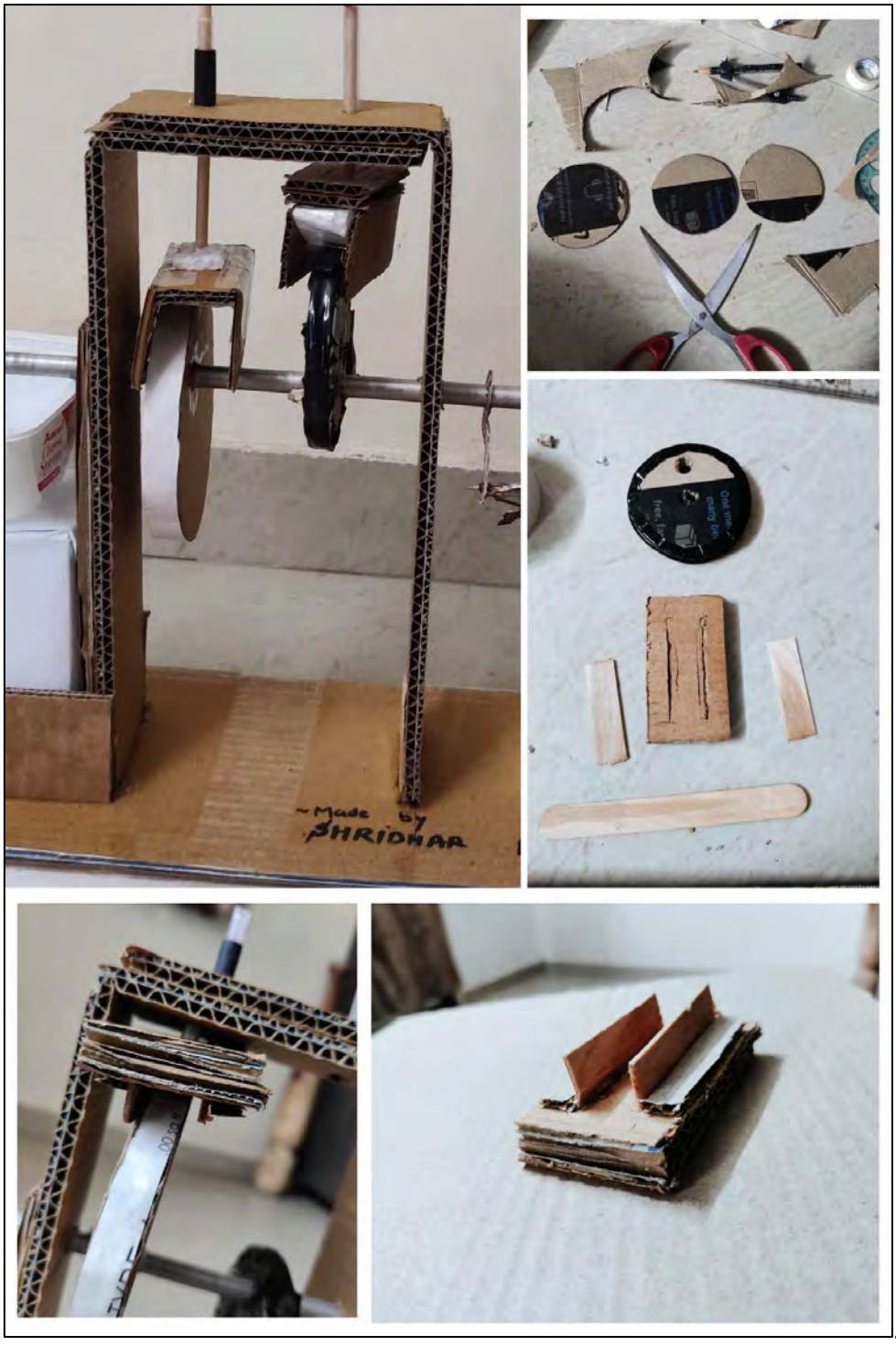

Figure 20: Cam-shaft-follower mechanism

Materials Needed:

- Cardboard (repurposed boxes) ,Scissors or craft knife, Pen refills or skewers (as camshaft), Glue or tape, Thermocol / bottle caps (to create a frame), Scrap paper, markers

Steps:

1. Cut out 2–3 circles from cardboard. Stack and glue them to make a **cam**.
2. Skew the circles slightly while stacking to create an *offset cam*.
3. Insert a pen refill through the center to make a **shaft.**
4. Mount the shaft on a frame (thermocol or reused plastic tray) so it rotates freely.
5. Cut a rectangular strip from thick paper or cardboard to act as the **follower**.
6. Position the follower vertically so it rests on the cam.
7. Rotate the shaft and observe how the follower rises and falls.

Reflective Prompts:

- What determines the height and rhythm of the follower's motion?
- In your life, what cam patterns—habits or desires—guide your actions?
- Can adjusting your routine (cam profile) lead to smoother outcomes?

2. Moiré Pattern - graphene interference pattern

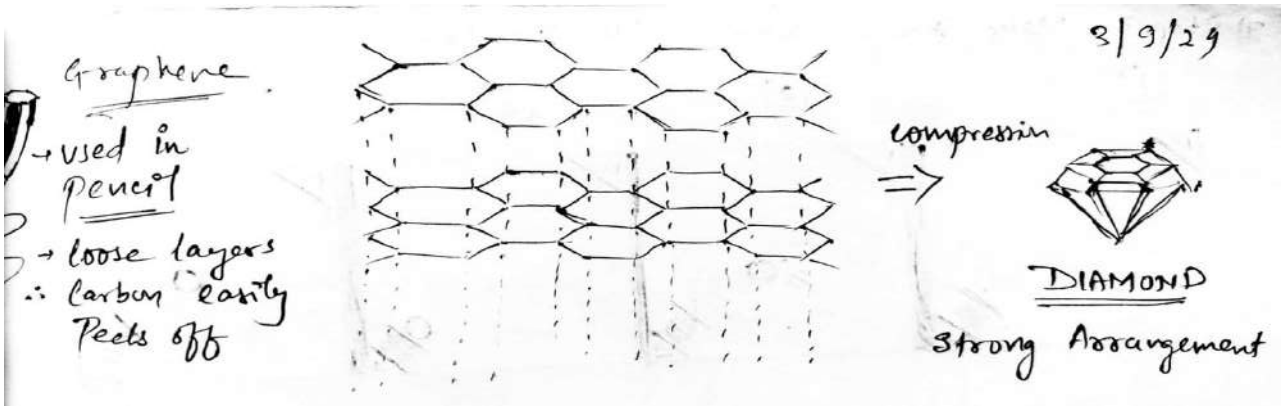

Figure 21: Author's Sketch , Class Notes - Course: Designing Scientific Toys

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Scientific Concept: Overlapping grids or patterns create visual interference—like in twisted bilayer graphene.

Theme: *Perception vs. Reality*

Figure 22: Making of Moiré interference patterns

Materials Needed:

- Transparent plastic sheets (used wrappers, folders), Permanent marker, Ruler, Stapler or thread

Steps:

1. On two plastic sheets, draw identical sets of parallel lines spaced evenly (around 5 mm apart).
2. Overlay one sheet on top of the other.
3. Slowly rotate the top sheet.
4. Watch as flower-like or wave patterns emerge and shift.

Reflective Prompts:

- How does slight rotation change what you see?
- What patterns in life change with just a small shift in perspective?
- What does this say about illusion (*Maya*) and perception?

3.Hinge-Based Motion (The Dancing Monkey)

Scientific Concept: Hinges add flexibility and degrees of freedom to systems.

Theme: *Discipline vs. Distraction – The Mind as a Monkey*

Materials: Needle and threads, thick cardboard, stick or toothpick, colors.

Steps:

- Attach the hinge to the fixed support and the movable panel/thick paper using thread knots or screws.
- Move the two pieces to observe the movement.
- Measure the rotation angle and analyze force distribution at the hinge.

Figure 23: Up cycle: Dancing Hinge based Monkey

Photographed by Author . Made using old garment cardboard box, toothpick and threads to teach science!

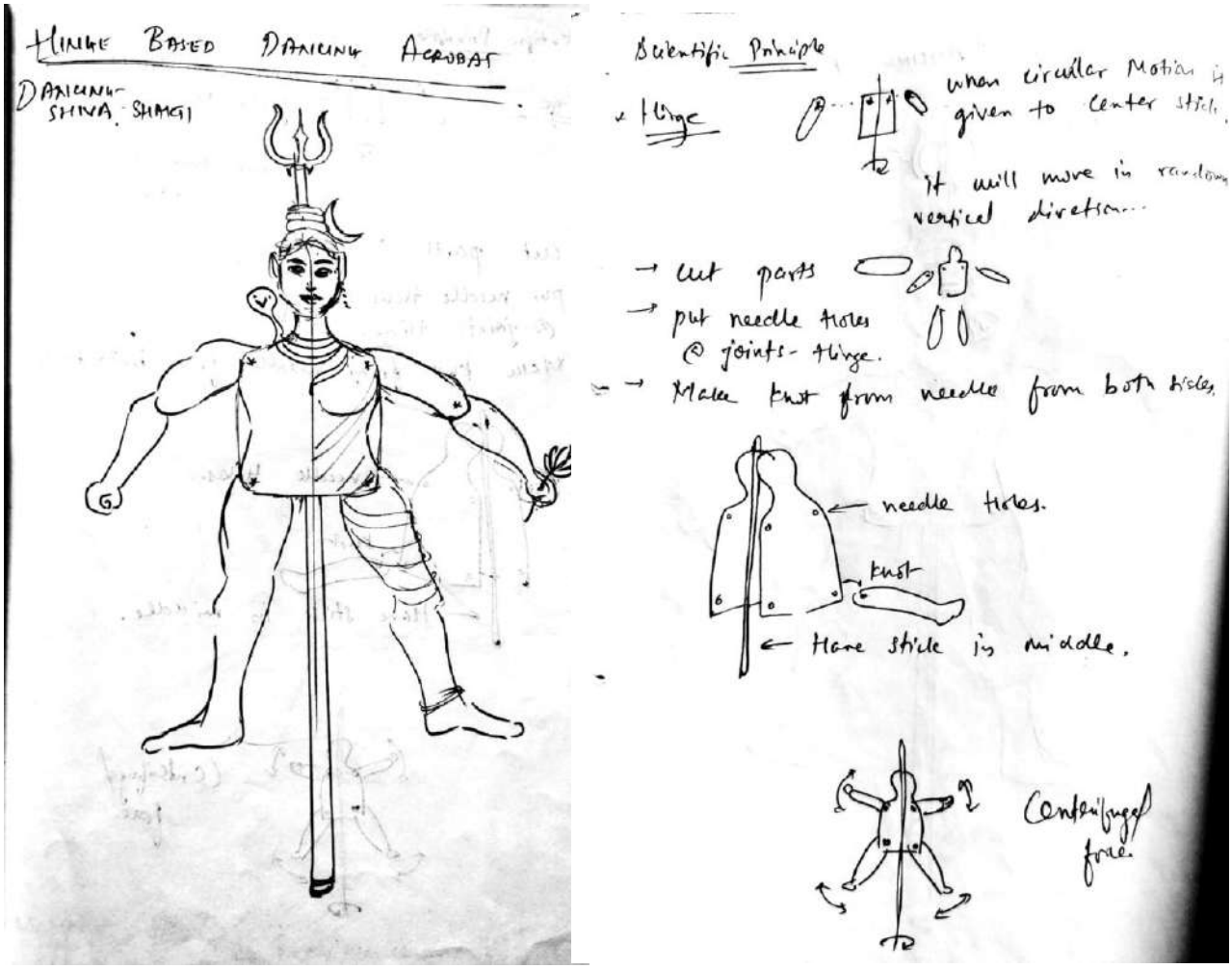

Figure 24: Hinge based mechanism Designing in process - Sketches and notes

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Reflective Prompts:

- How do the hinges allow movement?
- What makes your thoughts swing back and forth like a monkey?

What practices help train the mind and bring it to stillness?

4. Surface tension and bubbles formation:

Scientific Concept: Molecules at the surface of water experience cohesive force, forming bubbles.
Theme: *Impermanence and the Beauty of Now*

Materials: Water (300 ml), soap or detergent (100 ml), glycerin (200 ml), plastic container and wire in a closed loop.

Steps:

1. Mix water with soap and glycerin to reduce surface tension.

2. Dip the straw or wand into the solution and blow gently to form bubbles. Here the wire loop is joined at the end of the shaft such that it rotates when rotating the handle. 3. Observe the shape, size, and lifespan of bubbles.

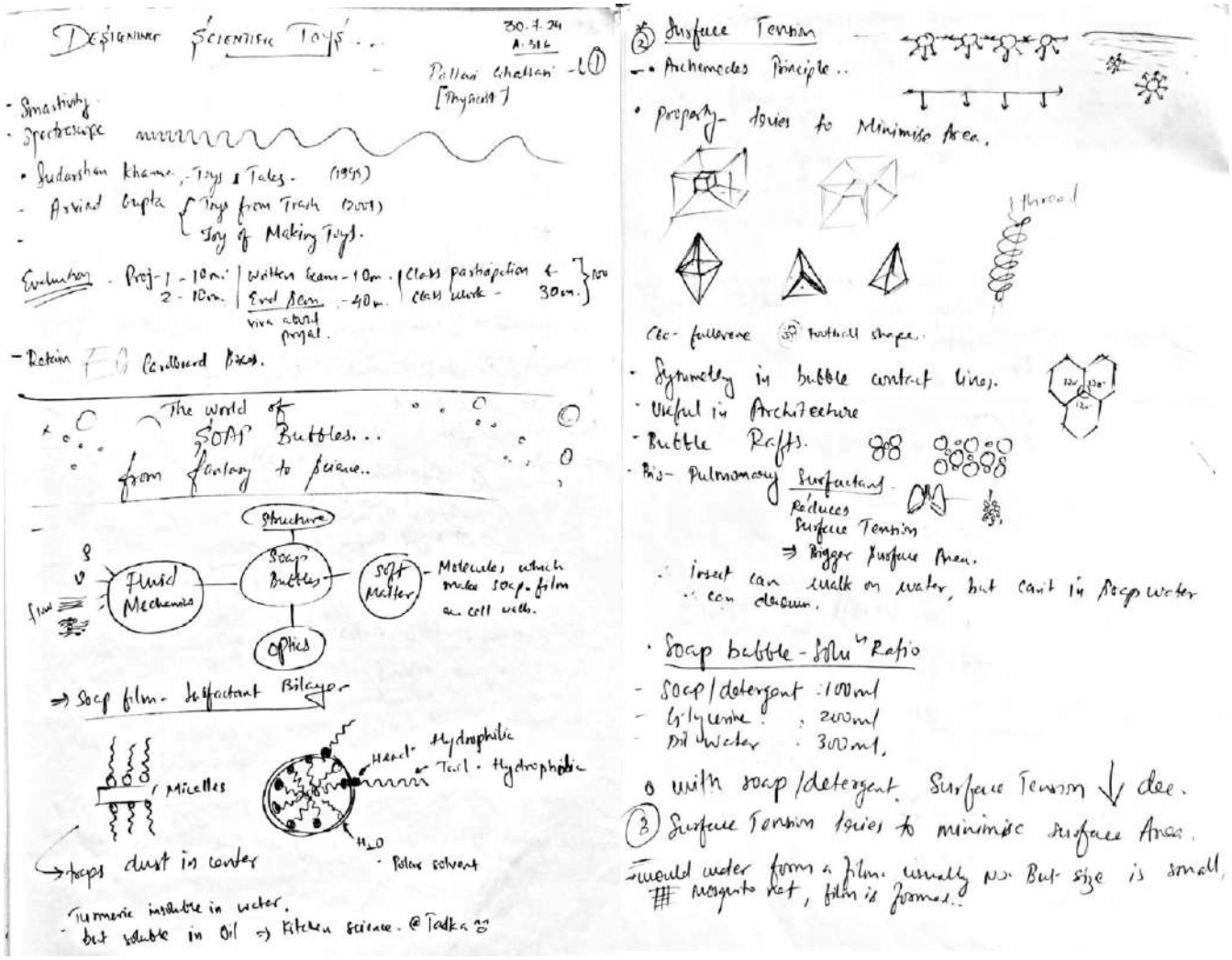

Figure 25 : Author's Class Notes - Course: Designing Scientific Toys

Figure 26: Upcycle: Soap solution Tray made from Amul Cheese container.

Photographed by Author . Small grooves made for shaft support. Instead of going into Trash, now it will be a tool to teach science!

Figure 27:Soap Bubble formation Mechanism

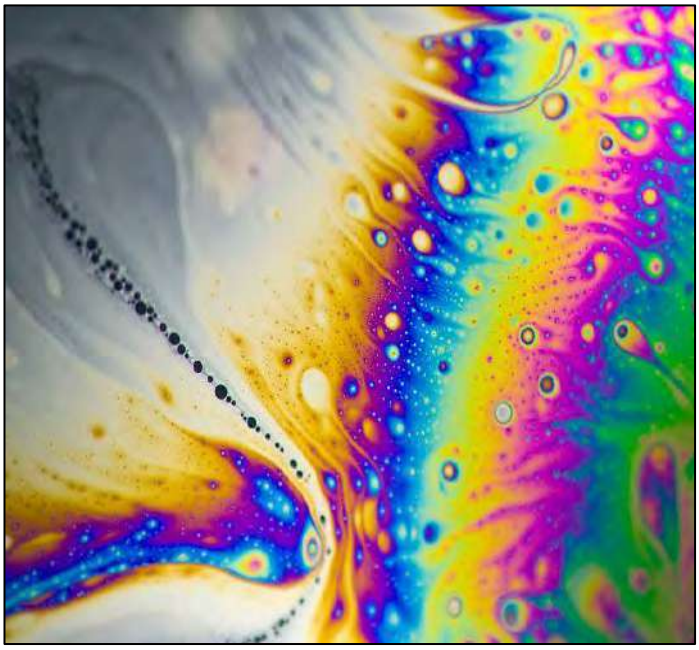

Figure 28: Soap Bubbles Iridescent rainbows

Retrieved from : https://www.wired.com/story/the-secret-to-soap-bubbles-iridescent-rainbows/

Reflective Prompts:

- Why do bubbles pop even when they seem perfect?
- What in life is short-lived yet beautiful?
- Can we love something without holding on to it?

In Summary

Each mechanism is more than an engineering concept, it's a metaphor. Each toy invites not just to play, but presence. And each recycled part teaches not only physics, but values—care, creativity, and curiosity.

Application and Exercises :

A Hands-On Way to Learn Science (and more)

Imagine starting the semester with a cool science toy or model—something students can touch, play with, and take part in. Along with it, they would get a simple DIY kit to build their own version. Here is how it could work:

First, students explore a ready-made model. They tinker with it, watch how it moves, and talk about what makes it work. They jot down the science behind it—laws of motion, energy transfer, whatever applies—and even reflect on how it connects to bigger ideas (like balance in nature or cause-and-effect in life).

Then, they get their hands dirty. Using the DIY kit, they rebuild the model themselves. This time, they'll notice details they missed before—why a certain part rotates this way, how friction changes the motion. The best part? Each group can add their own twist—maybe tweak the design, throw in extra gear, or even mix in some art. It is not just copying; it is creating.

Make It a Cross-Campus Project

Take it further by turning it into a collaborative, interdisciplinary effort:

- **B.Ed students** identify difficult science concepts students struggle with.
- **Science majors** design physical models to illustrate those concepts.
- **Engineering students** contribute mechanics, levers, lights, or sensors.
- **Art and Design students** create visual impact and narrative meaning.

The result? A mini-innovation lab where creativity meets critical thinking, and theory meets hands, heart, and imagination.

Glimpses of Exercises Inspired by Physics, Mysticism, and Mindfulness

This is just a glimpse. The author, a lifelong seeker, hopes one day to compile a full workbook of interdisciplinary exercises. For now, let this be a beginning.

"Imagination is more important than knowledge."
"The most beautiful experience we can have is the mysterious." — Albert Einstein

Set 1: Quantum Curiosity – The Mind as Observer

1. Wave or Particle?

- Watch a double-slit experiment video.
- **Art Task:** Paint what you feel—dots, waves, or both.
- **Reflective Question:** When no one is watching, light behaves like a wave. But when observed, it becomes a particle. *What does that say about how your attention shapes reality?*
- **Spiritual Link:** In the Upanishads, the seer and the seen are one. Is observation itself a form of creation?

2. Entangled Twins

- Simulate entanglement with two similar coins.
- **Creative Task:** Write a dialogue between two twins who feel each other's emotions across continents.
- **Vedic Link:** Indra's Net—each jewel reflects all others. *How interconnected are we really?*

Set 2: Cosmic Labs – Playing with Time and Space

3. Black Hole Mandala

- Watch a black hole visualization. Watch the Interstellar movie by Christopher Nolan. Discuss The Black Hole, time travel and relativity.
- **Art Task:** Create a mandala. Outer ring: collapsing stars. Center: unknown.

- **Philosophical Prompt:** Is consciousness like a black hole—drawing in all thought until only stillness remains?

4. Time Dilation Journal

- For one week: Log all day, phone use time, sleep, break, study, work etc.
- Record "heart time"—moments of joy or flow.
- Lay down on the terrace at night, or near a river or seashore, on a park bench… stargaze or sky gaze and write about cosmic time.

Final Question: Which one felt most real? Short or stretched? Why? Describe.

Consciousness Experiments

5. Observer Effect Diary

Quantum Prep: Read about Schrödinger's cat .

Campus Activity: For 3 days: Morning: Predict how many people will smile back. Evening: Record actual smiles when you initiate.

Bhagavad Gita Link: "Does seeing require a seer? Can there be light without your eyes?" Who

Why This Works:

True Interdisciplinary: science "and" spirituality - shows they're two languages describing one reality. Cognitive Friction: Creates productive discomfort ("Wait, how can light be both?") Embodied Learning: Uses body (art), mind (science), and gut (philosophy)

Teacher Tips:

Start sessions with 3 minutes of Mindfulness Meditation (calibrate "observation instruments", *Already in practice at Bachelor of Education program, Navrachana University*). Use "What if…" questions more than "What is…". Celebrate wrong answers that show deep thinking

Exercises set 2

3-Minute Meditations for Online Classes/Home Practice

(Based on Vigyan Bhairav Tantra, Zen & Taoist Masters)

A. "Breath Gap" Meditation (Vigyan Bhairav Tantra#15)

Practice: At the start of class, the teacher says: "Notice the tiny pause after exhaling… wait there for 3 breaths." Students observe the natural stillness between breaths.

Art: While taking deep breaths, make an artwork which shows art, science and spirituality. Example:

Figure 29: Art as Bridge between Science and Spirituality

Illustration generated using ChatGPT (GPT-4o), OpenAI, 2025, based on conceptual input and design by the author.

Why It Works:

Science: Activates parasympathetic nervous system (Frontiers in Human Neuroscience, 2018)

Tantra: "In the gap between thoughts, taste infinity."

B. "Hand Awareness" (Zen & Taoist Embodiment)

Practice: Rub palms vigorously for 10 seconds until warm. Freeze motion but keep feeling the tingling energy. Ask: "Where does the 'aliveness' in your hands come from?"

Scientific Twist: Maps to homunculus brain model (hands occupy large portion of somato-sensory cortex)

C. "Sound Vortex" (Vigyan Bhairav TantraTantra#33)

Practice: Play a singing bowl, tuning fork, or app sound. Students close their eyes and raise their hands when the sound fades completely. Notice the silence afterward.

Neuroscience Link: Trains attention like fMRI neurofeedback (Nature Scientific Reports, 2020)

Research: Why are Bells placed in religious gathering spaces of Hinduism, Buddhism, Christianity, Jainism and other world religions?

5-Minute Home Practices

D. "Third Eye Flashlight" (Tantric/Taoist Hybrid)

Practice: Sit in dim light. Hold the flashlight against closed eyelids. Move light slowly left-right while chanting "AUM" softly. After 2 minutes, turn off the light but observe the inner glow.

Science Connection: Stimulates pineal gland (melatonin release) via retinal exposure

E. Difference between Religion and Spirituality.

Debate: Share views and do research.

Practice: Explain how both are different in practice.

Art: Draw a painting which shows Science, Religion and spirituality

Example: Figure 28

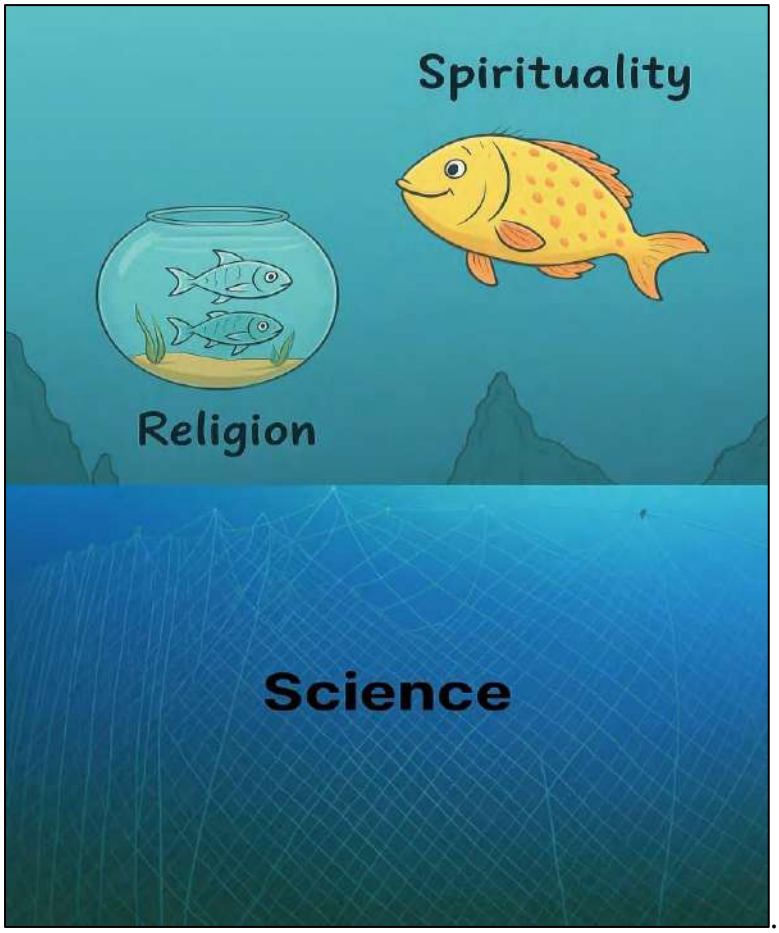

Figure 30 Artistic Representation of Religion, Science and Spirituality. *Science is a net to grasp nature and reality, the size of net varies to grasp life in ocean .Still one needs to take a deep dive in ocean to understand and feel the ocean life.*

Illustration generated using ChatGPT (GPT-4o), OpenAI, 2025, based on conceptual input and

Why Practice Beats Theory: Neurological Rewiring

Meditation grows the prefrontal cortex (Harvard, 2011) Reading about meditation activates only language centers

Para Vidhya (Higher Knowledge) Requires: Direct Experience: Like tasting chocolate vs reading about it. Embodied Insight: Buddha attained awakening through practice, not scrolls

Modern Proof:

MRI scans of monks reveal gamma waves during compassion meditation (Prof. Richard Davidson, UW-Madison)

Student-Friendly Explanation

"Imagine trying to learn swimming by only reading books. You might understand buoyancy, but you will still sink. Real wisdom—in physics or self-awareness—comes from doing, failing, and feeling. These mini meditations are like mental push-ups for your inner scientist."

Scope of Improvement/Evolution:

Electromagnetic Induction Demonstration

Enhancement: Attach a set of magnets and copper wire to the rotating shaft, causing a bulb to light up. Teaching Principle: Demonstrates how a changing magnetic field (from the spinning shaft) induces electron flow in the wire—the core concept behind generators and electricity.

Gear Systems & Energy Centers

Enhancement: Introduce a 7-gear mechanism to teach gear ratios and mechanical advantage. Interdisciplinary Link: Connect each gear to one of the 7 chakras (energy centers in yogic philosophy), merging physics with mindfulness. For example:

Gear 1 (Base): Stability and foundational motion (like the Muladhara chakra). Gear 7 (Crown): Precision and harmony (Sahastrara chakra).

IoT/AI Integration (University Level)

Advanced Model: Design a robotic prototype incorporating:

Microcontrollers (Arduino/Raspberry Pi) and sensors (ultrasonic, IR, temperature/humidity) mimic human senses. Spiritual Link: Map sensors to the Pancha Indriyas (five senses in Ayurveda), e.g.: Ultrasonic sensor ≈ Hearing (Shrotrendriya). Temperature sensor ≈ Touch (Sparshanendriya).

AI Layer: Use machine learning to analyze sensor data, prompting discussions on consciousness (e.g., how the "robot mind" processes inputs vs. human intuition).

Why It Works:

- **Hands-on Physics**: From Faraday's law to gear mechanics, grounded in real-world applications.
- Holistic Learning: Bridges STEM with self-awareness (chakras, senses).
- Scalable Complexity: Adaptable for schools (basic models) or universities (AI/robotics).

- **Integrated Learning:** Science will merge with vital sustainability lessons and ethical thinking.

What Students may Learn

This project opens the door to a kind of learning that engages the whole being—hands, head, and heart. Students do not merely absorb information; they interact with it, reflect on it, and question it.

- They build, break, and rebuild—developing problem-solving skills not by memorizing steps but by navigating real constraints, like material limitations or design flaws. Trial becomes their teacher.
- They learn science by doing. Concepts like torque, motion, and wave interference become more than textbook terms—they are seen, touched, and felt. A cam mechanism no longer exists only on a page; it becomes a rotating truth about how action creates movement.
- They see waste differently. By using recycled materials—pen refills, bottle caps, cardboard—they realize that sustainability is not a theory but a habit. What we throw away has value. So does what we ignore.
- They make sense. Through integration with spiritual ideas—karma, illusion, stillness, balance—students begin to reflect: What powers this motion? What lies in the gap between breaths? What does this pattern remind me of in life?

- They feel the beauty of learning. Art transforms the process into play. Creativity becomes the paintbrush that colors even the most logical of lessons. Science becomes poetic; spirituality becomes practical.
- They ask better questions. Not just What is the answer? But What does this mean to me? What am I missing? Who am I, beyond grades and goals?
- Each toy becomes a mirror. Each meditation becomes a doorway. Students begin to grasp not only the laws of the physical world, but the inner laws of attention, intention, and presence.

In the long run, such learning plants quiet seeds—of resilience, of curiosity, of conscious living. Because the real test is not just how much we know—but how deeply we live what we learn.

Conclusion

What if science could feel like poetry? What if learning physics could also open a door to the soul?

This case study is a perspective. One that suggests we do not need to separate equations from emotion or discard inner exploration in pursuit of external results. When science, art, and spirituality are allowed to meet—through a humble scientific toy, made from scrap—they begin to speak a common language.

The Tao of Physics reminds us:

"Every particle in the universe is in constant dance with others; nothing exists in isolation. What we call reality is a flow, a relationship, a process." (Capra, 1975)

Education, too, must reflect this. It must become a dance—not a drill. A co-creation between knowing and wondering. Between doing and being. Scientific toy-making becomes more than a project; it becomes a mirror for motion, cause, and consequence—a live demonstration of Newton and karma, of gears and choices. A Moiré pattern made with old plastic reveals the illusion of perception. A soap bubble becomes a reminder: all beautiful things are also fragile.

And somewhere in this process, students begin to pause—not just between tasks, but between thoughts. They begin to ask better questions—not just "how does it work?" but "why does it matter?" They begin to listen—not just to the teacher, but to their own inner voice.

In a time when 13,044 students in India took their own lives in a single year (ADSI, 2022), this shift matters. When self-worth hinges on marks and likes, and failure feels fatal, we need education that strengthens the mind as much as it trains the brain. This paper does not claim to have answers. It simply holds space for a different way—where doing meets being, recycling meets sacred, and STEM becomes STEAMS by welcoming Art and Spirituality into the equation.

Inspired by India's **NEP 2020** and **NCF 2023**, this approach aligns with global goals too. **It directly addresses SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), and**

SDG 12 (Responsible Consumption). But more than checkboxes, it aims to light a spark—a deeper way of knowing and growing.

As the author reflects, this project was not merely a pedagogical experiment, it was a deeply personal journey. From confusion to clarity, from despair to design, each step revealed that the most valuable insight is not always what you teach, but how you live.

Nothing must be done. But something can begin. May that beginning be mindful, creative, and courageous.

The author, a believer in **Vasudhaiva Kutumbakam**—the ancient Indian ideal that "the world is one family"—prays for love, peace, and unity among all members of this shared global home.

He closes this case study—part perspective, part self-inquiry—with a timeless prayer from the **Brihadaranyaka Upanishad**, echoing a universal yearning for truth, light, and liberation:

ॐ असतो मा सद्गमय ।
तमसो मा ज्योतिर्गमय ।
मृत्योर्मा अमृतं गमय ।

Aum, lead me from the unreal to the real!
Lead me from darkness to light!
Lead me from death to immortality!

Let learning be an offering. Let inquiry be sacred. Let Life itself be the curriculum!

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References

1. Capra, F. (1975). *The Tao of Physics*: *An exploration of the parallels between modern physics and Eastern mysticism*. Shambhala.

2. *Swami-Vivekananda quote on meditation and knowledge*. (April 3,1900). Quote is an excerpt from lecture Delivered at the Washington Hall, San Francisco, Retrieved from https://vivekavani.com/swami-vivekananda-quotes-meditation/

3. *Swami Vivekanand and Nikola Tesla connection.* (2021) Retrieved from https://www.facebook.com/sagarworldmultimedia/posts/did-you-know-swami-vivekananda-inspired-nikola-tesla-with-vedasnikola-tesla-and-/3718381091554376/

4. *Swami Vivekanand and Nikola Tesla connection*. (1997) Retrieved from *https://www.teslasociety.com/tesla_and_swami.htm* , *An Article by Toby Grotz Web Publication by Mountain Man Graphics, Australia - Southern Autumn of 1997*

5. Norton, R. L. (2009). *Design of machinery: An introduction to the synthesis and analysis of mechanisms and machines.* McGraw-Hill.

6. Woodford, C. (2010, January 20). Cranks and cams: How they work. Explain That Stuff. https://www.explainthatstuff.com/cranks-and-cams.html

7. Bhagavad Gita. (n.d.). (Chapter 2, Verse 47). Karmanye vadhikaraste, ma phaleshu kadachana

8. National Council of Educational Research and Training (NCERT). (2023). *Science textbook for class XI & XII* (Chapter 5: Laws of Motion). NCERT.

9. NCERT. (2023). *Physics textbook for class XII* (Part 2).

10. *Gland in Brain and Egyptian Culture*; Retrieved from https://en.wikipedia.org/wiki/Pineal_gland

11. Strassman, R. (2001). *DMT*: *the spirit molecule : a doctor's revolutionary research into the biology of near-death and mystical experiences*. Park Street Press.

12. Satguru Sivaya Subramuniyaswami. (2003). *Merging with Śiva: Hinduism's Contemporary Metaphysics*. Himalayan Academy Publications.

13. Egyptian Civilization Records. (n.d.). *The Third Eye concept - Eye of Horus and its connection to spiritual awakening.*

14. National Council of Educational Research and Training (NCERT). (2023). *Physics textbook for class XII* (Part 2, Chapter 10: Wave Optics). NCERT.

15. Hecht, E. (2017). *Optics* (5th ed.). Pearson.

16. Vivekananda, S. (1896). *Jnana yoga: The path of knowledge*. Advaita Ashrama.

17. Halliday, D., Resnick, R., & Walker, J. (2013). *Fundamentals of physics*. Wiley.

18. Brihadaranyaka Upanishad. (n.d.). *Asango hi ayam purushah* (Chapter 4, Verse 4.3).

19. *Colorful Soap bubbles.* Retrieved from https://pikbest.com/backgrounds/soap-bubbles-three-small-placed-in-black-background_9473549.html

20. Adamson, A. W., & Gast, A. P. (1997). *Physical chemistry of surfaces*. Wiley.

21. *Adi Shankaracharya's Thoughts on Life*. Retrieved from https://www.sanatan.org/en/a/110659.html/englishpravachan_part2_12

22. Shankaracharya, A. (8th Century). *Bhaja Govindam* (Verse 21).

23. *Artistic Representation of Life Cycle and Rebirth*. Retrieved from https://www.bvashram.org/from-death-to-immortality/

24. CERN. (2004). *Nataraja at CERN: Symbol of cosmic dance. European Organization for Nuclear Research*. Retrieved from https://cds.cern.ch/record/768796

25. *A Shower of about 100 particles in the Bubble Chamber; A dance of particles.* Tao of Physics book, Pg. 236.

26. *Shiva in Natraj pose.* Retrieved from https://www.wikiwand.com/fr/articles/Tandava

27. *The statue of Shiva at CERN*. Retrieved from https://cds.cern.ch/record/768796 CERN provides the image free of charge for educational and informational use. (https://copyright.web.cern.ch/)

28. Bhandari, Sabindra. (2022). The Cosmic Dance of Lord Shiva: Divulgence of Vedic Cosmology and Culture in Shiva TandavaStotram. *The Outlook: Journal of English Studies,* 100-114. 10.3126/ojes.v13i1.46699.

29. Aurobindo, S. (2005). *The life divine*. Sri Aurobindo Ashram Trust.

30. National Council of Educational Research and Training (NCERT). (2023). *Physics textbook for class XII* (Part 1, Chapter 6: Work, Energy, and Power). NCERT.

31. National Council of Educational Research and Training (NCERT). (2023). *Science textbook for class IX* (Chapter 8: Motion). NCERT.

32. Tesla, N. (1900). *The problem of increasing human energy*. The Century Magazine.

33. Chandogya Upanishad. (n.d.). *Tat Tvam Asi* (Chapter 6, Verse 2.1).

34. OpenStax. (2023). *Physics*. OpenStax.

35. *Soap Bubbles Iridescent rainbows*. Retrieved from https://www.wired.com/story/the-secret-to-soap-bubbles-iridescent-rainbows/

36. Radhakrishnan, S. (1953). *The principal Upanishads*. HarperCollins.

37. Feynman, R. P. (1963). *The Feynman lectures on physics*. California Institute of Technology.

38. Tagore, R. (1922). *Sadhana; The realization of life.* Macmillan.

39. Patanjali. (n.d.). *Yoga Sutras* (Chapter 1, Verse 2).

40. Radhakrishnan, S. (Trans.). (1953). *The Principal Upanishads.* George Allen & Unwin. (pp. 712–713). Inspired from Original work: Brihadaranyaka Upanishad, I.3.28

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