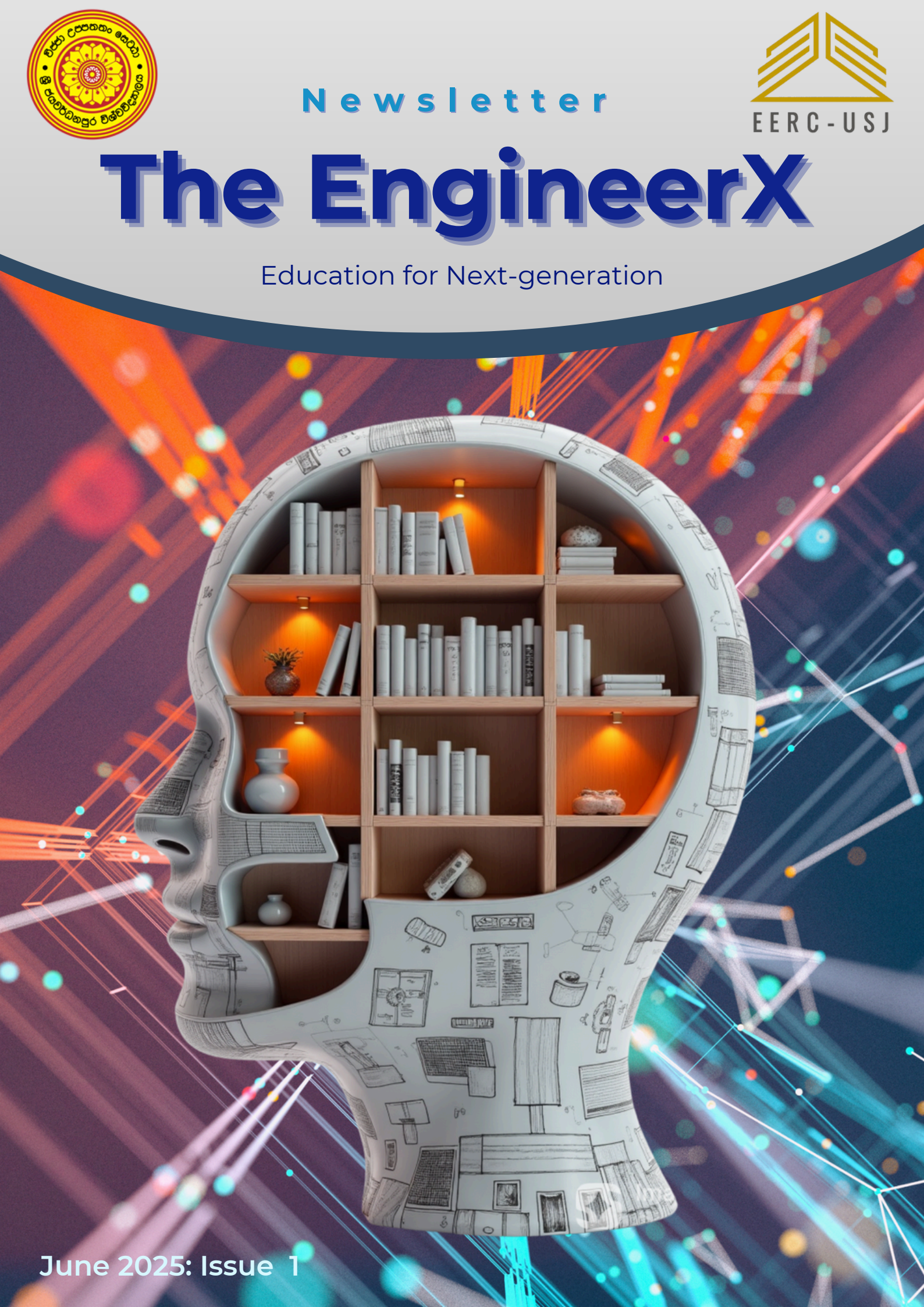
Newsletter

The EngineerX

Education for Next-generation



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WHAT IS EERC

Engineering education in Sri Lanka requires real-world exposure beyond the classrooms to explore exciting career opportunities on offer in Engineering and related industries. Currently, the country lacks a central facilitator that focuses on engineering education with a futuristic vision to facilitate future scientists, engineering and technology professionals, problem solvers, and innovators within and outside the University systems. Sri Lanka can benefit from such a central educational facility in streamlining engineering education, introducing and adapting global changes and requirements into the country's engineering education, providing a central discussion platform, facilitating social outreach, and facilitating content development and dissemination. The Engineering Education Research Center (EERC) was established in 2022 under the Research Council of University of Sri Jayewardenepura. The initial work was funded by the competitive research grant CRG/R2/SJ3 of the STHRD Project.

Vision

To be a leading hub of innovation and excellence in engineering education research, fostering transformative learning experiences, advancing pedagogical methods, and driving impactful technological advancements. We strive to empower educators, students, and industry professionals through interdisciplinary collaboration, state-of-the-art research, and a commitment to continuous improvement in engineering education.

Mission

Establish an engineering education culture that readily recognizes global and local trends and challenges and facilitates futuristic educational solutions.

Objectives

- *Investigate global trends and requirements in engineering education, and introduce those to the local context*
- *Support and facilitate adapting to futuristic changes in engineering education*
- *Establish a discussion forum among stakeholders for engineering educational reforms*
- *Facilitate content development and dissemination*
- *Facilitate social outreach*

DISCUSSIONS

GUEST LECTURE ON ENHANCING IN-PLANE PERFORMANCE OF MASONRY WALLS THROUGH SOFT LAYER MEMBRANES: AN ENCAPSULATION

EERC hosted a guest lecture for the Academic staff, Research assistants and students on 04th December 2024 from 10:00 a.m. to 12:00 noon at Senate board room, USJ.

Dr. Nebojša Mojsilović a Senior Scientist at ETH Zurich. Dr. Mojsilović's primary research interests encompass a wide array of topics related to structural masonry and he has authored and co-authored approximately 100 referred journal and conference papers, and honored with the prestigious John B. Scalzi Research Award by The Masonry Society (TMS) in 2020.

Dr. Nebojša Mojsilović
Senior Scientist at ETH Zurich

Masonry walls are widely used in construction due to their durability, cost-effectiveness, and structural efficiency. However, they often suffer from poor in-plane performance, particularly under seismic or lateral loads. Traditional strengthening techniques, such as fiber-reinforced polymer (FRP) wraps and steel bracing, improve performance but often at the expense of flexibility and economic feasibility. The incorporation of soft layer membranes as an encapsulating mechanism presents a novel solution that can enhance ductility, energy dissipation, and overall in-plane behavior while maintaining ease of application.

Soft layer membranes enhance the in-plane performance of masonry walls by modifying shear behavior, improving ductility, and increasing energy dissipation. Made from elastomeric coatings, polymer sheets, or hybrid composites, these flexible interlayers introduce controlled deformation to prevent sudden failure. Their effectiveness is analyzed through masonry wall testing and Digital Image Correlation (DIC).

(Photographs by EERC team)

DISCUSSIONS

LETTING A REALLY CUTE TIGER CUB PLAY
UNDERSTANDING THE ROLE OF AI IN EDUCATION

By Dr.B.Munasinghe

Discussing the effects, impacts, and readiness of embracing Artificial Intelligence (AI) and/or Generative AI (Gen-AI) in education, particularly in STEM and higher education, is not a simple task, especially in a country that is still moving towards digital education at a slow pace, even in 2025. There are so many aspects to consider, many to comprehend, many more to achieve, and some even to sympathize. With many unforeseen consequences, AI continues to evolve and transform the education landscape worldwide, enhancing and improving teaching and learning, boosting productivity, and preparing students for an AI-driven future [1].

Geoffrey Hinton, the “Godfather of AI”, metaphorically described AI as a “really cute tiger cub”, warning, "Unless you can be very sure that it's not going to want to kill you when it's grown up, you should worry."[2]. This interpretation of AI is both appealing and intimidating! The Tech Mogul and visionary Bill Gates envisions a future where AI serves as a supportive agent in education, offering personalized learning experiences and assisting educators in their roles. If AI is a dangerous predator in the making, how vulnerable is education in becoming its prey? Isn’t it better if we try to tame it while it is still a cute and manageable cub? What if it were to become a adorable pet, and not dangerous at all? How much should we worry?

A closer look would show that the ongoing discourse surrounding the influence of AI in education seems to still draw parallels to the 2000-year-old debates of great philosophers like Socrates and Aristotle on knowledge discovery. Is Socrates’ “truth is discovered through discussions with peers” or Aristotle’s “knowledge comes from sensory experience and logical reasoning” still valid, although the peer in question is an AI-driven chatbot?

DISCUSSIONS

The integration of AI is transforming the learning experience, enabling personalized instruction tailored to each student's unique needs. Adaptive AI systems analyze performance data to develop customized learning paths, allowing students to progress at their own pace and comprehension level. This individualized approach enhances both engagement and academic outcomes. AI is also changing the teaching landscape, offering tools that streamline administrative work and support innovative instructional methods. For instance, AI can automate tasks like grading, generate lesson content, and deliver instant feedback to learners, freeing the educators to focus more on nurturing critical thinking and guiding student learning. It is revolutionizing assessments towards more dynamic and insightful methods than conventional methods. Real-time analysis and feedback is made possible, offering a clearer picture of student understanding and progress. Beyond the classroom, AI is also improving administrative operations such as enrollment, scheduling, and resource distribution, making educational institutions more efficient and responsive [4].

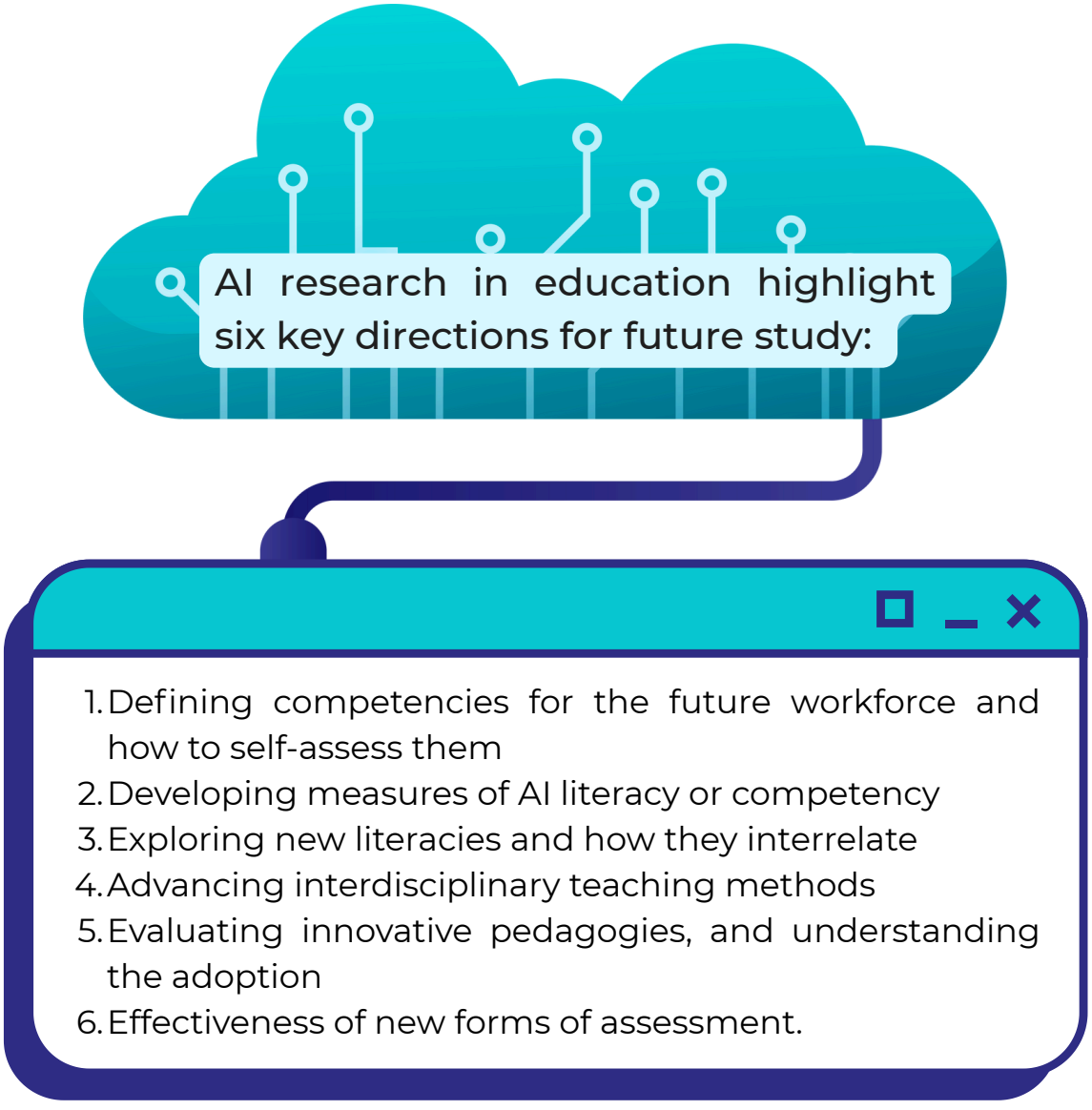
The use of AI in education can be understood across three distinct but related areas. First, as mentioned earlier, AI tools like intelligent tutoring systems enhance learning by offering personalized support with adaptive platforms and instant feedback, which improve engagement and efficiency. Second, AI serves as an aid in subject-related activities and projects, helping students with tasks like writing, research, data analysis, and design, despite the concerns of originality and academic integrity. Third, students may explore how AI works, particularly in STEM or Computer Science projects, by creating and training models, and studying algorithms, which deepens their understanding of AI's capabilities, limitations, and ethical implications. Each area highlights a different role of AI—as a tutor, a tool, or a subject of study—in modern education.

These distinctions are critical because it enable educators, institutions, and students to apply AI tools purposefully, ethically, and effectively within higher education. Each category entails different pedagogical objectives, responsibilities, and risks. While AI is used to enhance learning the focus must be on ensuring that personalized support does not undermine independent thinking. The focus should shift to guidance with clear academic integrity to distinguish between assistance and academic dishonesty when AI is applied in subject-related tasks. And when AI itself becomes the subject of learning, the goal shifts toward developing students' technical understanding, critical analysis, and ethical awareness of AI systems. Without recognising these differences, institutions risk misusing AI technologies, compromising learning outcomes, and failing to prepare students for a world increasingly shaped by intelligent systems.

DISCUSSIONS

The distinction also informs curriculum design, assessment strategies, and institutional policies that align with the core values of academic rigor and integrity.

While AI offers significant benefits in education, it also presents challenges that must be addressed to ensure its success and equity. Key concerns include data privacy, algorithmic bias, the need for teacher training [4], and equitable access to technology, especially for underserved communities. AI tools must be designed to avoid biases and ensure fairness in decision-making. The educators may need continuous support in integrating AI effectively without undermining the vital human connections in teaching. Additionally, ensuring long-term sustainability and accessibility of AI solutions is crucial for their lasting impact. Overcoming these challenges is essential to maximising AI's potential and providing all students with quality education in the digital age.



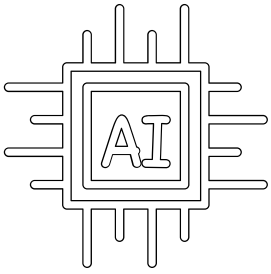
DISCUSSIONS

Future higher education must evolve to prepare students for employment in a society increasingly shaped by GenAI. This transformation calls for updated learning outcomes that include the ability to learn and teach with GenAI, as well as a strong foundation in AI literacy [5]. Interdisciplinary approaches and maker-based learning (i.e. student-driven creation and problem-solving) should be emphasised. Meanwhile, the assessments should prioritise hands-on, in-class activities.

On a different footing to the discussion so far, it is increasingly likely that innovative AI tools for education are more likely to come from outside traditional universities, especially from data-rich organisations capable of scaling AI commercially. This trend poses a potential threat to public educational institutions [7]: the public schools, colleges and universities, that is, in the local context the very establishment of Sri Lanka's free education system. In such a situation, the central question that arises is, should the technology be designed to automate and replace educators or instead be harnessed to empower both teachers and students in the learning process? Who should have control in AI in education: educators, students, governments, computer scientists, or large corporations? What would happen to countries like ours, where all these parties are still struggling?

The great French poet Charles Baudelaire famously declared photography to be "the refuge of every would-be painter, every painter too ill-endowed or too lazy to complete his studies". But he could not have predicted that it would later evolve into an artform.

Rather than avoiding or refusing, let's embrace the integration of AI and generative AI into education, and witness together the dawn of a new era in the realm of learning and teaching. While worrying over the possibility of it injuring, or worse, killing us when grown up, and while looking for ways to it, *let the tiger cub play, for its cuteness is worth watching!*



ENGINEERING HISTORY

EVALUATING THE HISTORY OF TECHNOLOGY IN SRI LANKA: AN ENGINEERING PERSPECTIVE

By Ms.A.D.D.N.Kariyawasam

Sri Lanka, with its rich and diverse history, boasts a legacy of remarkable engineering and technological feats that have shaped its cultural and infrastructural landscape over the centuries. As we explore the evolution of these technologies, it is essential to understand the broader context of their development and impact on Sri Lankan society.

The ancient cities of Anuradhapura and Polonnaruwa are testament to Sri Lanka's advanced engineering skills in construction and urban planning. The monumental remains, such as stupas and columned structures, showcase the architectural innovations of the time. These structures were not merely functional. They were symbols of centuries-old civilizations, reflecting the aesthetic sensibilities and societal values of the eras in which they were built. The existence of large brick structures demonstrates a sophisticated understanding of materials and engineering principles, which is still relevant today.

Samanala Wewa Dam

Source: Wikimedia Community User Group Sri Lanka

ENGINEERING HISTORY

Sri Lanka’s ancient engineering expertise is evident in its advanced water management. The island’s irrigation systems, including tank cascade systems, ensured sustainable agriculture despite a variable climate. In metallurgy, wind-powered iron smelting in Samanalawewa showcased an innovative use of natural resources for high-quality metal production. These historical advancements continue to influence modern engineering and sustainability practices.

The Bisokotuwa, an ancient Sri Lankan hydraulic feature, highlights the country's advanced water management expertise. Like a valve pit tower, it controlled water flow in irrigation systems long before similar designs appeared in the West. Colonial rulers recognized its significance while restoring these systems, using modern hydraulic knowledge to interpret its function.

Sandagiri Stupa
Source: AmazingLanka.com

As we evaluate the history of technology in Sri Lanka, it is vital to consider how the ancient engineering feats relate to contemporary challenges. For instance, the methods used in the construction of ancient stupas remain relevant today. The strategies utilized for the restoration of structures like the Sandagiri stupa rely on traditional techniques, demonstrating a profound appreciation for ancient methodologies. By integrating historical insights with modern engineering practices, we can create sustainable solutions that honor our past while addressing current needs.

In summary, Sri Lanka's technological history highlights ingenuity and resilience, particularly in irrigation and metallurgy. These achievements continue to influence modern engineering, emphasizing the value of integrating historical knowledge into future advancements for sustainability and innovation.

RESEARCH PUBLICATIONS

The Australasian Association for Engineering Education (AAEE) conference is an annual event that promotes engineering education scholarship and best practices. The conference is held in Australia and New Zealand, typically in early December. 34th AAEE conference hosted by Griffith University, Queensland, Australia from 3-6th of December 2023 in Gold coast, QLD and EERC published two research papers regarding field camps and credit requirements of undergraduate programs in Sri Lanka.

This research work and publications were supported by the Science and Technology Human Resource Development Project, Ministry of Higher Education, Sri Lanka, funded by the Asian Development Bank (Grant No. CRG/R2/SJ3)

1. Skill developed through field camps: A case study on surveying camp for Civil Engineering undergraduates.

Surveying work camps play a crucial role in shaping the practical skills of civil engineering undergraduates. Conducted over a two-week residential camp, the study demonstrated that students enhanced their basic surveying skills, problem-solving abilities, and essential soft skills such as teamwork and communication. Utilizing a questionnaire survey among participants, the research identified how these camps contribute to achieving key graduate attributes outlined by the Washington Accord. The findings indicate that both on-campus and camp-based learning methods effectively promote critical skills necessary for future engineers. This study underscores the value of immersive learning experiences in bridging the gap between theoretical knowledge and real-world application in civil engineering education.

Scan this QR Code to read the Full paper

To the next page...

DISSEMINATION ACTIVITIES

2. Analysis of Knowledge domain credit requirement in the Sri Lankan four-year civil Engineering Undergraduate Degree programs

The paper examines the credit allocation for knowledge domains within civil engineering curricula in Sri Lanka, aligning them with global standards such as the Washington Accord. The study reveals that all selected Sri Lankan universities meet the minimum requirements for essential knowledge areas, including Mathematics, Basic Science, Engineering Science, and Engineering Design. Despite this achievement, the research highlights variations in credit distribution across different institutions, suggesting a need for a more balanced approach to enhance graduates' diverse skill sets. The authors advocate for further research to investigate these discrepancies and emphasize the importance of a comprehensive education framework to equip future engineers for the complex challenges of the modern world. This analysis is crucial in fostering a robust engineering education system that meets both local and international expectations.

Scan this QR Code to read the full paper

WHAT IS HUMAN LIBRARY

**"Have you ever wanted to have a conversation with someone whose life experiences are different from your own?
EERC's Human Library offers that opportunity! "**

Instead of borrowing a traditional book, participants "borrow" a person a "human book" and engage in a conversation.

The Human Library is a method that connects people through communication and encourages them to embrace new ideas, eliminate prejudices, and adopt positive approaches in life. It is a global movement where individuals volunteer to be "books," sharing their stories and experiences with "readers."

In the early 1990s, in Copenhagen, Denmark, five young individuals led by Ronnie Burger established a non-governmental youth organization called "Stop Violence" with the goal of persuading young people to reject violence through peer education. Their belief was that everyone has a tendency towards violence, but face-to-face communication with one's adversaries could lead to a resolution of misunderstandings and the prevention of violence. In July 2000, at the Roskilde Music Festival, the "Stop Violence" organization lent out 75 living "books" or "Human Books" and achieved significant success, earning positive recognition from society. This initiative ultimately gave birth to the concept of the Living Library.

DISSEMINATION ACTIVITIES

OUR FIRST HUMAN LIBRARY SESSION

(About – Civil & Structural Engineering Consultants (Pvt) Ltd)

Our first session featured Eng. Shiromal Fernando is the Managing Director as well as Principal Structural Engineer of Civil and Structural Engineering Consultants (Pvt) Ltd., Sri Lanka, which is one of the leading consultancy companies in Sri Lanka. He is a well-experienced charted engineer in Sri Lanka while also Chairman of the Council on Tall Buildings and Urban Habitat, Sri Lanka, Vice President of the Green Building Council of Sri Lanka (GBCSL), and Member of the Institution of Engineers, Sri Lanka (IESL), Sri Lankan Standard Institute (SLS), and Society of Structural Engineers Sri Lanka. He is a leading expert in innovative construction methods such as tall buildings, bridge construction, and advanced sustainable construction materials (ICSBE 2020). Eng. Shiromal Fernando shared his extensive experience in the construction industry, emphasizing the importance of adaptability, ethical practices, and innovation in engineering. The interactive session allowed students to explore industry challenges and opportunities beyond textbooks.

(Photographs by EERC team)

DISSEMINATION ACTIVITIES

WONDERFUL EVENING WITH PROF.RAJ SOMADEVA

The second human library session featured Prof. Raj Somadeva, is a Senior Professor in Archaeology at the Postgraduate Institute of Archaeology, University of Kelaniya in Sri Lanka, and a Senior Fellow of the Sri Lanka Council of Archaeologists. He wrote many books regarding History and archelogy. In an engaging discussion, renowned archaeologist Prof. Raj Somadeva explored the intersection of engineering and archaeology. He highlighted how engineering techniques contribute to uncovering and preserving historical sites, fostering an appreciation for interdisciplinary learning.

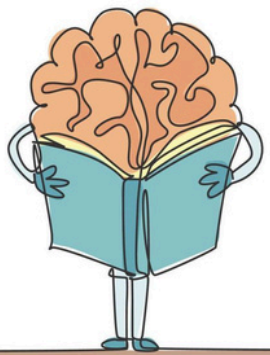
(Photographs by EERC team)

(raj somadeva - Google Search)

We look forward to hosting more sessions in the future, fostering a more connected and understanding community.
Stay tuned for future Human Library sessions!

Interested in being a "human book" or a "reader"?

Contact EERC Research Team
Email- eerc@sjp.ac.lk



LATEST UPDATES

PROJECT-BASED LEARNING IN ENGINEERING

Project-based learning (PBL) is revolutionizing engineering education by emphasizing hands-on, real-world problem-solving experiences. Unlike traditional lecture-based approaches, PBL engages students in collaborative, interdisciplinary projects that mirror professional engineering challenges. *(Perrenet, Bouhuijs and Smits, 2000)*

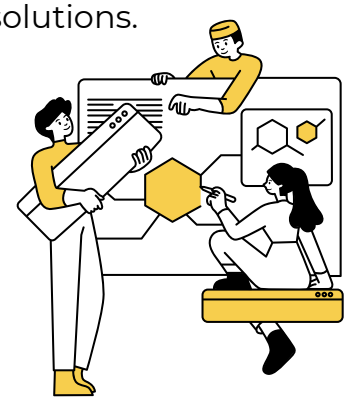
What is Project-Based Learning?

PBL is an educational methodology where students learn by actively engaging in meaningful projects. These projects typically require applying engineering principles to design, build, and test solutions to complex problems.

PROCEDURE

Benefits of PBL in Engineering

- Enhanced Problem-Solving Skills
  - Students develop critical thinking and analytical skills by tackling real engineering problems.
- Collaboration and Teamwork
  - PBL encourages students to work in teams, simulating the collaborative nature of professional engineering.
- Application of Theoretical Knowledge
  - Concepts from textbooks are applied to practical scenarios, reinforcing learning.
- Innovation and Creativity
  - Students are encouraged to think creatively and innovate when developing solutions.



LATEST UPDATES

NEW WAY TO CONSTRUCT CEILING IN A NEW SHAPE AND LIGHT WEIGHT

By Ms.N.K.Y.Netthikumara

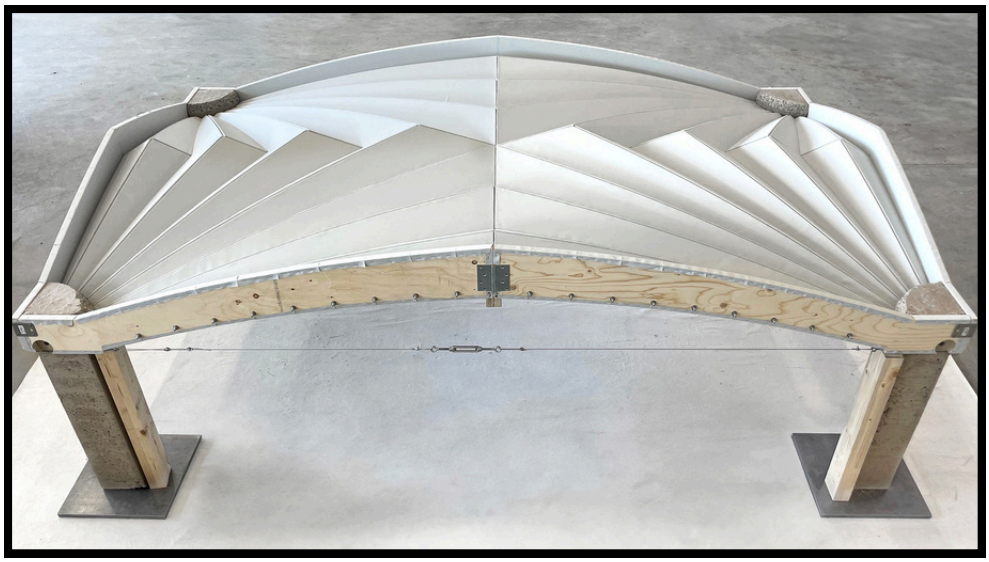
A reusable and resource-efficient foldable formwork system has been created by the PhD student in the research group of Professor Philippe Block at the ETH. These floors are significantly thinner than their traditional equivalents thanks to ingenious geometry, and they don't need any embedded steel reinforcement.

Unfold Form consists of thin, flexible plywood strips that are connected by textile hinges and can be unfolded like a fan. Four of these compact units can be rapidly assembled within a wooden frame to create a sturdy, zigzag shaped mold onto which concrete can be poured directly. The formwork is simple to remove from underneath, fold up, and store for later use after the concrete has dried. Even though the prototype system only weighs 24 kg, it is capable of supporting up to one ton of concrete.

This type of formwork uses geometry to shape a floor that uses up to 60 percent less concrete and 90 percent less steel than the conventional reinforced concrete floor slab, reducing carbon emissions and material waste.

Real life test was done in Cape town, South Africa by Mark Hellrich, which transported the folded formwork to Cape Town using two surfboard bags. [8]

(Source: ETH Zurich-News and Events)



This is what the finished formwork looks like from above. It consists of four individual parts that can be unfolded like a fan. (Photograph: Lotte Scheder-Bieschin / ETH Zurich, BRG)

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PHOTOHIGHLIGHTS

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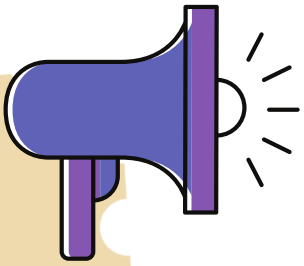

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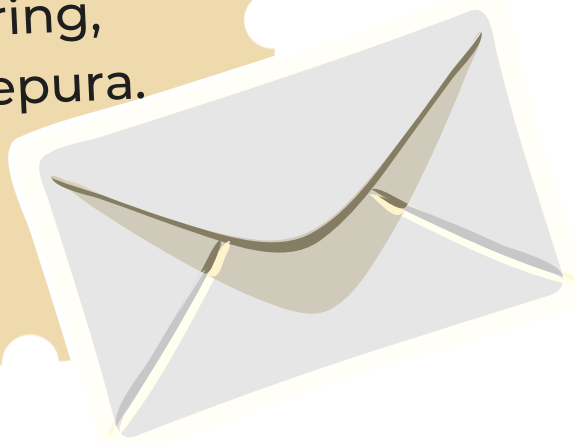

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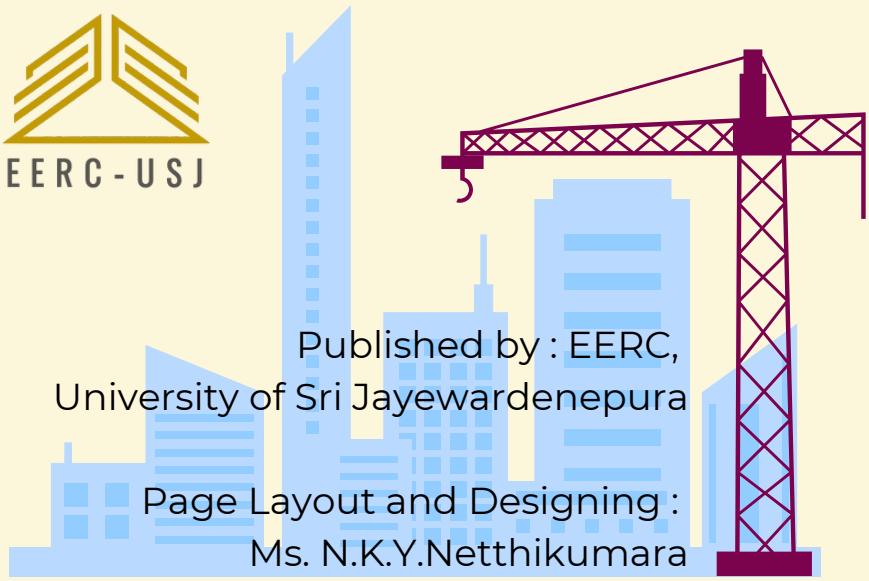

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