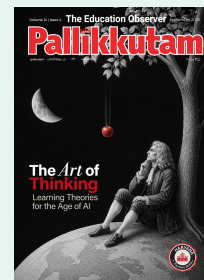


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INSIGHTS

Fostering Human Ingenuity in the AI Age



AI-native education must go beyond technical skills, nurturing self-awareness and purposeful action to preserve human ingenuity in an AI-driven world.

Artificial intelligence can now generate writing, images, music, designs and computer code that appear remarkably original. Generative models produce new combinations from patterns learned through data, while genetic algorithms create variations through selection, mutation and recombination. Their outputs may be novel, useful and even surprising. Yet machine-generated novelty is not identical to human ingenuity. An algorithm operates within encoded representations, computational procedures and defined conditions of evaluation. A human being encounters reality personally, interprets its meaning, forms convictions and decides that something new ought to be created. Creativity becomes fully human when

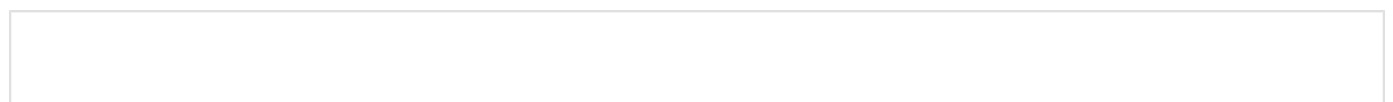
imagination is joined with lived experience, purpose and responsibility.

The mathematical limitations of formal systems help clarify this distinction. Gödel's Incompleteness theorems (1931) show that a sufficiently expressive and consistent formal system may contain true statements that cannot be proved using only the rules of that system. The Moore-Myhill's Garden-of-Eden theorem (1962-1963) shows that, within cellular automata, certain possible configurations may have no preceding configuration from which they can arise through the system's transition rules. Together, these theorems reveal principled limitations: a formal system may be unable to prove every truth expressible within it or reach every admissible state through its internal operations. They do not prove that machines cannot produce anything new. They show that algorithmic generation should not be confused with unrestricted access to truth, possibility or meaning.

AI-native education must therefore move beyond AI-collaborative skilling. Students certainly need to learn how to prompt, code, verify, design and work productively with intelligent tools. However, collaboration with AI is not sufficient preparation for a future in which AI performs parts of human thinking and robots acquire parts of human skilling. Students also need AI-complementary formation. At its centre is self-view, the developing understanding of who one is, what experiences have shaped one, what capacities and limitations one possesses, and what kind of person one chooses to become. Self-view gives direction to ability by connecting competence with identity, purpose and personal responsibility.

Worldview enlarges self-understanding into an interpretation of reality. It enables students to recognise human needs, social inequalities, ecological challenges, cultural meanings and possibilities for improvement. It asks not only, "What exists?" but also, "What matters, what ought to change, and what responsibility do I have?" Self-view and worldview become productive through entrepreneurial willing. Entrepreneurial willing is the human capacity to perceive an unmet need, imagine a better possibility, accept responsibility for pursuing it, mobilise knowledge and tools, and persist until value is created for others. It is not limited to establishing a business. It is the resolve to transform meaningful insight into purposeful action.

The Mahabharata offers a powerful metaphor for this educational task. The AI-native student is the modern Arjuna who needs both Drona and Krishna as mentors. Drona develops disciplined competence, technical precision and mastery of instruments. He represents AI-collaborative skilling. Krishna nurtures self-knowledge, enlarges the understanding of reality and awakens action guided by purpose and responsibility. He represents AI-complementary formation of the will. Education in the AI age must do more than prepare students to operate alongside intelligent machines. It must foster human ingenuity by forming persons who know themselves, understand their world and bring valuable possibilities into reality.





About the author

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Prof Dr Varghese Panthalookaran, MSc is Professor at Rajagiri School of Engineering and Technology, Kochi, India. He has authored three books, 'Condemned to be Creative', 'Entrepreneurial Intellection-Shades of Black and White' and 'Pedagogy of the Digital Natives: An Introduction to Entrepreneurial Education'.