Reducing complexity through visual narrative frameworking – designing a multimodal learning experience in the age of AI

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Abstract

This paper explores innovative pedagogical approaches for teaching algorithmic thinking and introducing Artificial Intelligence (AI) concepts without direct technical instruction or reliance on AI tools. Instead, it leverages business and futures-thinking visual frameworks, such as the Business Model Canvas, Scenario Development Canvas, and Anticipatory Tech Canvas, as conversational catalysts for management students and workshop participants. The central thesis posits that these non-technical canvases effectively facilitate discussions on advanced technology-based futures, fostering critical thinking, problem-solving skills, and a deeper understanding of AI's potential impact across various sectors.

The study is grounded in practical experiences gathered by three facilitators during the academic year 2024/25, encompassing 25 workshops with management students and two significant events with over 60 participants each, including a Blended Intensive Program in Poland and the Asia Europe Foundation's InnoLab program. Researchers compared observations from sessions using pre-designed canvases with insights from workshops where students drew canvases from scratch. Additionally, experiences with 81 spontaneously sketched 'Future of Education' canvases were thematically coded using Saldana's methodology [1] to identify challenges and opportunities. Students had access to AI tools of their choice in both cases.

Results indicate that the analysis of group work with pre-defined visual frameworks led to the description of the PIVOT learning approach (Purpose-driven, Imagination-led, Visually-rich, Outcome-focused, Thought-provoking) for designing visual canvases. Thematic analysis revealed key challenges in education, including misalignment with labor market needs, issues with studying experience, erosion of academic integrity, and AI ethical concerns. Opportunities identified include innovation-centricity, personalized and flexible learning, enhanced industry collaboration, and new forms of collective intelligence through AI integration and global

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accessibility. Furthermore, the study confirmed that social learning, curiosity, and self-discovery, particularly through creative explorations, are pivotal in knowledge and skill acquisition in the age of AI.

As a practical implication, the paper proposes a universal FOLD (Future Oriented Learning Canvas) canvas designed to help students frame problem-solving narratives using future thinking and foresight. This novel, hybrid canvas integrates design thinking, systems thinking, and anticipatory governance to foster deeper engagement with the future of education in an AI-dominated world. The FOLD canvas process involves an "Observatory" phase, "Problem Statement," a scenario development matrix, a"Desired Future" stage visualized through collage, and a "Backcasting" stage to articulate "Value Proposition" and "Sustainable Value Proposition". The canvas serves as a universal tool that requires expert facilitation. The study supports the practical application of Foresight tools, contributing significantly to active teaching methodologies in the AI era.

Keywords: *learning models; future thinking, future of Education, visual frameworks, interactive narratives (IN)*

1. Introduction

The integration of Artificial Intelligence into management education presents a unique opportunity to cultivate algorithmic thinking, not through direct technical training, but through strategic pedagogical designs that emphasize critical discourse and collaborative problem-solving [2-4]. There is a need for sense-making and frameworking combined with hands-on experience [5]. Paradoxically, in the era of screens we need immersive physical experiences and reason to talk, to interact, and to interact with others [6]. The integration of AI into management education necessitates a shift towards algorithmic thinking through pedagogical interventions that emphasize critical discourse and collaborative problem-solving. The need for sense-making and frameworking, combined with hands-on experience, becomes increasingly crucial in this tech-context [4]. In the age of AI, we should aim at a conversation about the future, based on data from the past collected, and interpreted in the present. Future scenarios and vision enable space for social learning and engaging group conversations.

2. Theoretical background

2.1 New learning models: agility, curiosity & playfulness

Not only in the age of artificial intelligence, but individuals also acquire knowledge and skills through self-discovery, creative exploration, and the intrinsic reward of creation [7]. While we value curiosity-driven models that embrace serendipity and emergent realities, prioritizing agility and playfulness, the capacity to navigate paradox and ambiguity with speed and

precision is essential for managing complexity introduced by the emerging technologies. Conversely, the human cognitive system seeks closure. In the pursuit of models applicable to technology-driven learning, constructivism and connectivism emerge as pertinent theoretical frameworks.

Seymour Papert [8], a seminal figure in both artificial intelligence and the creation of engaging, playful learning environments, serves as a prime example of this pedagogical orientation. We should also notice the changes in the approach to the learning curve with notions such as: collective intelligence, social networks, open communities, and swarm learning. The collective learning curve signifies the progression of a group's comprehension, abilities, or effectiveness over time, driven by shared experiences, knowledge dissemination, and joint problem-solving. This concept is closely related to connectivism, which asserts that learning emerges from a variety of connections and networks, enabling knowledge to be distributed and continuously updated through interpersonal interactions. When groups participate in active learning and knowledge construction, consistent with constructivist tenets, the mutual process of investigation, experimentation, and rigorous analysis fosters a collective enhancement of understanding. In the current era of artificial intelligence, sophisticated tools can markedly improve this collective trajectory by streamlining information exchange, facilitating the collaborative development of products and solutions, and offering platforms for responsive feedback and adjustments [9]. A critical reflection on current trends and future directions remains at the center of attention [10,11]. This cultivates an atmosphere where inquisitiveness propels not only individual but also group-level discovery, and the collective capacity for creation reinforces a more extensive and resilient shared understanding. In this context, curiosity acts as the engine that drives learners to explore, experiment, and discover new relationships between concepts, while the power of creation allows them to solidify their understanding by building and sharing their own artifacts and knowledge [12]. AI tools are capable of augmenting constructivist learning experiences, empowering learners to critically analyze information, arrive at well-reasoned conclusions, and dynamically adjust their plans as needed [13], but they are just tools that should be incorporated into socio-emotional learning process. Crucially, the focus extends beyond mere coding skills; it encompasses the broader act of creation [14]. Constructivism, with its emphasis on active learning and knowledge construction, finds a powerful ally in connectivism, a theory that emphasizes the importance of networks and connections in the learning process [15]. Constructivist and connectivist learning experiences are enhanced through AI-powered tools, enabling critical evaluation of information, informed decision-making, and dynamic adaptation in an interactive process [16].

Furthermore, to continue seeking engaging learning frameworks in tech-related environments, we can explore agility and SCRUM behavioral patterns, using exploration as a method to understand reality and employability as the ultimate goal. The most recent World Economic Forum's promoted CLASS model [17] with elements such as: Creativity, Learner scaffolds, Agency, Scope, Sandboxes emphasizes adaptability, knowledge application, and continuous learning as crucial for navigating the Fourth Industrial Revolution [18]. The CLASS model's comprehensive approach ensures that education is not only relevant but also engaging and adaptive, preparing students for the complexities of the modern world. Agility promotes flexibility and the ability to adjust to new information and challenges, and Skilling ensures students acquire practical skills relevant to the current job market [19].

Moreover, the new agile learning models emerged rapidly [20] and are focused on either on social learning and playful experiences or better-to-say: on agility and social competences acquired through play. The LEGO Foundation's model of playful learning [21] represents a significant contribution to the field of education, advocating for a pedagogical shift that emphasizes the intrinsic value of play in fostering holistic child development. This model is not merely about incorporating games or recreational activities into the classroom; rather, it entails a fundamental rethinking of how learning occurs, recognizing play as a primary vehicle for knowledge acquisition, skill development, and the cultivation of essential life competencies [22]. The LEGO Foundation's playful learning model, emphasizing child-centric, hands-on experiences, offers a potent framework for adapting education to the burgeoning age of artificial intelligence. Playful learning, characterized by active engagement, iterative experimentation, and collaborative problem-solving, cultivates crucial skills that complement AI's capabilities [23]. This approach diverges from traditional rote learning, instead fostering a dynamic environment where learners develop critical thinking, creativity, and adaptability—skills vital for navigating an AI-driven world. The integration of AI in education offers unprecedented opportunities for personalization and efficiency, yet it simultaneously necessitates a re-evaluation of pedagogical strategies to ensure holistic cognitive development [24].

2.2 Interactive Narratives (IN) as an example of proactive pedagogies

The proliferation of technology in educational settings has spurred a significant shift in learning paradigms, moving away from conventional, rigid methodologies towards more flexible, adaptive frameworks [25] and variety of modalities. In response to the AI-driven evolution of higher education, strategic planning and proactive methodologies are essential for educators and administrators [26]. Educational approaches must prioritize the development of problem-solving abilities, creative ideation, and ethical reasoning, even in the absence of advanced technical proficiency, by employing visual tools such as the Business Model Canvas to enhance comprehension and engagement with AI-related discourse [27]. Interactive Digital Narratives represent sophisticated expressive modalities where meaning emerges from the synthesis of multiple layers of information, interacting to form a complex system presented as a unified experience [27]. These narratives leverage multimodality, engaging various senses and cognitive processes to enhance understanding and memory [28]. Consequently, our focus is directed towards novel learning strategies, particularly those involving Interactive Narratives.

Interactive Digital Narratives offer a rich and multifaceted approach to learning, where meaning is constructed through the interplay of various informational layers modeled by developers to achieve specific expressive outcomes [4]. These updated models, adapted to complex environments, encourage greater interconnectedness and collaboration, departing from traditional, often isolated, learning approaches. Key characteristics of this transformation include the increasing sophistication of personalized learning experiences with artistic aesthetic experience [29]. The Experiential Turn [30], the widespread adoption of AI-powered educational tools, and the convergence of the physical and digital learning environments [31] are just some of the examples of shifts in the paradigm of pedagogies. Moreover, searching for the impactful

narrative, the focus on already existing fixed frameworks such as Sustainable Development Goals provides a framework for aligning AI innovation with societal objectives, contributing to a more equitable and sustainable future.

2.3 Visual framework as simplification

Furthermore, in the rapidly evolving landscape of education, particularly within fields grappling with the abstract and multifaceted implications of Artificial Intelligence, the integration of visual frameworks emerges as a pivotal pedagogical strategy [32]. Visual frameworks, such as the Business Model Canvas, Scenario Development Canvas, and Anticipatory Tech Canvas, serve as invaluable conversational artifacts, enabling students to explore the multifaceted dimensions of AI-driven futures without necessitating technical expertise [33]. The deployment of these canvases across diverse educational settings, including workshops and international events, demonstrates their versatility and effectiveness in scaffolding discussions on AI-related topics [34]. This approach equips learners with the ability to navigate the complexities of the contemporary business landscape. These frameworks facilitate a structured dialogue around AI's potential impact on business models, strategic planning, and technological innovation, thereby fostering a deeper understanding of AI's role in shaping organizational strategies and societal outcomes.

Educational methodologies should prioritize the cultivation of problem-solving skills, innovative thinking, and ethical judgment, utilizing visual aids like the Business Model Canvas to deepen understanding and foster engagement with AI-related concepts, irrespective of advanced technical expertise. Our theoretical examination highlighted the significance of adaptability and playful engagement within learning frameworks, asserting that an agile educational methodology fosters capacity for sustainable development. Additionally, the concept of Interactive Narratives was introduced, emphasizing the design of multimodal learning experiences. Lastly, the necessity of concluding educational exchanges by developing a visual artifact to simplify complex discussions was underscored.

3. Research design

All authors are seasoned facilitators of creative methodologies. We structured our experience-sharing session with a more organized framework, subsequently coding the content from the selected canvas thematically, and finally, we designed a new canvas informed by these collective experiences. Firstly, we analyzed 81 canvases that were sketched from scratch by second and third-year bachelor students and educators participating in various International Weeks. These were created in response to the question: "What is the Future of Education?". After thematic coding, we identified challenges and opportunities regarding the future of education. The outcome of this exercise was also to ascertain whether students' self-generated outputs would be more intensive and insightful compared to when they were required to fit their ideas into pre-prepared canvases. Thematic coding was employed, utilizing Saldana's methodology [1]

for qualitative researchers, to identify problems and opportunities related to education. Notably, participants were not explicitly directed to focus on AI; rather, the task was to identify educational challenges and explore solutions using foresight tools independently.

Secondly, we, as the workshop facilitators collected our experiences from 25 sessions where various forms of canvases were utilized, with a comprehensive list of these workshops provided in the accompanying table. Over a 12-month period from June 2024 to June 2025, we conducted 25 distinct workshops. Each participating group, which served as the basis for our data collection, engaged with at least one canvas during their discussions. We define a canvas as a single-page document, which could be related to Futures Thinking, Business Model Generation, Sustainable Innovation, or one of the templates from the "Design Better Business" website [29], such as the Empathy Map.

Finally, drawing upon the gathered insights, we propose the development of a novel canvas titled "FOLD canvas" tailored for workshop facilitation, incorporating feedback from both student and educator cohorts.

4. Research Findings

4.1 Findings from the thematic analysis of the student's sketched canvases

Thematic coding was performed using John Saldana's method [1] that lead the coding procedure through: Data – Code – Category – Concept scheme. Thematic coding from 81 sketched from-scratch canvases resulted in key themes regarding challenges and opportunities in education. An example of coding logic is provided in the appendix (Attachment No. 2). Problems in Higher Education The "Problems" section highlights several critical challenges facing traditional higher education institutions in the age of AI possibilities: The conceptual code map is presented below and the detailed categories with the frequency of mentions can be checked in Attachment No. 3.

Challenges

Code based on the frequency of mentions	Category	Description
Concept 1a: misalignment with today's labor market needs		
Lack of Practicality	Criticism of Education	Ineffectiveness in preparing for the job market; a gap between theory and practice.

Low Return on Investment (ROI)	Value of Education	Minimal difference in pay between undergraduate and graduate degrees; dissatisfaction with financial benefits.
Recruitment Issues	Formal Process Critique	Formal, cliché motivational and reference letters that don't reflect actual skills.
Inadequate Preparation	Educational Shortcomings	Students are not prepared to solve real industry problems, leading to a low employability rate.
Undermining the Degree's Value	Value of Education	Questioning the financial and time investment of a degree.
Cost of Education	Finance	Rising education costs and demographic imbalances.
	Concept 2a: Studying experience	
Lack of Authentic Experience	Quality of Teaching	Shortage of teachers as "masters," and a lack of personal, human-to-human interaction in small groups.
Inequality in Access	Social Issues	Unequal access to education and bias recognition; a lack of equitable access to knowledge.
Cheating and Plagiarism	Academic Ethics	Problems with academic integrity and plagiarism.
AI Ethical Concerns	Technological Impact	Worries about AI's environmental impact and the ethics of replacing instructors.
Teacher Shortage	Faculty Issues	A lack of faculty, who are often reduced to the role of course instructors, instead of the mentors
Mental Health Issues	Student Well-being	Problems with mental health and career pathway uncertainty.

Table 1 Challenges in Education, Based on the authors' own research

Thematic analysis identified two primary concerns: a misalignment between academic curricula and the requirements of the professional sphere, and a diminished perception of the enhanced quality of life afforded by educational pursuits.The challenges facing modern academia are complex and interconnected, forming a multifaceted crisis that questions the very purpose and structure of higher education. A key issue is the erosion of academic integrity, with the rise of AI tools making it easier for students to engage in plagiarism and cheating, thereby compromising the fairness of evaluation. This ethical problem is compounded by a growing skepticism regarding the value of degrees, as students and graduates express dissatisfaction with the financial return on their educational investment. This sentiment is often rooted in the perception that traditional academic programs fail to equip students with the employability skills needed for the modern workforce, leading to a disconnect between a student's qualifications and the demands of the job market. This has, in turn, fueled a fundamental shift in recruitment and credentialing, with employers increasingly valuing a candidate's portfolio of real skills and practical experience over a formal degree. Within the classroom, a concerning trend in faculty roles suggests educators are becoming mere instructors rather than mentors, which hinders the crucial personalized, human-centered interaction essential for genuine learning.

Furthermore, these academic and professional pressures are exacerbated by significant financial strain and student welfare concerns, as rising costs and mental health challenges create a difficult environment for students to thrive. This sense of strain is sometimes perceived as student exploitation, where intellectual contributions are not adequately supported or compensated, further underscoring the gap between academic theory and practical, real-world application. Underlying all these issues are deep-seated problems of access and inequality, which perpetuate uneven opportunities, and an entrenched academic rigidity that resists the necessary changes. The landscape is also being reshaped by evolving learning modalities, with a shift away from traditional postgraduate degrees towards more specialized programs. Finally, the rapid integration of technology introduces new AI ethics dilemmas, from the environmental impact of these tools to the unsettling possibility of replacing human educators, raising profound questions about the future of learning and the role of humanity within it.

On the other hand, the Opportunities in Higher Education identified can be mentioned as the following: The predominant approach emphasized innovation-centricity, positioning AI as a transformative force and a catalyst for institutional adaptation. The dynamism of the startup ecosystem, characterized by rapid change and less hierarchical structures, appears to fuel a wave of educational empowerment. Employability and the degree of novelty introduced into the ecosystem were highlighted in some canvases as crucial metrics for effective education, underscoring the significance of venture design and startup funding for research and development investment, as indicated by the phrase "National investment in R&D ecosystem and startups," which signals a recognition of innovation and entrepreneurship within the educational sphere. This section presents the findings of the thematic content analysis, structured around three core concepts identified from the qualitative data: "The Ways of Learning and Student Lifestyle and Expectations," "Higher Efficiency through Industry Collaboration," and "New Types of Collective Intelligence in Education."

Concept 1b: The "Ways of Learning" and student lifestyle and expectations:

Concept	Description
Personalized and Flexible Learning	Tailored to individual needs and delivered in flexible formats, with options like "Designing in educational loops," "More self-paced and personalized learning," and "Offering modular programs."
New alternatives	Learn-as you go "Modular Patchwork" scenario with support on high tech learning platforms
New Types of Learners and Lifelong Learning	Growing market for lifelong learning and education catering to diverse age groups, including "New types of learners – elderly people, silver economy," "Aging population returning to studies," and the idea that "Studying is a lifestyle."
High-Immersive Experiences	Engaging, technology-enhanced learning environments that are crucial for development, blending tech with human experiences.

Concept 2b: Higher efficiency through Industry Collaboration:

Concept	Description
Data-Driven Efficiency	Potential for data to streamline educational processes if managed properly, despite concerns about "Data privacy."
Skills-Based Education and Industry Collaboration	Shift towards "Skills-based recruitment," where employers value "certification, bootcamps more" and "skills over degree," supported by the rise of professional certifications and practical accreditations.
Industry-Led Education and Microcredentials	Bridging the gap between education and employment through "Coursera certifications offered by companies and employers," "Large companies will develop their own education job-ready programs," and "Microcredentials offered by universities." Employer-Sponsored Higher Education: The example of "Employer-sponsored higher education – PwC and McKinsey choose to pay for employee's MA degrees" indicates a growing trend of corporate investment in employee development through formal education.

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Concept 3b: New types of collective collaborations:

Concept	Description
AI Integration and Human-AI Collaboration	AI's transformative potential in education through "AI agents: that can be filled with the roles of experts," "Cooperation with AI / Human-AI collaboration / Tech enablement empowerment," and "Rise of AI mentors."
Global Accessibility and Collaboration	Education transcending geographical boundaries through "World-class content = global collaboration / globalization and connection between cultures and workplaces" and "Global accessibility."
Community-Led Learning and "Give Back" Attitude	Opportunities for localized, socially conscious, and community-driven learning models, including "Community schools" and "Forming 'give back to the society' attitude," emphasizing continuous personal and professional development with a focus on student well-being.

Table 2 Opportunities in Education, Based on the author's own research

The thematic analysis of the canvas revealed that the younger generation is confident that the status quo will change, as AI necessitates a new indicator reflecting a shift in perceived value. These concepts encapsulate the evolving landscape of higher education, highlighting a paradigm shift towards more individualized, industry-aligned, and technologically integrated learning environments. The first concept, "The Ways of Learning and Student Lifestyle and Expectations," explores the shift towards personalized and flexible learning, new alternatives for educational delivery, the emergence of new types of learners, and the increasing demand for highly immersive educational experiences. This encompasses the need for educational environments that adapt to individual needs, learning styles, and aspirations through AI-powered platforms that customize content, pacing, and feedback, thereby fostering greater student or better to say "community-driven" ownership of their education. The integration of artificial intelligence is pivotal in this transformation, enabling tailored educational paths and optimizing teaching methodologies to enhance student outcomes This shift towards personalized learning also encompasses the integration of novel pedagogical approaches, such as "Designing in educational loops" and "Modular Patchwork" scenarios, which promote continuous engagement and flexible skill acquisition through cooperation and boosting radical interdependence and collaboration in the networks and communities.

4.2 Findings from the workshop facilitators' observations and reflections

Following the analysis of student-provided content, we summarized observations from workshops using canvases. All workshop details are available in Appendix 1. We gathered and analyzed insights from facilitators' experiences across 25 workshops, with a comprehensive list of these workshops and their characteristics appended to this document. The emergent findings are synthesized into a model we term the PIVOT learning approach, which will be elaborated upon. Broadly, two predominant themes emerged: the tension between technology-focused and human-focused paradigms, and a concept we identify as 'Innovation-centricism.' During the scenario-naming process, a recurrent dichotomy surfaced between human-centered and technology-centered objectives. Scenarios that envisioned human-AI co-teaching presented a counter-narrative to purely automated processes, highlighting a focus on purpose, meaning, and value. The prioritization of innovation, or 'Innovation-centricism,' was a core theme, advocating for collaborative innovation efforts. This involves granting extensive access to specialized education while simultaneously motivating individuals to concentrate on their own creations and inventions, thereby fostering innovation through novel applications of established knowledge. Beyond these two principal narratives, other observations have been categorized and integrated to formulate the PIVOT model that sets directions for designing the canvas that can be used during the workshops:

P	**Purpose-driven**	Emphasizes the focus on value, societal impact, and addressing inequalities. When working with pre-designed canvases, students inquired about the purpose of the exercise and the subsequent use of the results. Observations indicated a tendency for students to bypass certain sections to expedite the process of reaching solutions. Moreover, when independently sketching modules, they incorporated sections labeled 'purpose,' 'objective,' or 'problem statement.' The emphasis on purpose, value, and social impact was evident as students naturally engaged in discussions concerning societal well-being, equity, and the ethical considerations surrounding technology and education. Students prioritize purpose, value, and reducing inequality, discussing how education can either democratize or "elitize" higher education and widen skill divides. They also see opportunities for inclusivity, reintegrating marginalized groups, and view sustainability as key to fostering ethical and environmental awareness. In essence, visual frameworks serve as vital tools in fostering a comprehensive understanding of AI's implications across various dimensions

I	**Imagination-led**	This approach emphasizes creativity, the use of open-ended terminology (naming and vocabulary used on the canvas without limitations), and the design of solutions that extend beyond predetermined boundaries. Within the structured parameters of the pre-defined canvas, students occasionally omitted sections or adapted existing components. For instance, in analytical exercises, a preference for the STEEP framework was observed over the prescribed PESTEL model, despite explicit guidance on the latter's utilization. In exercises involving frameworks such as the Value Proposition Canvas, Customer Journey Map, or Persona canvas, participants tended to follow instructions in a directive manner; however, engagement increased when visionary components were introduced, highlighting a preference for imaginative thinking over imposed limitations. Students demonstrated a greater capacity for engagement when granted autonomy in terminology, naming conventions, and the design of scenario dimensions. The scenario thinking matrix yielded significant insights from a content perspective. This was validated not only through the "drawing from scratch" exercise but also through elements such as matrixes where participants were tasked with designing the titles for the dimensions. Creative exploration thrives in the absence of imposed restrictions, indicating that imagination functions more effectively when not confined by limitations.
V	**Visually-rich**	This approach emphasizes the engagement derived from visual mediums such as drawing, collage, and other artistic methodologies. The inclusion of visual arts, like collage, 3D visualization using tools such as Playmobil.pro figures, fostered more dynamic discussions compared to activities lacking this visual component. Notably, some groups spontaneously visualized personas using Generative AI tools even when not explicitly requested. Interactive and hands-on elements, including activities like 'drawing from scratch,' designing matrix titles, and employing artistic visual methods, proved highly engaging. Interactive elements and visual canvases are crucial for student engagement training. Activities like data analysis with Python, NotebookLM, fact-checking, and using QR codes leading to more advanced sources are recommended. Finally, we found that visual methods like vision boards and collages were popular and engaging elements of the workshop. These approaches not only facilitated a deeper understanding of the subject matter but also empowered students to express their ideas and perspectives effectively [14].

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O	**Outcome-focused**	With focus on outcomes reflects a strong emphasis on employability and the practical application of educational pursuits. Students desired a practical focus for the problem. While utilizing the Design Thinking Canvas, feedback indicated that prototyping, even if time permitted, was perceived as merely a procedural step or was perceived as something for the sake of the exercise. The interesting discussion is on the ownership and control in the educational ecosystem. This highlighted a tension between access and corporatism, with "corporate universities" potentially dominating or partnering with tech companies, leading to industry-led direct result result-oriented education. Industry-driven versus on-demand learning models, encompassing both skills and formal education, represent a shift from traditional, fragmented degree structures. Once again students are convinced that the education need to radically adapt. The proposed scenarios were provocative, suggesting the direction of change in the education: courses should be shorter, more modular and personalized. In each scenarios the indicators were around the employability opportunities after graduation, stating the question of relevance: Will graduate education stay relevant in the future world considering the development of technologies and changes in the job market?
T	**Thought-provoking**	The future thinking canvases were viewed as a mental exercise that fostered a broader perspective for problem-solving. Critical Thinking enables critically analyzing societal divides, integrating technology, and contemplating future scenarios. Observations highlighted this, particularly when using a variety of megatrend cards, which encouraged exploration and the development of selection criteria, rather than simply picking cards. Students actively considered employability, the relevance of education, and AI integration. Thought-provoking is also about discussion on ethical AI and Human Values: Students emphasized the necessity of addressing ethical considerations, such as security, trust, and responsible technology use.

Table 3 Explanation of the PIVOT model's elements.

Proposed PIVOT model encapsulates the core attributes and practices that support effective learning, design, and innovation within interdisciplinary and intercultural contexts, leveraging both human and technological resources and is open to modifications from the teachers which enables co-creation and tailoring the FOLD canvas to various subject-matter, resources and workshop time-scheduling scenarios.

4.3 Implications for facilitators: Designing FOLD – Future Oriented Learning Canvas

To make this research practical and to provide educators with a new tool in response to the evolving landscape of AI in education, we developed of novel pedagogical tools and frameworks – the FOLD canvas, fostering deeper engagement and critical discourse surrounding the futures of education in an AI-dominated world [35]. A novel, hybrid canvas—synthesizing design thinking, systems thinking, and anticipatory governance—holds promise as a mechanism for fostering deeper engagement in the discourse surrounding the futures of education within an AI-dominated world. This hybrid canvas can integrate elements of design thinking to encourage creative problem-solving, 12 systems thinking to promote a holistic understanding of complex interdependencies, and anticipatory governance to facilitate proactive planning and ethical decision-making. The focus on Agile Social Learning framework with participatory IT design, project-based learning is important to develop citizen development approach [14] In the final phase of the research, all observations and thematic analysis insights were synthesized to design a novel canvas. This framework transcends traditional design thinking by emphasizing future-oriented perspectives and incorporating established Foresight frameworks, augmented with visual elements. It is designed to be flexible, moving beyond rigid output definitions, and is dynamic in its physical folding mechanism and its reliance on facilitator-provided QR codes for inspiration. Its universal adaptability allows for seamless integration into various courses and workshop durations. This canvas framework cultivates structured dialogue, enabling students to critically consider AI's influence on business models, strategic planning, and technological innovation.

To describe the flow of the work with FOLD canvas, the process commences with an "Observatory" phase, focusing on the collection and analysis of user experiences, identification of prevailing trends, and exploration of megatrends. This is followed by the "Problem Statement" phase, which defines the central issue under consideration. The third component is a standard scenario development matrix, uniquely enhanced by a separate, dedicated page that requires participants to physically turn it over. This facilitates the transition to the "Desired Future" stage, which is envisioned through visual collage, acknowledged as a highly engaging method. The final stage involves "Backcasting," where the outlined vision's "Value Proposition" and "Sustainable Value Proposition" are articulated. The methodology also incorporates a visual space for documenting indicators and outlining subsequent steps.

Figure 1 FOLD Canvas

The canvas serves as a universal tool, necessitating expert facilitation by a professional experienced in Future Thinking. This facilitator dictates the scope of each canvas component's application, determines areas of emphasis, and selects supplementary resources. Furthermore, the facilitator is responsible for choosing the visualization methodology for the "Desired Future Board Part." This entails selecting collage materials, curating a compilation of pertinent megatrends and trends, and choosing the methods for synthesizing gathered information, such as employing mind mapping techniques. In essence, this approach ensures a structured and effective exploration of future possibilities and strategic planning [36].

5. Research limitations & Conclusion

In the academic year 2024/25, a summary of workshop facilitation was conducted. This process identified challenges and opportunities within education in the age of AI, drawing from thematic analysis of student-created canvases. Leveraging insights from 25 cross-cultural workshops, the PIVOT model was developed to illustrate the design of a universal canvas that enhances engagement and integrates advanced AI knowledge into practice. This versatile canvas is applicable across various contexts. Although it requires real-world validation and continued post-workshop observation, its universal nature supports scalability. Potential future improvements include minimizing self-reported feedback and integrating quantitative physiological data. This paper supports practical applications of Foresight tools, referencing the ACTVOD workshop scenario [37] as a readily applicable framework that significantly contributes to active teaching methodologies in the AI era.

The collected material from the workshops revealed the richness of facilitated creative sessions that incorporated elements of creative pedagogies and socio-emotional facilitation. While measuring student engagement directly was challenging due to the diverse nature of the workshops, it presents a potential avenue for future research, possibly employing non-declarative methods such as emotion recognition software. The authors hope this universal framework will be adopted as a practical tool, freely available for use, modification, and adaptation to individual teaching materials and facilitation styles.

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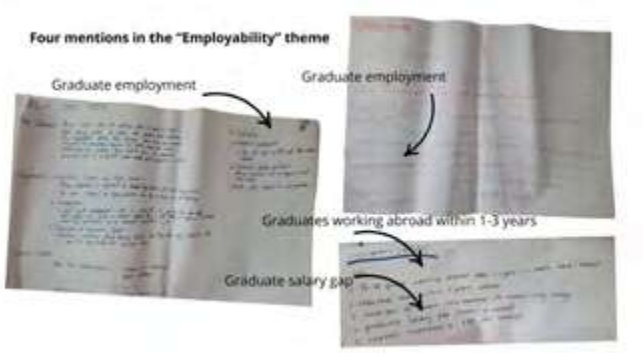

Attachment No. 2

Frequency	Theme
High	Skills-Based & Alternative Credentials
	Lack of Personalized Learning
	Lack of Value of Degree because better perceived new institutional business alternatives
	Lack of Practicality
Medium	AI Integration & Technology
	Lack of global collaboration skills (technology and tool oriented approach instead of meaningful connection and social learning process)
	Quality of Teaching & Experience
Low	
	Recruitment & Skills Mismatch
	Multigenerational workplaces challenges
	Financial & Social Issues
	Academic & Ethical Issues
	Ethical & Social Development

Attachment No. 3 Challenges of Education: Frequency of mentions in the thematic coding