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A Catalyst For Change: Moving Toward Pedagogies Of The Possible Through Talent Development

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Abstract
The development of technologies has created the need to gain a better understanding of the nature of creativity and learning. Investigating the impact of the "digital creativity" and "giftedness and talents" holds the potential for gaining new insights that will assist with the development of learning to foster creativity. The author first explores some of the general beliefs that interfere with efforts to systematize the understanding of pedagogy, giftedness and talents, digital technologies and creativity. Then the author outlines the model of creativity and learning, including technology mediated creative learning practices and immersive technology. Third, the author discusses the features of "Pedagogies of the Possible". Implications for educational practice and research bring the discussion to an end. The aim is to highlight the challenges and opportunities of these themes of pedagogy, giftedness and talents, digital technologies and creativity, and to suggest recommendations to support further development of innovative digital teaching and learning practices. Both quantitative and qualitative tools and methods were utilized.

Key Terms: *Pedagogies of the Possible, Giftedness and Talents, Creativity and Learning, Intelligent Learning Space*

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I. Introduction

Pedagogies of the Possible

The major trends in the current transformation of work are education and digitalization Brandl & Attila, 2024:200 . Digital technologies is penetrating our lives and students have grown up in the context of their widespread use Barabanova, Nikonova, Gazizova, Khvatova, & Romashkova, 2024:319; Albano, Meng, Xu, & Li, 2024:95 . Pedagogies of the possible enable students to put their learning and gifts to creative work Beghetto. & Glăveanu, 2022:25 . The fourth industrial revolution features smart machines or artificial intelligence (AI) and AI-based automation Zhao, Basham, & Traver,s 2022:409 . It is important to note that AI is defined as augmented intelligence and is similar to artificial cognitive system Derke, 2020:21; Kharina, 2024:511 . The role of education must be to develop mindsets that allow students to respond to challenges. This is the domain of creativity—the ability to devise effective solutions to problems Henriksen, Richardson, Gruber, & Mishra, 2022:105 . The adoption of immersive technologies (virtual environment) promotes student engagement in critical thinking Wagner & Liu, 2021:71; Chan & Cheung, 2021:105 . The educational environment should be built on the basis of open and accessible learning technologies that means the use of mobile technologies to support all forms of the educational process Deev, Finogeev, Gamidullaeva, Schevchenko, & Finogeev, 2021:486,487 .

Talent Development

Gifted education is facilitative to the development of students' potential that the human capital argument educates the promising children to be future professionals Cross & Cross, 2021:91; Dai, 2022:107 . Talent development is a complex system with students' potentials interacting with other people within their social circles Plucker, McWilliams, & Guo, 2021:300 . Now may be a critical time to make the paradigm shift that gifted education can be a catalyst for change by demanding the best education for all students. Committing to developing the talents of all students will bring about a new era in education Cross & Cross, 2022:100 . Digital technologies are reshaping the landscape of education today Li, & Zaki, 2024:191 . The emergence of AI language models has opened up new possibilities for learning and instructional support (Nguyen-Nhu Le, Nguyen, Nguyen, & Bo, 2024:52). States' progress is based on the provision of knowledge and skills to workforce and providing opportunities for younger generations to develop their talent in the employment, so it demands more expansive thinking about the nature of giftedness and talent development Ambrose, 2021:1 .

The local communities are introducing fundamental transformation in the national education policies adequate to modern employment trends and workforce requirements Eteris, 2024:99 .

Creativity and Learning

With the technology shifts, it is an imperative for a skilled workforce so thta technology-enhanced learning will require innovation in education Manjón, 2020:10 . The opportunity for talent development toward excellence is necessary Blumen, 2021:21 . Digitalization influences the pedagogy, making us reliant on creativity Alsharah & Alsaeedi, 2024:260 . Schools have a role to play in preparing students for the trials posed by the societal issues underlying the sustainable development goals (SDGs) Van Meerkerk, Neele, & Van Korven, 2021:239; Möller, Unterberg, & Jörissen, 2021:126 . There has been an increasing emphasis on the development of creative competence in education as a goal to help prepare students for an uncertain future Baruah & Paulus, 2019:155; Corazza, Darbellay, Lubart, & Panciroli, 2023:72 . Creative learning is mediated human action and a psychological process which is a means of explaining how social and participatory learning take place Glăveanu, Ness, Wasson, & Lubart, 2019:67; Lassig, 2021:1048 . Education should provide new learning experiences that reflect the changing nature of work and technology. This has enabled educators to develop creative learning spaces Parsons & MacCallum, 2022:9 . The way of education reforms seems the directions in accelerating education towards new challenges to equip students with knowledge for socio-economic development Eteris, 2024:2 .

Creative Economy

Creative thinking is the high point of human cognition that empowers individuals to learn new knowledge and discover new possibilities Gilhooly & Gilhooly, 2021:1 . Creativity, the ability to devise novel and effective ideas and solutions, is essential in addressing the uncertainty and challenges Henriksen, Richardson, Gruber, & Mishra, 2022:104 . The power of those creative minds has been growing due to advances in technology Glăveanu, Ness, Wasson, & Lubart, 2019:64 . Technology is a key factor in enhancing innovativeness, and innovators are able to develop sustainable competitive advantages Manjón, 2020:41,173; Bas, 2022:9 . Innovative digital online tools can offer optimal scaffolding with potential for successful learning Brandl & Attila, 2024:198 . Due to AI and automation in manufacturing, the work environment is being shaped by creative economy Rech, 2024:311-312 . Creativity economy demands the transformation of education, and gifted education is a force to promotes such a change. Those educators should make efforts to nurture talent and encourage creativity Smith, 2021:13,14; Mullen, 2020:23 . The technological advances that defined the new economy changed the way we learn Tardif, 2020:187 . Creativity drives economic and technological growth, we need to put forth suggestions for the new creativity agenda Murthy & Page, 2023:76 .

Related Researches

Scholars do researches into the themes “Moving Toward Pedagogies of the Possible Through Talent Development ”, and come to the conclusions as described below: First, necessity is the mother of invention and helps us connect creativity and innovation to the human need Lee, O’Mahony & Lebeck, 2023:149 . Second, the brain is the central engine in the creativity machine that it drives all the competencies necessary for creative intelligence (CiQ) De Villiers, 2022c:51 . Third, creative ideas contain three core elements that are original, appropriate, but also artistic Kilgour, 2022:77 . Fourth, uncertainty is inherent in all creative efforts Runco, 2022a:23 . Fifth, our educational system is in need of creativity Tardif, 2020:110 . Sixth, the learning futures are intertwined with the technology-enhanced learning Koh, 2022:198 . Seventh, teaching has been explored as a creative process Doyle, 2019:41 . Eighth, creativity, critical thinking and problem-solving skills are marked as essential for effective learners and future employees Harris & De Bruin, 2019:99 . Ninth, AI has the potential to revolutionize education and Chat GPT can be a valuable tool enhancing the learning experience Modran, Chamunorwa, Ursut,iu, & Samoil˜a, 2024:499 . Tenth, simulation-based training coupled with AI offers a solution to equip educators to navigate complex educational settings Cowin, Oberer, Lipuma, Leon, & Erkollar, 2024:532 . Eeventh, giftedness can be conceptualized as a propensity to use creativity-generating intellectual styles Zhang, 2021:489 .Twelfth, gifted children have a need for specific cognitive support and a need for social and emotional support Margrain & Van Bommel, 2022:43 . Thirteenth, the intelligent learning space is created through the application of emerging technologies Moid, 2022:213 . Fourteenth, the advent of the digital transformation provides opportunities for the future by expanding learning experiences Antonczak, Neukam, & Bollinger, 2022:37 . Fifteenth, The innovative approaches connect pedagogy and digital technologies to activate learning that educators embrace digital technologies as a tool to support learners Nykvist, Mukherjee, & Blundell, 2022:245 .

II. Aims, Underlying Assumptions & Method

The development of technologies has created the need to gain a better understanding of the nature of creativity and learning. Students will shape the future that look different from our world. The demand for new ways of thinking and acting goes beyond the conventional agenda of education. Giftedness can be conceptualized as a propensity to use creativity-generating intellectual styles. Broadening educators' understanding of the influences of digital technologies on creativity in education has potential to foster learning environments more welcoming to creative expression. Investigating the impact of the "digital creativity" and "giftedness and talents" holds the potential for gaining new insights that will assist with the development of learning to foster creativity. The author raised the issue of "how to harness technology for talent development", stressing that appropriate use of the internet can increase access to gifted education programs or relevant curricula. The author also provided a framework for using technology for greater access to educational options. Online programs with enrichment strategies maximize the creativity and potential of gifted learners. The paper offers considerations for how we can take on the future through the transformation of educational efforts.

The author first explores some of the general beliefs that interfere with efforts to systematize the understanding of pedagogy, giftedness and talents, digital technologies and creativity. A comprehensive literature review was conducted. Then the author outlines the model of creativity and learning, including technology mediated creative learning practices and immersive technology. Third, the author discusses the features of "Pedagogies of the Possible", highlighting the kinds of new possibilities and transformations that come from such experiences. Finally, the author presents the main conclusions drawn from the study and offers insights for future research and practical interventions aimed at supporting today's working life and the future in the case of learning. Implications for educational practice and research bring the discussion to an end. In this way, this paper offers a complementary view to previous syntheses about education for creativity. The aim is to highlight the challenges and opportunities of these themes of pedagogy, giftedness and talents, digital technologies and creativity, and to suggest recommendations to support further development of innovative digital teaching and learning practices. The author elaborates on these trends with an emphasis on how gifted education can be made more productive—capable of producing a reservoir of talent for future innovators. Both quantitative and qualitative tools and methods were utilized. This design, which is shown in Figure 1, shows that the results should provide decision-makers in education policy and reforms with a better understanding of potential development trends.

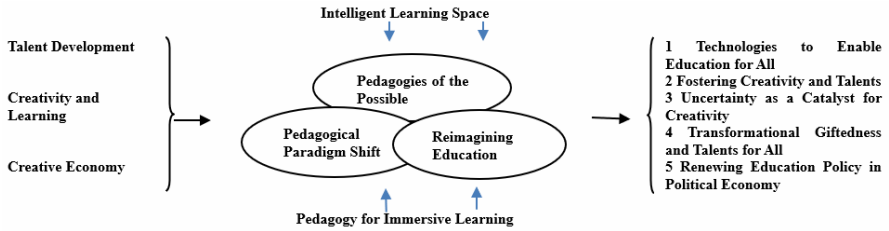

Figure 1. Research Framework

Theoretical Framework

Pedagogies of the Possible

For something to be labelled as creative, it must possess two primary elements: originality/newness/novelty, and effectiveness/usefulness/appropriateness Taherysayah & Westermann, 2024: 153; Pinheiro & Simão, 2023:33; Lemmetty, Glˇaveanu, Forsman, & Collin, 2023:2; Beghetto, 2023:26-27; Goodwin, 2023:19; Renzulli, 2021:184; Choi & Kaufman, 2021:69; Simonton, 2022:296; Cahill & Petersen, 2022:276 . Creativity is seen as stimulating cultural literacy learning through openness and curiosity to develop something new or imaginative Lähdesmäki, Baranova, Ylönen, Koistinen, Mäkinen, Juškiene, & Zaleskiene, 2022:1 . Scholars have proposed various models to describe the creativity process. Sternberg argues that creativity is three-dimensional and requires analysis, synthesis and contextualizing De Villiers, 2022a:8 . Guilford's major contribution was probably the distinction between divergent production and convergent production Runco, 2022b:175 . Wallas's model of creative thinking proposed four stages: preparation, incubation, illumination and verification Holm-Hadulla, 2023:13; Murthy & Page, 2023:77 . Rhodes defined creativity as taking place when a person makes a communicable product which have become known as the 4Ps : person, process, product and press Tippett & Gonzalez, 2022:134 . The new 6Ps model expands person to add partnerships, expands press and elevate the role of politics/philosophy De Villiers, 2022a:14 . Glaveanu emphasized that creativity is embedded in a socio-cultural context, and suggested substituting the 4Ps with the 5As: actor, action, artifact, audience, and affordances. Teaching has also been seen as a creative process Doyle, 2019:42; Lee, O'Mahony & Lebeck, 2023:38 . Kaufman and Beghetto's theory on creativity is the Four C Model of Creativity. The 4-C theory differentiates creativity as (1) inherent in personal meaning-making and learning (Mini-c), (2) recognition of a creator's Mini-c idea or creation (Little-c),

(3) professional expertise in an area of creativity (Pro-C), and (4) eminent creativity reserved for greatness (Big-C) Choi & Kaufman, 2021:69-70; Cropley & Patston, 2019:273; Fasko & Rizza, 2019:385; Cotter, Beghetto, & Kaufman, 2022:250-253 . Amabile highlights the importance of creativity-relevant skills, domain-specific skills, and intrinsic motivation Choi & Kaufman, 2021:70 .

Creativity and learning are becoming vital in a variety of educational settings Ness, 2023:195-196 . Gardner's theory of multiple intelligences identifies eight distinct intellectual strengths: bodily kinaesthetic, interpersonal, intrapersonal, language, logical-mathematical, musical, naturalistic, and spatial De Villiers, 2022a:11 . Gardner's work on human intelligence emphasizes that intelligence is best conceived of as the product of dynamic process involving individual competencies and the opportunities afforded by society Plucker, McWilliams, & Guo, 2021:297 . There are three major approaches to developing programs for gifted and talented learners: content-based instruction, process skills focusing on higher-order thinking skills; and concept- or theme-based curricula Vidergor, 2021:469 . Dorothy and Jerome Singer noted that preschool age children inhabit the golden age of socio-dramatic and make-believe play, and reported that these children appear to be more capable of creative thought. Paul Torrance identified four major characteristics of the creativity process, including originality, flexibility, fluency, and elaboration. According to Csikszentmihalyi, the creativity act is based on human evolution and involves two specific mechanisms: motivation to discover novelty and motivation to relax and renew Bergen1 & Rousta, 2019:68,69 . Pedagogies of the possible represent a special case of creative learning that includes possibilities for people to make creative contributions Beghetto. & Glăveanu, 2022:27 .

Giftedness and Talents

Giftedness is the potential or talent to achieve substantially above the level of one's peers in a domain Simonton, 2021:393,394 . It can generate a debt with respect to the gifted individual's family or the school environment Tordjman, Besançon, Pennycook, & Lubart, 2021:252 . Talent is a structural and functional property of the person relative to context and time, and a form of neurodiversity that means special brain development and nervous system functioning which results in cognitive, sensory, and emotional exceptionalities David & Gyarmathy, 2023:32 . A person's talent potential is not a fixed capacity but depends on the person's environmental opportunities Dai, 2021:102 . Talent is the tip of the iceberg of giftedness because not all children have the opportunity to develop their potential Tordjman, Besançon, Pennycook, & Lubart, 2021:254 . Sternberg's triarchic theory of giftedness, noted that talent development requires creative production and practical intelligence Subotnik, Olszewski-Kubilius, & Worrell, 2021:426 . To be gifted means not simply being highly able, it is rather a specific attitude, a drive to change. Hollingworth called the IQ range 125–155 socially optimal intelligence David & Gyarmathy, 2023:15 . Technology has extended human capabilities, and schools must focus on developing human qualities Zhao, Basham, & Traver,s 2022:410 . The purpose of providing supplementary resources for the development of giftedness is to increase the world's reservoir of highly creative and productive individuals Renzulli, 2021:187 . Most scholars of giftedness embrace the idea of a developmental trajectory throughout the life-span (Three Ds). The goal of gifted education should be talent development through initiating interactions between person and learning environment, and adapting learning environment in accordance with progressive adaptations through applying the acceleration and content-enrichment curriculum Sak, 2021:387 .

Intelligent Learning Space

The fifth industrial revolution, marked by cyber-physical systems, inspires Education 4.0 which refers to education that leverages advanced technology adaptive learning. The interconnectivity of the Internet shapes the future of learning Ghamrawi, Shal, & Ghamrawi, 2024:174,175; Solanki, Sujee, & Dalwai, 2024:95 . All this in conjunction with implementation of emerging technologies like AI and Virtual reality etc. made it possible to customize not just the knowledge dissemination as well as the learners' capabilities Moid, 2022:214 . Combining these resources will enable the students to obtain the desirable critical competencies needed for future work Almela, 2023:150 . Salgues defined Society 5.0 as the AI society that connects the physical and cyber spaces Sharonova & Avdeeva, 2024:113 . Changes are expected to happen in education, where AI's smart methods will play a dominant role Gr. Voskoglou, 2024:131 . There has been a focus on what are called twenty-first century skills, such as the "4Cs" of creativity, critical thinking, collaboration, and communication Parsons & MacCallum, 2022:5 . Students must be empowered in the pedagogy learning approach and possess digital literacy skills.

Creativity has been affected by the digital shift Di Marco, Tedjosaputro, & Lombardi, 2024:3 . AI, including its subsets machine learning (ML) and generative design, can emulate human cognitive processes Feng, 2024:23 . Sternberg's WICS (Wisdom, Intelligence, Creativity and Synthesized) model posits that gifted individuals synthesize wisdom, intelligence and creativity Choi & Kaufman, 2021:69 . Digital Transformation is described as organizational change triggered by the widespread diffusion of digital technology Marx, 2022:66 . Virtual environments are increasingly recognised as valuable tools for fostering

creativity Taherysayah & Westermann, 2024:155 . The application of AI and machine learning (ML) in education is marking a paradigmatic transformation Dall'Asta & Di Marco, 2024:193; Hutson, Lively, Robertson, Cotroneo, & Lang, 2024:26 . The digitalization innovations are referred to the enablers of environmental sustainability Alsharah & Alsaeedi, 2024:261 . The digital learning represents a pedagogical approach that utilizes interactive and immersive digital games to nourish the development of critical thinking and problem-solving skills for active learning Albano, Meng, Xu, & Li, 2024:95 .

Pedagogy for Immersive Learning

The fifth industrial revolution, known as smart manufacturing, is characterised by exponential technological breakthroughs in the fields of robotics, artificial intelligence (AI) and the Internet of Things (IoT), offers an innovative learning environment, and will alter the way we live Razak & Moten, 2023:120; Li, & Zaki, 2024:202; Solanki, Sujee, & Dalwai, 2024:96 . It shows technologies must be integrated into the education Okashah, Hamid, Kim, & Rubin, 2023:108; Mohezar, Jaafar, & Akbar, 2021:37; Wong, Kwong, & Chan, 2021:122 . These new approaches of learning extend on developments in human-machine interaction to develop new models of teaching. Immersive learning seeks to embed learners into a virtual environment Aguilar, 2021:167 . Innovation and creativity have changed our lives, and they may be the age of sustainability Tardif, 2020:192 . AI in education has taken the form of intelligent tutoring systems, adaptive learning systems, and other systems that improve the quality of the educational process Modran, Chamunorwa, Ursut,iu, & Samoil˜a, 2024:500 . The integration of AI into creative practices has the capacity to revolutionize the way we teach and learn, unlocking novel avenues for creative expression Hutson, Lively, Robertson, Cotroneo, & Lang, 2024:87 . Digital education has been a wake-up call to the education governance to understand the benefits of new technologies for the digital learning Eteris, 2024:88 .

III. Local Community In Global Context: Taiwan Experience

1. Status Quo

Committing to Talent Development for All

The definitions of gifted and talented encompassed multiple areas, including intellectually gifted, academically gifted, performing/visual arts, creatively gifted, and specific academic areas. It is the school's responsibility to nurture those gifts and talents. The school-based conception of giftedness (SCG) system supports children with high intellectual potential based on acceleration, enrichment, discipline-oriented training delivered in optional courses, and special initiatives. Students are able to see opportunities for enhancement. A first step in bringing about change is to shed our notions of what gifted education adopts a more inclusive and more effective approach. The popular Schoolwide Enrichment Model (SEM) promotes the component of talent development that combines with a more flexible approach to serve high-ability students in a variety of educational settings. Both schools and students are responsible for the development of talent and students have access to opportunities for talent development. It is incumbent on schools to provide ample opportunity, scaffolding and challenge to students. Curriculum are designed around the development of talents.

Changing the Education Landscape

The rapid development of information technology has significant implications for work. Internet connectivity, laptops, smartphones and cloud computing make it possible for more companies to implement flexible working. The changing nature of the organizational structure has witnessed a shift in the demand of workers to advanced cognitive skills. The use of the Internet has begun to change the educational landscape. Distance education paves the way for the evolution of smart education that this creates a hybrid educational space. The evolution of digital learning has brought changes in how we teach and how students learn. The changing nature of digital technologies and how they are used in society will continually present challenges for educators. Digital educational resources are a priority of educational policy because that diverse and accessible learning opportunities ensure the smooth transition, and that the relevance of training options to the needs of the development of society and the labor market. Those educators create a dynamic learning environment that encourages critical thinking and exploration. By acknowledging the creative motivations of students, educators can integrate AI into the art classroom while fostering critical thinking skills.

Creativity in the Curriculum

In recent years, national curricula have been developed or updated in Taiwan, including STEM (science, technology, engineering, and mathematics) or STEAM (merges the arts with STEM subjects . While teachers need to be supported in their endeavours to provide for gifted students, online learning and mentoring come to mind. Those educators are toward a dynamic conception of giftedness. The National Science and Innovation Agenda emphasizes the importance of STEAM being prioritized in the curriculum and, a national STEAM strategy was developed. The prioritization on the STEM disciplines has led to the recommendation by

creativity. Most of the gifted programs have a curriculum focus on science and mathematics. Adjustments were made to gifted and talented classes, which include the system-wide adoption of STEAM curriculum and programs. STEAM education has evolved into the pedagogy for gifted and talented students to support their high abilities and creative minds. Creativity in education has become synonymous with critical thinking and innovation. The seeds of creative thinking are cultivated during early childhood.

Labour Market in Educational Reforms

Under the influence of the digital revolution, there are qualitative changes in the labour market. In order for research and innovation to be successful, the local communities need funding that turning technological discoveries into a greater number of industrial applications. The national education systems shall develop in line with the growing education challenges to provide adequacy to changing needs and employment. Skills in creativity, critical thinking, initiative's taking and problem solving play an important role in coping with changes. It is recognized the need for new ways of learning, as well as more flexible training and educational models to tackle the mobile and digital employment. One of the important problems in the local communities is employment, particularly among young people. The government has to take active actions to provide young people with adequate opportunities to: help youth to develop their potential in taking part in future growth, provide a bridge to jobs for the next generation through, and some additional measures to support youth employment.

In order to allow citizens with disabilities and giftedness to receive adaptive education and fully develop their abilities, Taiwan has already passed the "Special Education Act" and relevant branch laws for diagnosis procedure. The governments aim to promote technology education that is prospective or pioneering. Students are trained in innovative ways. The effectiveness of teaching and the cultivation of professionalism are enhanced. Measures include planning of courses/academic programs, linking industry with academia, and international exchanges. To comply with the national policies of technology development, the implementation focuses on: "Social Science Education Pilot Project", "Science & Technology Education in Important Industries Pilot Project", and "Interdisciplinary Education of Humanities & Science Pilot Project". The Digital Learning Enhancement Plan for Grades 1-12 from 2022-2025 includes the "Internet Access for Every Classroom, Online Learning for Every Student" policy that subsidizes learning tool use by teachers and students during lessons. The main points are as follows: "Digital Environment", "Digital Content", "Teaching Applications", "Support System and Educational Big Data", and "Aligning with International Trends and Strengthening Domestic and International Promotion" (Minister of Education, 2025a:42,64-66). Table 1 illustrates changes in the Awards of Taiwan Students in International Science and Engineering Fair (ISEF), Year 1982-2025. Table 2 illustrates changes in the Medals Attained by Taiwan Students in the Asian Pacific/International Olympiad, 2020-2025.

Table 1. Awards of Taiwan Students in International Science and Engineering Fair (ISEF), Year 1982-2025

Year	Term	No. of Participants	No. of Awardees
1982	33	2	2
1985	36	2	-
1990	41	6	4
1995	46	6	3
2000	51	6	4
2001	52	8	7
2002	53	6	4
2003	54	-	-
2004	55	20	15
2005	56	11	10
2006	57	12	11
2007	58	10	6
2008	59	10	4
2009	60	11	7
2010	61	10	9
2011	62	12	6
2012	63	12	6
2013	64	13	9

2014	65	12	6
2015	66	11	6
2016	67	13	11
2017	68	13	6
2018	69	14	10
2019	70	13	12
2021	72	13	5
2022	73	21	12
2023	74	14	7
2024	75	20	11
2025	76	19	8

Source: Minister of Education (2025b). Analysis of International Comparison of Education Statistical Indicators. Ministry of Education, Republic of China (Taiwan).

Explanation: International Science and Engineering Fair (ISEF) is the highest level international science fair and competition.

Note: 1. Since 1982, R.O.C. has selected student representatives (including individuals and groups) to attend ISEF each year.

2. In 2003, due to the SARS outbreak, R.O.C did not participate the Fair, resulting in no awards or achievements for that year.

3. Due to the COVID-19 pandemic in 2020, ISEF was only organized as an online cultural exchange without grade competitions.

Table 2. Medals Attained by Taiwan Students in the Asian Pacific/International Olympiad, 2020-2025

	2020	2024	2025
Total	5G 12S 8B 3H	21G 13S 9B 3H	…
Asian Pacific Mathematics Olympiad (10 persons per team)	32th	36th	37th
Medals	1G 2S 4B 3H	1G 2S 4B 3H	3S 4B 3H
Asian Physics Olympiad (8 persons per team)	Postponed to 2021 due to COVID-19 epidemic	24th	25th
Medals		3G 5S	5G 3S
Rank		5	3
International Math Olympiad(6 persons per team)	61th	65th	66th
Medals	3S 3H	2G 2S 2B	2G 2S 1B 1H
Rank	23	11	20
International Chemistry Olympiad(4 persons per team)	52th	56th	57th
Medals	2G 2S	2G 2S	3G 1S
Rank	5(Calculated by Golds)	5(Calculated by Golds)	4(Calculated by Golds)
International Physics Olympiad(5 persons per team)	Postponed to 2021 due to COVID-19 epidemic	Due to the orange and red levels travel warning for Iran, the delegation was not participate.	55th
Medals			3G 2S
Rank			5(Calculated by Golds)
International Olympiad in Informatics(4 persons per team)	32th	36th	37th
Medals	3S 1B	1S 3B	1S 2B
Rank	Nil	Nil	Nil
International Biology Olympiad(4 persons per team)	31th	35th	36th

Medals	2G 2S	4G	1G 3S
Rank	4	1(Calculated by Golds)	8(Calculated by Golds)
International Earth Science Olympiad(4 persons per team)	Cancelled due to COVID-19 epidemic	17th	18th
Medals		3G 1S	3G 1S
Rank		2(Calculated by Golds)	2
International Junior Science Olympiad(6 persons per team)	17th Cancelled due to COVID-19 epidemic	21th	…
Medals		6G	
Rank		2	

Source: Minister of Education (2025b). Analysis of International Comparison of Education Statistical Indicators. Ministry of Education, Republic of China (Taiwan).

Explanation: Olympiads are annual international competitions held for the world's top high school students who have not yet enrolled in college and are under the age of 20. The difficulty level of the examinations in each subject is extremely high, which is why they are highly regarded in the international academic community.

Explanation: G= Gold, S= Silver, B= Bronze, H= Honorary award.

IV. Discussion

Technologies to Enable Education for All

We are now in a digital era, whereby innovations, driven by the emerging technologies, educate new skills according to the labour market's requirements and transform the workplace Mohezar, Jaafar, & Akbar, 2021:36; Bas, 2022:16 . Technology-enhanced learning (TEL) may require students to use new digital tools and engage in new ways of learning Koh, Tay, & Ali, 2021:182; Koh & Kan, 2021:205 . The emergence of digital platforms and smart devices has allowed to access a large pool of talent while offering opportunities for students Mohezar, Jaafar, & Akbar, 2021:8 . It is important to understand the influence on creative industries of technological advances, especially recent digital technologie Pedersen, Slavich, & Khaire, 2020:2 . Educators can no longer ignore the importance of digital technologies and must embrace them as an essential pedagogical tool Nykvist, Mukherjee, & Blundell, 2022:246 . This integration of AI in the creative process opens up the possibilities for students to understand creativity, and to collaborate with intelligent machines to augment their critical thinking Latto, 2024:124,125 . AI is opening up new possibilities for creativity in novel ways and teachers are challenged to adapt to a new paradigm and technological landscape to engage their students Di Marco, Tedjosaputro, & Lombardi, 2024:5 . These 21st century skills need to rely on critical thinking and problem solving to create innovative solutions. Our education must prepare for change, and provide students with an understanding of the social context Murthy & Page, 2023:211,213 . Education has a leading role in shaping the transitions necessary to adjust to the creative economy Almela, 2023:149 . Digital tools have become important for supporting creativity and learning Lemmetty, Gl˘aveanu, Forsman, & Collin, 2023:20 .

Fostering Creativity and Talents

The Little-c opportunities are core parts of the school-wide enrichment model that can inspire students to pursue the Big-C creativity Renzulli, & Reis, 2021:343 . Students develop mini-c insights any time they learn something new and meaningful. It is important for educators to be able to identify the mini-c insights of their students through creative moments Cotter, Beghetto, & Kaufman, 2022:253 . The growth of students is cultivated, and the creative projects of students had an impact on their post-secondary decisions and plans Mullen, 2020:40 . Providing an environment will increase students' chances of being creative Matsubara, Kosaka, & Kobayashi, 2022:182 . Creativity can be infused into activities by adding specific tasks that promote inductive and deductive thinking Fasko & Rizza, 2019:385 . The more a curriculum aims to promote innovation, the more it has to be open to unexpected future Thienen, Szymanski, Weinstein, Rahman, & Meinel, 2022:63 . Divergent thinking is used as estimates of creative potential Runco, 2022b:177 . Creativity is a necessary capacity for intelligence/giftedness Lassig, 2021:1051 . There was a focus on developing creativity skills in pull-out classes for gifted students; however, this is a focus that can be applied in the general classroom too Smith, 2021:1467 .

Uncertainty as a Catalyst for Creativity

We can draw connection between digital innovations and education by those advancements in digital technologies. Schools have been able to reach a more diverse student population through online learning and offer hybrid learning environments Leahy, Scragg, & Mishra, 2022:327 . Curiosity can be influenced through different teaching methods, and teachers can scaffold and encourage students to use uncertainty as a way to

explore without being afraid of taking risks Jirout & Matthews, 2022:260 . Complex challenges provide students with opportunities for creative expression, so that uncertainty serves as a catalyst for creativity Beghetto, 2019:146 . Educational efforts are future oriented that preparing young people for uncertain futures. The goal of gifted and talent development is that students deserve to have their unique capacities cultivated Elder, 2022:163 . Giftedness is associated with the use of creativity-generating intellectual styles, and educators are expected to alter their teaching practices and the learning environment Salmi, Maamari, & Tekin, 2022:41 . There is a need for workers to sustain their employability, and it becomes imperative to understand the employability agenda that is becoming the national priorities Billett, Leow, & Le, 2024:74 . Society requires the integration of young people arriving on the job market and the achievement of inclusive and sustainable growth Saied & Mokaddem, 2024:533 . Education and training have become the drivers for both the workforce and national growth. The educational component underlines the need of constant trans-formative measures and reforms Eteris, 2024:10,11 .

V. Conclusions And Suggestions

Challenges and Issues

Moving Toward Pedagogies of the Possible

The justification for gifted education is to increase the world's reservoir of creative and productive people, and this requires an understanding of how to establish the optimal environment to foster creativity Lassig, 2021:1052 . Creativity development needs to be infused throughout education, and students are more likely to pursue creative opportunities leading to more productive lives Renzulli, & Reis, 2021:351 . By going beyond the traditional IQ-based ways of defining giftedness, we can increase diversity in gifted education Choi & Kaufman, 2021:71 . Creativity is one of the important characteristics that differentiate individuals and is important for survival Mohezar, Jaafar, & Akbar, 2021:10-12 . In order to turn their giftedness to creativity, those high-potential students need learning support that tailored according to their needs Tordjman, Besançon, Pennycook, & Lubart, 2021:274 . Education of students with creativity and talents must begin in the general education program. It is time to integrate gifted education with general education Gentry, 2022:194 . The fusion of technology and creativity offers us opportunities to expand our notions of what it means to be creative. We can shape a future where creativity knows no boundaries and where technology becomes a catalyst for the possibilities of human imagination Hutson, Lively, Robertson, Cotroneo, & Lang, 2024:34 .

Transformational Giftedness and Talents for All

Education is charged with the responsibility for helping students become productive members Zhao, Basham, & Traver,s 2022:404 . If everyone can be creative and develop their potential, it seems wise to respect every individual's transformational effort Choi & Kaufman, 2022:54 . We need to reimagine excellence and ask ourselves what the education looks like when it fosters excellence Fasko & Rizza, 2019:394,395 . Educating for creativity becomes an effort aimed at promoting higher levels of potential for originality and effectiveness, as well as the conditions that transform hidden-creativity into some form of creative achievement Mullen, 2019:16 . Scaffolding talent potential and skill development are critical for students that enrichment opportunities develop skills and display talent potential may be needed Olszewski-Kubilius, Subotnik, Worrell, Wardman, Tan, & Lee, 2021:106 . To develop individual uniqueness as giftedness, education needs to cultivate the spirit of transformation so that students are able to become unique. This education paradigm requires the following changes: Firstly, acceptance of learner variability as a norm; Secondly, the role of education is to create opportunities for individuals to understand their talents Zhao, Basham, & Traver,s 2022:413,414 . It is important to remember that creativity in the classroom requires that a teacher committed to the intellectual and socio-emotional development of students Doyle, 2019:58 . By embracing the integration of AI, reexamining teaching methods, and adapting the curriculum, educators can empower students to navigate the challenges and opportunities Hutson, Lively, Robertson, Cotroneo, & Lang, 2024:91 . It is unfortunate that gifted education often gets marginalized in discourse because it is seen as irrelevant to education-reform Dai, 2022:122,123 .

Technologies to Enable Education for All

Technology has brought us changes and has affected the way we work Mohezar, Jaafar, & Akbar, 2021:35 . Technology will change the way gifted education is provided and will make gifted education more accessible Dai, 2022:116, 117 . It becomes important to take digitalization in educational contexts Möller, Unterberg, & Jörissen, 2021:136 . Integrating AI and machine-learning style transfer into education represents a pivotal moment in pedagogy that educators play a vital role in guiding students to employ AI technology Ochoa, 2024:21 . Those educators would use AI and simulation projects to improve the educational landscape Cowin, Oberer, Lipuma, Leon, & Erkollar, 2024:537 . The integration of emerging and immersive technologies into pedagogy can be seen as a mediator that enables creative work Glăveanu, Ness,

Wasson, & Lubart, 2019:72 . Technologies to enable education for all has the potential to empower students as innovators that it can transform traditional classrooms into simulated environments where students are encouraged to innovate Ghamrawi, Shal, & Ghamrawi, 2024:175 . The fusion of human and machine creativity opens up new frontiers of possibilities. Educators have recognized that AI can serve as a tool that augments and enhances their creative abilities of students Hutson, Lively, Robertson, Cotroneo, & Lang, 2024:23 .

Renewing Education Policy in Political Economy

In this era of uncertainty, being able to adapt well and pursue opportunities will be central to successfully navigate the future. Creativity and creative skills are recognized as the important employability and as a precursor to the innovations Barr, Hartley, Lopata, McFarlane, & Mcnamara, 2022:342,343 . Responding to uncertainty requires bringing creativity into the educational context Henriksen, Richardson, Gruber, & Mishra, 2022:105 . Gifted education is facilitative to the development of students' talent, and students' potential should not be limited by the schools' resources Cross & Cross, 2021:91 . Maintaining working age adults' employability is important for them to adapt to changing circumstances, and students are aware of the need to re-skill and up-skill to maintain stable employment Billett, Leow, & Le, 2024:7 . Education is seen as a vital instrument in sustainable development so that it is important to strengthen education as a public good. The governments have to take efforts to adapt these challenges through education and innovation that are termed new education revolution Eteris, 2024:18,41 .

VI. Limitations And Implications

Outlook for Future Research

(1) Pedagogical Paradigm Shift: Reimagining Education

Technology has become an integral part of the creative process that AI, machine learning and digital tools expand the boundaries of what is possible, so that humans and machines work together generate creative outcomes Dai, 2022:108 . By integrating AI into the classroom, students can gain valuable experience in navigating the intersection of technology and creativity Hutson, Lively, Robertson, Cotroneo, & Lang, 2024:110 . Educators need to facilitate an open and collaborative learning environment that encourages students to experiment with digital tools and explore innovative approaches Hutson, Lively, Robertson, Cotroneo, & Lang, 2024:89,90 . It needs to explore simulation-based learning as effective methods and requires educators to excel in their roles Cowin, Oberer, Lipuma, Leon, & Erkollar, 2024:533 . We are stepping into a more immersive digital society where mixed reality (MR) is becoming the new norm Li, & Zaki, 2024:216 . Digitalisation and sustainability have become the integral part of the present transformative agenda. New approaches to education policies shall be oriented to teaching sustainability issues for perspective workforce Eteris, 2024:57 . Educators needed to learn how to approach teaching with digital technologies that new pedagogical approaches can offer as more agile learning environments Nykvist, Mukherjee, & Blundell, 2022:246,248 .

(2) Moving Toward Pedagogies of the Possible

Pedagogies of the possible represent the efforts aimed at ensuring that students have the opportunities to learn how to contribute to the learning and lives. Educators should scaffold students' ability to imagine the future Beghetto. & Glăveanu, 2022:32,38 . Gifted pedagogy is a pedagogy of talent development and creative productivity, and students should come to value themselves as unique persons capable of achieving happiness Elder, 2022:164 . Education should aim to enhance individual diversity and amplify uniqueness Zhao, Basham, & Traver,s 2022:409 . It is imperative that all stakeholders make efforts to provide environments that support creativity for the benefit of students because they are the future innovators Fasko & Rizza, 2019:396 . Teachers should be given resources to help those gifted implement this alternative education paradigm Cropley & Patston, 2019:275 . Research on the critical role of talent development suggests that these skills can be cultivated within aspiring students by teachers and parents and that this must start early Olszewski-Kubilius, Subotnik, Worrell, Wardman, Tan, & Lee, 2021:109 .

(3) Uncertainty as a Catalyst for Creativity

Creativity leads to progress in science and technology and to rapid social change, so that there is an increasing awareness of the importance of creativity Zielińska & Karwowski, 2022:96 . Creativity can thrive under uncertainty and it is important to understand different pedagogical approaches and their relation to uncertainty Barr, Hartley, Lopata, McFarlane, & Mcnamara, 2022:344 . Effective creative education involves moving toward more creative engagement, and teachers and students must embrace creative uncertainty. Administrators play a crucial role in valuing creative skills and capacities, thereby enabling schools to flourish as a creative environment. Creativity education policy is central to helping arm teachers that interested in

changing standardised curricula and toward more creative and innovative places. There remains a long way to go beyond the digital technological understanding of creativity education Harris & De Bruin, 2019107,:106,108,110 . Education for creativity should provide opportunities for creativity in all domains/subjects and should be based on empirical research about what supports the development of student creativity. An interesting future direction would be further research with students in other contexts to see if the findings are consistent with the study Lassig, 2021:1062,1063 . More research is needed to support the connection of creativity with change Fasko & Rizza, 2019:395 .

(4) Transformational Giftedness and Talents for All

Students should develop their creative capacities to the fullest, so that curricula designed for gifted students should allow ample opportunities for creative thinking Razak & Moten, 2023:123 . Gifted students can perform well academically and exhibit a propensity for the use of creativity-generating styles, and should encounter rich learning tasks Zhang, 2021:503,504 . Considering creativity across different domains allows us to add an enriched meaning for the idea of creativity for all Choi & Kaufman, 2021:71 . Education can influence creative development positively when students develop their knowledge for engaging in creative challenges. Open and flexible classroom situations have been known for supportive of creative development Lassig, 2021:1053 . It is important that teachers and parents should be aware of the experiences and opportunities of school that are helpful in developing commitment to the skills that students make progress in their talent development Park & Kim, 2021:643 . The educational component (SDG-4 on teaching sustainable economics), will be a vital instrument in transformation, alongside such issues as sustainable social relations and employment. The future of education needs to be inclusive, and through the skills-for-future issues, there is a need for restructuring of education systems. Reforms in education have to be accelerated to prepare students for the jobs of tomorrow Eteris, 2024:24,27,34 .

Limitations of Study

There are several research limitations that must be taken into account. First, our research site cannot be said to be representative of a typical educational setting that is the local communities. Additionally, our findings might only be transferable to the formal learning settings and not to less structured environments such as a group of children playing in a park. Second, we collected data through literature review only and therefore we missed opportunities to examine the students' thinking processes in more depth (e.g., through interviews). Third, the study's generalizability is constrained because it is predicated on a qualitative analysis of the local. Four, the statements examined only apply to one period, the reporting period of 2024-2025. As a result, they can only depict the issue as it exists at this particular moment. Further research to examine such factors should follow the quantitative approach. Qualitative approaches that can add value and mixed methods are encouraged. Schools should establish comprehensive guidelines governing the utilization of digital tools, adapt their teaching and assessment methodologies, and prepare students for a future where AI-driven digital tools constitute an integral aspect of learning. Those educators should supplement an in-depth analysis of technological changes in education. We should research the subject matters of schools that such researches will make it possible to examine the innovation patterns, stagnation of creative innovation, and development productivity dilemma and their effects.

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