Welcome

The 3rd issue of the 12th volume of **Opus et Educatio** (issue 46, 2025) is our second English-language compilation this year. Significant development work was carried out in the summer months to modernize the journal. Our professional background has been significantly strengthened in recent months by the fact that our university, the first civil engineering training institute founded in 1782, the *Institutum Geometrico-Hydrotechnikum*, as the legal predecessor of our university, the *National Technical Information Center and Library* (OMIKK), provides the technical background of our journal and provides modern library support. From this year, the **Budapest University of Technology and Economics** has also started an epoch-making innovation program; the 244-year-old institution is transitioning to a new corporate-style operating mode, in connection with which the university's professional periodicals are published under the coordination of OMIKK. As part of these changes, our editorial board was renewed in September, which is why it is worth taking a look at the colophon of the journal's electronic interface. In accordance with international practice, one third of the members of the editorial board of **Opus et Educatio** are distinguished international personalities, forming the *International Advisory Board.*

Although the structure of **Opus et Educatio** has not changed, the process of internationalization is also reflected in the fact that the authors of this issue are researchers and educators who "arrived" from seven countries. Our first column is *Online First*, in which *Saule Anafinova's* reflections on the phenomenon of the Open Education movement in the 21st century, which interests many, can be found. Four significant articles are featured in our *"Studies"* column, followed by four additional publications in our *"Start-up"* column, which showcases the writings of young researchers. The manuscripts submitted by half of the authors of the issue arrived at our editorial office from several continents, from Canada to Europe to Asia, demonstrating not only the thematic diversity but also the innovative characteristics of the development of an international approach.

Our traditions remain unchanged, and in addition to studies, we would like to allow our readers to review and look ahead. Therefore, we report on a significant international conference, the *European Society for Disability Research*, which is a scholarly network that promotes research on disability in the social sciences and humanities (*13th ALTER Conference at the University of Innsbruck* from 8 - 10 July 2025), and the presentation of a forum on the educational problems of people with disabilities. Finally, as usual, we close our current issue with a review, the title of which is also mysterious: *The Shape of Things Unseen*, so this issue figuratively opens a window onto the world, providing an outlook for readers interested in the multidisciplinary themes of **Opus et Educatio**.

Budapest, September 2025

András Benedek

Editor-in-Chief of **Opus et Educatio**

ANAFINOVA, Saule

Open education movement in the XXI century: personal reflection

Introduction

The XX century has witnessed a tremendous expansion of education systems at the school and university levels. However, despite the extensive growth, education and science systems across countries have faced different challenges that impede their further expansion. The primary goals for education in the XXI century have become the support the growth of the knowledge-based economy (OECD, 1996). Specifically, an expansion of education did not result in the higher equality: "an expansion of access to education, particularly tertiary education, does not automatically result in greater equity in educational attainment" (OECD, 2018, p. 13).

The purpose of the present paper is to discuss the open science movements and their key values, which contribute to the development of education in accordance with the expectations of the knowledge economy. The author of the paper has participated in several open science projects, including RepliCATS, OLS, and SCORE, and concludes the paper with a personal reflection.

Open education and open science: importance for the knowledge-based economy

In the 21st century, education systems are tasked with preparing highly skilled specialists in response to labour market demands; however, unequal access to education opportunities can prevent this achievement (OECD, 2024). For example, figure of Table 1 below shows that quite a large proportion of adults still cannot participate in education and training due to financial barriers (OECD, 2016).

Figure 1 — Barriers to participation in education and training due to financial cost (2016)

Country	Men	Women	Total	Unit	Year of estimate
Latvia	47.50	59.50	54.50	%	2016
Greece	47.30	46.60	46.90	%	2016
United Kingdom	46.10	55.50	50.70	%	2016
Spain	42.60	43.80	43.30	%	2016
Lithuania	36.90	45.50	42.80	%	2016
Portugal	35.80	41.50	38.90	%	2016
Hungary	35.60	47.30	42.40	%	2016
Switzerland	35.30	46.50	41.50	%	2016
Slovenia	34.00	40.90	37.80	%	2016
Italy	32.60	40.90	37.10	%	2016
OECD average	30.12	35.63	33.25	%	2016
Ireland	30.10	26.70	28.20	%	2016
Austria	28.70	36.00	32.70	%	2016
Slovak Republic	28.10	37.40	33.20	%	2016
Germany	26.70	37.80	32.90	%	2016
Luxembourg	26.50	25.20	25.80	%	2016
Türkiye	25.40	19.20	21.90	%	2016
France	23.20	28.50	26.20	%	2016
Israel	22.75	25.93	24.58	%	2015
Mexico	21.50	24.19	22.97	%	2017
Finland	21.40	28.50	25.40	%	2016
Sweden	20.80	21.00	20.90	%	2016
Poland	20.22	23.00	21.40	%	2016
United States	18.00	22.97	20.74	%	2017
Belgium	17.80	19.80	18.90	%	2016
Canada	15.76	21.21	18.81	%	2015
Chile	15.63	15.80	15.72	%	2015
Denmark	15.30	23.80	19.60	%	2016
Australia	15.26	21.00	18.43	%	2012
Czech Republic	14.90	25.20	21.70	%	2016
New Zealand	12.39	15.52	14.21	%	2015
Korea	7.91	12.95	10.75	%	2015
Japan	6.29	9.46	8.00	%	2012

Note. Reproduced from OECD (2024), Education Equity Dashboard: Percentage of 25–64 year-olds reporting wanting to participate in education and training but could not because of financial cost, *https://www.oecd.org/en/data/dashboards/education-equity.html. Licensed under CC BY 4.0.*

Replication crisis

Science and innovation are another sector that is essential for the knowledge-based economy. In the 2010s, several scientific projects attempted to repeat the experiments published in peer-reviewed academic journals on a large scale. For example, a team of researchers supported by the Center for Open Science and the Laura and John Arnold Foundation attempted to reproduce 100 experiments in the field of psychology science (Open Science Collaboration, 2015). However, the results were devastating for the perception of science as a rigorous field: only 36% of replications produced significant results in comparison with the 97% of original studies, which reported substantial results (Open Science Collaboration, 2015). When similar attempts were conducted in other subject fields, the results were similarly disappointing (i., Begley and Ellis, 2012). This caused a huge concern among the academic community about the possible "replication crisis" in psychology and other fields: that the pursuit of prestige led researchers to publish unreliable research findings (Psychology Today, n.d.). The emergence of the replication crisis has prompted the academic community to demand greater transparency and

openness in science, resulting in the growth of the open science movement. Thus, open education and open science have become important developments for the further development of education and innovation systems.

The idea of openness promotes new practices in education and science, which value equal access to educational materials and scientific knowledge, regardless of an individual's place of origin or location (Biswas-Diener & Jhangiani, 2017). These practices "encompass a broad range, including the creation, adaptation, and adoption of open educational resources, open pedagogy, open course development, open science, and open access. Despite this heterogeneity, they all wage parallel battles for access and progress and against territoriality and tradition (including traditional notions of prestige)" (Biswas-Diener & Jhangiani, 2017, 5).

One of the movements that paved the way for more open education is the Movement for Open Educational Resources (OER) (Bliss & Smith, 2017). In the United States, the Hewlett Foundation has supported several open science projects since 2001 (Bliss & Smith, 2001). The MIT University collaborated with Mellon and Hewlett Foundations on the OpenCourseWare (OCW) project, which aimed to make many MIT courses available to the public on the Internet (Bliss & Smith, 2017). Currently, the OpenCourseWare website provides access to teaching resources, including syllabi of official MIT courses, videos of lectures by MIT professors, and other teaching materials (MIT OpenCourseWare, n.d.).

The Internet empowered the infrastructure of Open Educational Resources. At the same time, the Creative Commons organization provided a legal basis for sharing educational resources openly: a series of licences which allowed people to reuse open materials ethically, while giving credit to the educators who shared them (Bliss & Smith, 2017). Since 2006, over 1 billion intellectual works have been published under the licenses of the Creative Commons organization (Bliss & Smith, 2017). In December 2001, the Budapest Open Access Initiative declaration was signed, which proclaimed support for self-archiving and open access journals (BOAI, 2002). Thus, several key developments paved the way for the movement towards more openness and transparency in education and science.

So, how is open movement changing education and science? It is introducing a new culture and values that promote openness and collaboration in education and science across borders. Sharing educational materials promotes greater transparency in the educational process, enabling educators to share their work and receive feedback from colleagues worldwide. The open movement has grown into a system of values, where sharing data is free in the interconnected community across borders (Huitt & Monetti, 2017). Furthermore, open movement sees different purposes of education in the 21st century. "Whereas traditional adult education has focused on specific work-related skills, a more open approach would focus as much on developing the potential of the individual so as to empowering the person to take more control over his or her life" (Huitt & Monetti, 2017, p. 48). The open culture values collaboration: "While basic academic skills are still important, the ability to engage in such activities as group-based problem finding and problem solving; planning and implementing personally developed solutions that relate to personal interests and strengths; behaving in a morally and ethical manner; and engaging in meeting the perceived needs of the community and society are just as important" (Huitt & Monetti, 2017, 48).

Figure of Table 2 below from the chapter by Huitt and Monetti (2017) summarizes traditional and open education cultures.

Figure 2 — Analysis of traditional and open education. (Reproduced from Huitt & Monetti, 2017, p. 45)

	Traditional	Open
Transparency	Opaque or hidden data and decision making processes	Transparent data and decision making processes
Purpose	Socializing for factory work	Socializing for global democracy
Focus	Curriculum-centered	Person-centered
Desired Outcomes	Cognitive	Holistic
Assessment	Discrete cognitive knowledge	Authentic, holistic profile
Teaching Processes	Standardized, directed learning	Varied, as appropriate, with more self-regulated learning
Learning Tasks	Curriculum-directed	Problem- and project-based
Resources	Private enterprise controlled	Free or inexpensive
Work environment	Compartmentalized	Connected
Organizational structure	Centralized	Decentralized

Note. Reproduced from "Openness and the Transformation of Education and Schooling" by W. G. Huitt & D. M. Monetti, 2017, in R. S. Jhangiani & R. Biswas-Diener (Eds.), Open: The Philosophy and Practices that are Revolutionizing Education and Science *(p. 45), Ubiquity Press. https://doi.org/10.5334/bbc.d. Licensed under CC BY 4.0.*

Conclusion

The author of the present paper has been involved in several open projects as a collaborator in the last several years. One of the projects was the Systematizing Confidence in Open Research and Evidence (SCORE) program, which was a large-scale initiative that included several subprojects. The program was a great experience of open culture and collaboration, led by the team of the Center for Open Science (COS), USA. The Center for Open Science was developed from a project in the walls of the laboratory at the University of Virginia (USA), led by psychology professor Brian Nosek and his team (Nosek, 2017). Since its inception, the Center for Open Science has made significant contributions to the advancement of open science practices and tools. The COS supports initiatives such as the OSF platform, which provides tools for collaborating on research projects, as well as their subsequent archiving and sharing (COS, n.d.). The Center also developed the TOP Guidelines for scientific journals, which enable journals to follow open science practices in their publishing policies at three levels: Level 1: Disclosed, Level 2: Shared and Cited, and Level 3: Certified (COS, n.d.). Following these Guidelines allows issuing Open badges to recognize researchers' efforts in sharing their research data and code (COS, n.d.). I have participated in several subprojects of the SCORE program as a collaborator, and it was an excellent opportunity for me, as a PhD candidate from Hungary, to collaborate with colleagues from COS and those from other parts of the world.

Finally, I took part in the training of the UK non-profit company, the Open Life Science Limited (OLS Limited, n. d.). As part of the OLS-7 cohort, I developed a roadmap for promoting open science in Central Asia under the mentorship of Saranjeet Kaur Bhogal, an open science advocate with an educational background in statistics, who co-led and co-founded the Research Software Engineering Asia Association (RSE Asia) (Kaur, n. d.). Within the training, I conducted several open Zoom lectures about open science for my colleagues from Central Asian universities (Anafinova, 2023).

I also took part in the Bergen Replication Games in November 2024, held in online and offline formats by the Institute for Replication in collaboration with the University of Bergen in Norway (Fiala, 2024). The Institute for Replication conducts Replication Games in collaboration with academic institutions. The Games is a one-day event, where researchers can collaborate on reproducing and replicating experiments of studies, published in peer-reviewed journals (Institute for Replication, 2024).

Overall, participating in the open movement has been an inspiring experience, which has allowed me to collaborate with colleagues all over the world. This experience has shaped my development as a researcher and supported my passion for science.

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Beatrix SÉLLEI

Burnout of talented economics students

Introduction

Measuring the burnout of students participating in higher education is an important topic from the point of view of student success and well-being, as well as the efficiency of higher education as a whole.

Since the appearance of the concept of burnout in the seventies (Freudenberger, 1974), the definition has changed, but the phenomenon lives on unchanged. In summary, the three main symptoms of burnout: emotional exhaustion, depersonalization, and decreased performance can appear in any area of life (Maslach et al., 2001). Focusing specifically on the burnout of higher education students, Schaufeli et al. (2002a,b) also defined three dimensions: exhaustion due to study requirements, distance and cynicism regarding studies, and decreased efficiency and performance accompanied by a feeling of incompetence.

From the late 1980s, the burnout of talented students has had a particular focus. Fimian (1988) and Fimian with his colleagues (1989) found that the levels of stress, boredom, and quality of school life are related to gifted students' burnout, as well as family and classroom stressors and personal attributes such as external control or low self-esteem. Burnout among students is an interaction of internal and external factors. Internal factors can be personality, attribution style, and self-esteem, and these step into the interaction with external factors related to school (teaching, expectations, peers) and parents' attitudes and economic status (Lin & Yang, 2021).

Novel studies try to clarify the background variables of burnout, such as maladaptive perfectionism and self-compassion (Vazitan et al., 2023; Khazaleh et al., 2023; Bashi et al., 2015; Zhag et al., 2007) low emotion regulation, low optimism and low core self-evaluation (Hou, 2021), low emotional intelligence (Romano et al., 2020; Duran et al., 2006) while self-efficacy and engagement prevent students from burnout (Marôco, 2020; Yuan, Liu, 2024) such as goal orientation (Bashi et al., 2015). Among the external factors, academic overload and extracurricular activities (Prempeh et al., 2023) as well as stress (Chambel & Curral, 2005) are predictors of burnout. Educational, social life, and interpersonal factors can also influence the escalation of burnout (Hou, 2021) because burnout is, in some aspects, a social problem (Ricardo et al., 2021), and we should also mention the university environment itself as a risk factor (Urbina-Garcia, 2020), including educators' support (Romano et al., 2020). Not least, many higher education students engage in paid work activities, which can be another source of overload, and the work-study imbalance exacerbates the risk of academic burnout (Chang et al., 2000; Koropets et al., 2019).

In short, burnout is the stage of emotional exhaustion, loss of motivation, and performance problems. However, if talented students burn out during their studies, how will they be well-trained, motivated, and good-performing professionals? The answer is that students, including talented ones, need help to prevent burnout and avoid the lousy process, which can start with enthusiasm and end in cynicism, demotivation, and ineffectiveness. Based on Maslach and Goldberg (1998), there are at least two ways. One is increasing the fit between students and the academic environment (physical, curricular, social, expectations, and opportunities) to reach a higher level of engagement. The second way deals with an optimized mindset, which focuses on the relationship between the person and the situation and how students evaluate risk outcomes. However, at the core, each activity enhances self-efficacy (Bresó et al., 2011). However, how professionals, such as teachers, counselors, or psychologists, can help gifted students may vary from the usual methods. Talented students experience the same challenges — emotional, social, and cognitive —but they may face them in heterogeneous and sometimes unusual ways. From this point of view, students need personalized actions that consider their giftedness but focus on their whole selves (Kennedy & Farley, 2018).

Methodology

The examination of BME's excellent BSc students was carried out between December 2022 and February 2023. The research meets the requirements of research ethics with the permit EPKEB-2023-039. The request for data collection was distributed by the faculty representatives of the Talent Support Council and the faculty members of the Student Representation so that the online questionnaire could reach undergraduate students as widely as possible. The conditions for inclusion in the sample were either a cumulative credit index of at least 4.0 or higher or the achievement of professional results beyond regular studies, such as participation in a scientific paper competition.

Based on the literature, we used the Hungarian student version of Maslach's burnout inventory (Hazag et al., 2010) and asked demographic questions (age, gender, housing). We asked about potential external risk factors for burnout, such as increased performance or work engagement.

The student burnout inventory uses three subscales, which can be interpreted separately, and the total score of the three scales can also be examined. The emotional exhaustion scale describes mental fatigue and a negative emotional attitude related to learning. Depersonalization means moving away from learning, lacking interest, and losing motivation and goals. The decrease in efficiency means the noticeable deterioration of performance and the appearance of marks or omissions. Based on the scores, the applicants can be classified into "low," "middle," or "high" zones, either separately based on the three aspects or according to the total score. In the low zone, students do not encounter these emotional states (≤ 7 for emotional exhaustion, ≤ 4 for depersonalization, 0 for decreased effectiveness, and ≤ 25 points for the entire questionnaire). In the middle zone, although the students' burnout-focused mental health is not yet in danger, they are not entirely healthy either, as they have experiences that, although not every day, affect their well-being, and if no changes occur, they will automatically move towards the upper zone (emotional 8-14 in the case of exhaustion, 5-10 in the case of depersonalization, 1-17 in the case of decreased efficiency, between 26-39 points about the entire scale). The points above represent the upper zone, in which the student is already in the process of burnout, and these experiences are frequent, even every day, for him (Hazag et al., 2010).

Results

In the following paragraphs, we describe the sample, give a cross-sectional picture of burnout, and analyze the variables potentially connected to burnout. For the statistical analysis, we used the SPSS 26 software.

Till the end of the survey, 234 students answered, but in this paper, we only present economics and management students' data, so the subsample contains 16 answers. Ten female and five male participants represented the faculty's gender ratio. The average age was 21,94 years with a 1,65 years standard deviation. Most of them, 81%, attend state-founded training. The number of their semesters varied between 1 and 9, with an average of 4,94. Their cumulative credit index meets the selection criteria with an average of 4.1, and 6 reported extra scientific work, such as participation in science paper competitions or scientific publications; 3 reported that they would like to contribute to scientific work, but they have had no opportunity yet. Almost every participant, 14 students, answered that they are working on their studies. 53% work less than 20 hours per week, 20% work 20-30 hours weekly, and 27% work more than 30 hours.

Figure of Table 1 shows the points and the risk evaluation of the respondents measured with the Hungarian version of the Maslach Burnout Inventory for students (Hazag et al., 2010).

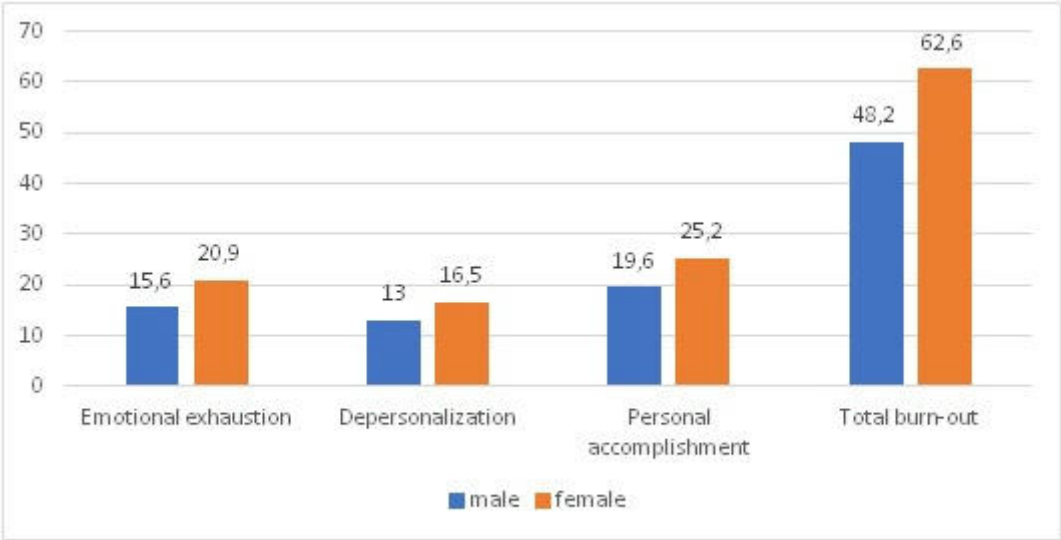
Figure 1 — Burnout of the sample based on the MBI-SS Hungarian version (n=16)

	Scale range	Min-max	Mean	SD	Risk evaluation
Emotional exhaustion	0-30	4-30	19,8125	6,90139	high
Depersonalization	0-24	2-23	15,8125	6,04669	high
Personal accomplishment	0-36	10-33	23,3750	6,53070	high
Total burn-out	0-90	36-77	59,0000	11,41344	high

Source: Own calculations

Examining the gender differences with a t-test, we find a significant difference at the .004 level in the total burnout score; women are more affected. However, we see tendential differences in each scale, shown in
Figure 2.

Figure 2 — Gender difference in economics students' burnout (n=16)



Source: Own calculations (based on Hazag et al., 2010)

In our sample, there are no differences in burnout connected to workload. Their burnout is related more to extracurricular activities. There is a significant difference ($p < 0.001$) in the accomplishment dimension between students participating in competitions and scientific work and those not making such efforts. The score of students who do not attend competitions or do not do other scientific work is 11.5 (in the low-middle zone), while those who do scientific work are 25 (in the upper zone). Based on correlations, scientific work is overloading because efficiency decreases as the number of papers increases, $r = -0.550$, sig. .005).

Exploring the associations with our other variables with correlation analysis, we found a moderately strong adverse effect with age. As age increases, the experience of inefficiency decreases (r=-.609, sig. .005). However, we cannot explain whether it comes from aging or is connected with experiences or other background variables. As students age, they carry a greater workload ($r = .567$, sig. = .005), which can also moderate this effect.

In summary, the participants in the study are exposed to a high level of academic stress. Hence, they are seriously at risk of burnout, and the well-being and mental state of these excellent students are low.

In the qualitative part of the study, students referred to highly positive and negative experiences during their studies. We made anonymous feedback reports from these answers to the faculty's dean and vice

deans for further application. In this study, we only briefly summarize the experiences related to student well-being. Students experience large-scale training as a negative experience. They miss personalization and individual opportunities. They struggle to excel when the requirements are unclear or change over time. According to the students, the attitude of some teachers is also demotivating, and they suspect that the instructors are burnt out. On the other hand, modern buildings positively affect students' well-being, and some instructors prefer to teach and use newer methods, consistently following the rules.

At the end of the online questionnaire, we also collected the solutions the students suggested based on the text answers. We divided them into three categories, as shown in figure of Table 2, based on the answers to the question: "Do you have any suggestions or ideas about how, in your opinion, the studies of students at BME could be made more attractive and livable?"

Figure 3 — Burnout prevention ideas based on students' ideas

Category	Solution possibilities
Education	- pedagogically qualified instructors - enjoyable lessons - partnership - opportunity for teamwork, increase creative homework - matching curriculum and assessment, student-friendly assessment - updated educational materials - a small number of seminars
Curriculum	- modernization of curriculum - transfer of applicable knowledge - more practical education - higher education scholarships - schedule of midterms, exams - making educational materials readily available - tutoring system available
Infrastructure	- healthy and accessible canteen - more intense community life - study corners on campus - reasonable hybrid education

Source: Own research

Future research directions

This study was part of a broader study to measure talented students' burnout at the Budapest University of Technology and Economics. However, it would be worthwhile to conduct a burnout examination for gifted and all students. Regarding the background variables, we should extend the questions to social and academic life-related factors and internal psychological source competencies. Furthermore, the data collection should be expanded to each university to derive ecologically valid conclusions about Hungarian management and economics bachelor students. It would also be worth using qualitative research designs, such as focus groups or interviews, to better understand burnout's risk and protective factors. From this type of data, students can be profiled by teachers (similar to Klinkenberg et al., 2023) to identify the most suitable support for each higher education participant, i.e., students and teachers.

Conclusions

Based on our results, all the talented students participating in the sample are burned out, which aligns with the research that burnout is a living and threatening phenomenon in higher education. Among the background variables, we first saw the effect of extracurricular activities in accordance with Prempeh and colleagues (2023). The effect of workload did not appear, in contrast to the literature (Chang et al., 2000; Koropets et al., 2019). Although we cannot pinpoint a specific cause, it is conceivable that with increasing age, the number of experiences increases, students learn to cope with academic challenges, and thus, their performance improves. They are less at risk in the dimension of burnout. Interestingly,

this effect is not influenced by the fact that older students are increasingly taking on work alongside their university studies.

Although the number of items in the sample is low considering the total number of BSc students, it can identify important focuses if the results are translated into prevention. Students mentioned curriculum and teaching-related solutions that need educators to change their mindset and methodology. However, some evidence-based studies say that gamification or design learning processes are effective in preventing burnout and helping students find their inner motivation and sources (Raoufrahimi et al., 2022).

The need for psychoeducation has been highlighted by several studies examining student burnout (DiBlasio & Szigeti, 2022). In these materials, in addition to knowledge about burnout, it is essential to also talk about treatment, with stress management methods, relaxation techniques to reduce emotional exhaustion (Davis et al., 2008), and teaching tools that make learning itself more effective to prevent performance decline and to increase the sense of competence (Hazag & Major, 2008) and help to find the flow and involvement (Neumann et al., 1990) in progress with specific techniques (Hung, Chia, 2018). Based on our results, we recommend developing training programs and psychoeducational materials, the empirical effectiveness of which is essential.

Students' burnout must be seen in a context. Based on the qualitative data, many problems are related to burnt-out teachers and educators. According to Szigeti (2023), teachers' burnout is a significant problem in Hungary. If we think of solutions, we should make interventions at each level of the higher education system, so programs should help students and educators, and renew higher education itself slowly.

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Resilience Profiles of Vulnerable and Unstoppable Youth in Generations Z and Alpha

Introduction

The issue of mental health and psychological well-being among younger generations has gained increasing prominence in educational discourse, particularly in the context of challenges within educational settings. Research indicates that certain dimensions of resilience are closely associated with pro-social behavior, which can be a fundamental component of an inclusive educational environment (Moore, Woodcock & Kielblock, 2023). Resilient students are more likely to adapt to changing circumstances, manage school-related stress more effectively, and are less prone to developing mental disorders, which is especially critical during the sensitive developmental stage of adolescence.

Members of Generation Z and Generation Alpha are socialized in a technologically saturated environment where online presence, smartphone use, and social media have become an integral part of their daily lives (Nagy & Kölcsey, 2017). For these generations, the digital space is not merely a source of information but the primary arena for self-expression, social relations, and identity formation. The digital transition in educational institutions, especially during the COVID-19 pandemic, further exacerbated the psychosocial stressors that can affect students' psychological resilience. Therefore, fostering resilience and understanding the factors that shape it among these digital native generations is of paramount importance in pedagogical practice. While technologically confident, these cohorts exhibit heightened sensitivity regarding social relationships, competition, and body image, which became particularly salient in the altered learning environment during the pandemic (Ang et al., 2022).

The aim of the present study is to explore the characteristic resilience profiles of Generation Z and Generation Alpha within the context of a specific region, Fejér County. Although its geographical focus is regional, Fejér County's social, economic, and educational characteristics make it broadly representative of the national average in Hungary; thus, its findings may hold relevant implications at the national level. The region includes both urban and rural educational settings, which allows for a more nuanced understanding of local resilience patterns. Investigations at the local level can be particularly valuable for pedagogical practice, as they can inform the development of targeted preventive and mental health interventions that consider students' social backgrounds, school environments, and generational specificities.

Research Question

What significant differences and distinct resilience profiles can be identified between Generation Z and Generation Alpha, considering the influence of gender and the moderating effects of relevant demographic variables?

H1: *A significant difference exists in the mean resilience scores of members of Generation Z and Generation Alpha. It is hypothesized that members of Generation Z will exhibit lower resilience scores than members of Generation Alpha.*

H2: *A significant difference exists in the mean resilience scores of males and females. It is hypothesized that males will exhibit higher resilience scores than females.*

H3: *Based on the resilience scores, at least three distinct and interpretable resilience profiles (clusters) can be identified within the total sample.*

H4: *Cluster membership shows a significant association with generation and gender. It is hypothesized that members of Generation Z and females will be overrepresented in the low-resilience cluster.*

Literature Review

The study of the mental health and psychological resilience of young people in education is receiving increasing attention in both Hungarian and international research. Supporting mental well-being in the school environment is particularly crucial, as educational institutions play a key role in prevention and in creating an emotionally safe atmosphere (CDC, 2023). Due to societal and technological changes, new challenges have emerged that test students' stress management skills and adaptive strategies. The stress burden observed in early adolescence and the effects of the digital environment play a significant role in the development of resilience, especially through the evolution of coping strategies (Pikó & Hamvai, 2012). Hungarian research also confirms that targeted mental health interventions in educational settings, such as mentoring programs, can enhance young people's resilience and reduce symptoms arising from psychological distress (Pölczman et al., 2025). In this context, resilience as a field of research and development is of paramount importance, especially for preventive and mental health practices within educational institutions.

The scientific interpretation of the concept of resilience has undergone significant development in recent decades, evolving from initial, simplistic approaches to complex, systemic models. Early research focused on the role of risk and protective factors, but the dynamic interaction between the individual and their environment, as well as the potential for developing psychological and social resources, gradually came to the forefront. Among the early models is Michael Rutter's (1987) theory of psychosocial resilience, which emphasized the role of protective mechanisms in mitigating the negative effects of stressful life events. Subsequently, Norman Garmezy (1991) contributed to resilience research by examining developmental risks and protective factors associated with poverty, highlighting the importance of family stability and a supportive environment. Representing a developmental approach, Urie Bronfenbrenner's (2000) ecological systems model interprets resilience on multiple levels, from the individual's immediate environment (family, school) to broader societal and cultural systems. This model fundamentally influenced the systemic thinking of later resilience theories. In the early 2000s, Luthar, Cicchetti, and Becker (2000) provided a critical evaluation of the concept of resilience, emphasizing that the social context, particularly family and school support, plays a crucial role in its development and maintenance. In parallel, Ann Masten's (2001) "ordinary magic" theory posits that resilience is not an extraordinary ability but a natural component of normal development that can emerge spontaneously with adequate environmental support. The dynamic, cyclical nature of resilience is highlighted by Glenn Richardson's (2002) meta-theoretical model, which suggests that individuals are disrupted from their state of equilibrium by stress and then, through coping strategies, regain it or transition to a new, higher level of functioning. A cognitive approach to resilience was developed by Parsons, Kruijt, and Fox (2016), who argue that psychological resilience is based on the flexible functioning of affective-cognitive systems, and that the efficiency of information processing is key to adaptive adjustment to stress. Finally, from the perspective of positive psychology, Luthans, Youssef, and Avolio (2007), in their Psychological Capital (PsyCap) model, define resilience alongside hope, self-efficacy, and optimism as a developable resource of the individual that has a significant impact on performance and mental well-being.

One of the most widely used instruments for measuring resilience is the Connor–Davidson Resilience Scale (CD-RISC), originally developed by Connor and Davidson (2003) for use in clinical and non-clinical populations. The 10-item version of the scale (CD-RISC-10), developed by Campbell-Sills and Stein (2007), is particularly suitable for the rapid and reliable assessment of large samples. This unidimensional scale measures an individual's psychological resilience on a 5-point Likert scale, where higher scores indicate greater resilience. The CD-RISC-10 has demonstrated its reliability through international validation in numerous populations. In addition to the original studies conducted in the United States, the scale has been successfully applied in Spain (Notario-Pacheco et al., 2011), China (Yu et al., 2011), and Australia (Windle et al., 2011), where its psychometric validity has been confirmed in groups with diverse ages and social backgrounds. Its use in Hungary is also becoming more common, especially

among university students and young adults. In the Hungarian validation, Járai et al. (2015) confirmed that the CD-RISC-10 exhibits adequate internal consistency and factor structure, making it suitable for both research and practical applications in assessing resilience.

The relevance of measuring and developing resilience is particularly evident in light of generational specificities. Members of Generation Z (born between 1995 and 2010) were exposed to the internet and digital devices from childhood, which significantly influences their information processing habits, social relationships, and stress management strategies (Evans & Luna, 2018). Research indicates that members of this generation are particularly sensitive to the social pressures mediated by social media, often leading to anxiety, low self-esteem, and body image issues. For Generation Alpha (born after 2010), scientific investigations are still in their initial phase, but it is already apparent that early digital device use, multitasking, and information overload may pose challenges to psychological development and socialization (Barr, 2019; Piccerillo et al., 2025). This difference is also reflected in pedagogical practice, as fostering student resilience requires consideration of their generational traits, social relationship patterns, and technological socialization (Mishra, Sharma, & Garg, 2024).

In summary, an integrated examination of the theoretical and measurement frameworks of resilience, as well as of generational differences, is essential for supporting the mental health of young people. The application of the CD-RISC scale provides an opportunity for pedagogical and mental health interventions to be targeted and tailored to generational specificities, thereby promoting students' psychological well-being and academic success.

Method

Participants

The study included a total of *N*=3275 students from Fejér County. The sample was recruited using a convenience sampling method. An invitation to complete the questionnaire was disseminated to all schools in the county, with participation levels varying by institution; in some schools, all students completed the questionnaire, while in others, participation was limited to specific classes or individual student volunteers. The final sample was composed of students from a total of 45 primary, secondary, and higher education institutions. Of the participants, 46.7% were female (*N*=1529) and 53.3% were male (*N*=1746). The birth years of the participants ranged from 1995 to 2012 (*M*=2006, *SD*=3.17).

For the purposes of this study, Generation Z was defined as individuals born between 1995 and 2009, and Generation Alpha as those born between 2010 and 2025. The sample consisted of 74.4% (*N*=2438) members of Generation Z and 25.6% (*N*=837) members of Generation Alpha. Additional demographic characteristics of the participants are presented in figure of Table 1.

Figure 1 — Demographic Characteristics of the Sample by Generation (N = 3275)

Demographic Variable	Category	Generation Z (*N*=2438)	Generation Alpha (*N*=837)	Total Sample (*N*=3275)
Gender	female	1117 (45.8%)	412 (49.2%)	1529 (46.7%)
	male	1321 (54.2%)	425 (50.8%)	1746 (53.3%)
Institution Type	primary school	532 (21.8%)	684 (81.7%)	1215 (37.1%)
	secondary school	1573 (64.5%)	153 (18.3%)	1726 (52.7%)
	higher education	334 (13.7%)	0 (0.0%)	334 (10.2%)
Field of Study	general	661 (27.1%)	667 (79.7%)	1328 (40.5%
	humanities	859 (35.2%)	69 (8.3%)	928 (28.3%)
	STEM	918 (37.7%)	101 (12.0%)	1019 (31.2%)
Place of Residence	village/town	942 (38.6%)	236 (28.2%)	1178 (36.0%)
	city	937 (38.4%)	283 (33.8%)	1220 (37.3%)
	county seat	514 (21.1%)	305 (36.4%)	819 (25.0%)
	capital city	45 (1.9%)	13 (1.6%)	58 (1.7%)
Parental Education	primary school	71 (2.9%)	30 (3.6%)	101 (3.1%)
	vocational school	382 (15.7%)	65 (7.8%)	447 (13.6%)
	high-school graduation	980 (40.2%)	232 (27.7%)	1212 (37.0%)
	college/university	1005 (41.2%)	510 (60.9%)	1515 (46.3%)

Source: Author's own compilation.

Note. Percentages represent the distribution within each column. N the number of participants.

Measures

This quantitative study employed both online and paper-based surveys, which consisted of two main sections. The first section collected participants' essential sociodemographic data, including gender, year of birth, the name and type of their educational institution, field of study or specialization, permanent place of residence, parents' highest level of education, and average daily internet usage. The second section of the questionnaire utilized the Hungarian-adapted and validated version (Járai et al., 2015) of the 10-item Connor-Davidson Resilience Scale (CD-RISC-10; Connor & Davidson, 2003). The instrument comprises 10 items that assess an individual's ability to cope with stress and adversity. Participants rated the extent to which each statement was true for them over the past month on a five-point Likert scale, ranging from 0 (not true at all) to 4 (true nearly all the time). The total score is calculated by summing the points for each item, with possible scores ranging from 0 to 40, where higher scores indicate a greater level of resilience. The internal consistency of the scale in the present sample (*N*=3275) was good, with a Cronbach's alpha of α=.82, which is close to the original value of α=.85. The results of the item analysis further supported the scale's internal consistency, with corrected item-total correlations ranging from .328 to .621, consistent with findings from both the original and the validation sources. The lowest correlation was found for the item „*I tend to act on a hunch*" (*r*=.328), while the highest was for *„I have a strong sense of purpose"* (*r*=.621). The mean total score on the scale was *M*=26.05 (*SD*=6.96), which is highly comparable to the value reported by Campbell-Sills and Stein (2007) in a large community sample (*M*=27.21, *SD*=5.84; *N*=1622). Based on these results, the CD-RISC-10 was considered a reliable instrument for assessing resilience in the studied population.

Procedure

Data collection took place between September 2022 and May 2023 in educational institutions across Fejér County. For participants who were minors, the respective schools managed the process of obtaining parental/guardian consent. Adult students provided their own consent to participate. All participants were informed about the purpose of the research, the voluntary nature of their involvement, and were assured of the anonymity and confidential handling of their data. The paper-based questionnaires were completed under supervision in a classroom setting, with an average completion time of 10 minutes.

Statistical Analysis

Data processing was conducted using IBM SPSS Statistics 27 and Python (via Google Colab), with the significance level set at α=.05. Descriptive statistics were used to characterize the main features of the sample and the distribution of resilience scores. The Shapiro-Wilk test was applied to assess normality; as the assumption of normality was violated, the Mann-Whitney U test was used for group comparisons. To identify resilience profiles, a two-step cluster analysis was performed. First, a hierarchical cluster analysis (using Ward's method with squared Euclidean distance) was conducted to determine the optimal number of clusters. Subsequently, a k-means cluster analysis was used for the final assignment of participants to the clusters. The relationship between cluster membership and categorical variables was examined using the chi-square test, with the strength of association measured by Cramer's V. For additional exploratory analyses, the Kruskal-Wallis test was employed for nominal variables with more than two categories, while Spearman's rank correlation (r_s) was used to investigate the monotonic relationship with ordinal variables, such as average daily internet usage.

Results

Descriptive Statistical Analyses

Descriptive statistics for the main variables of the study are summarized in figure of Table 2. The mean resilience score for the total sample (*N*=3275) was *M*=26.05 (*SD*=6.96). Regarding generational subgroups, members of Generation Z had a slightly higher mean resilience score (*M*=26.36, *SD*=6.85) than members of Generation Alpha (*M*=25.14, *SD*=7.17).

Figure 2 — Descriptive Statistics for Resilience Scores and Average Daily Internet Use by Generation

Variable	Generation	N	Mean (*M*)	*SD*
Resilience Score (0-40)	Generation Alpha	837	25.14	7.17
	Generation Z	2438	26.36	6.85
	Total	*3275*	*26.05*	*6.96*
Average daily Internet use (hours/day)	Generation Alpha	837	3.33	2.08
	Generation Z	2438	5.05	2.16
	Total	*3275*	*4.61*	*2.27*

Source: Author's own compilation

Average daily internet use for the total sample was *M*=4.61 hours (*SD*=2.27). Members of Generation Z spent more time online on average (*M*=5.05, *SD*=2.16) than the younger students belonging to Generation Alpha (*M*=3.33, *SD*=2.08).

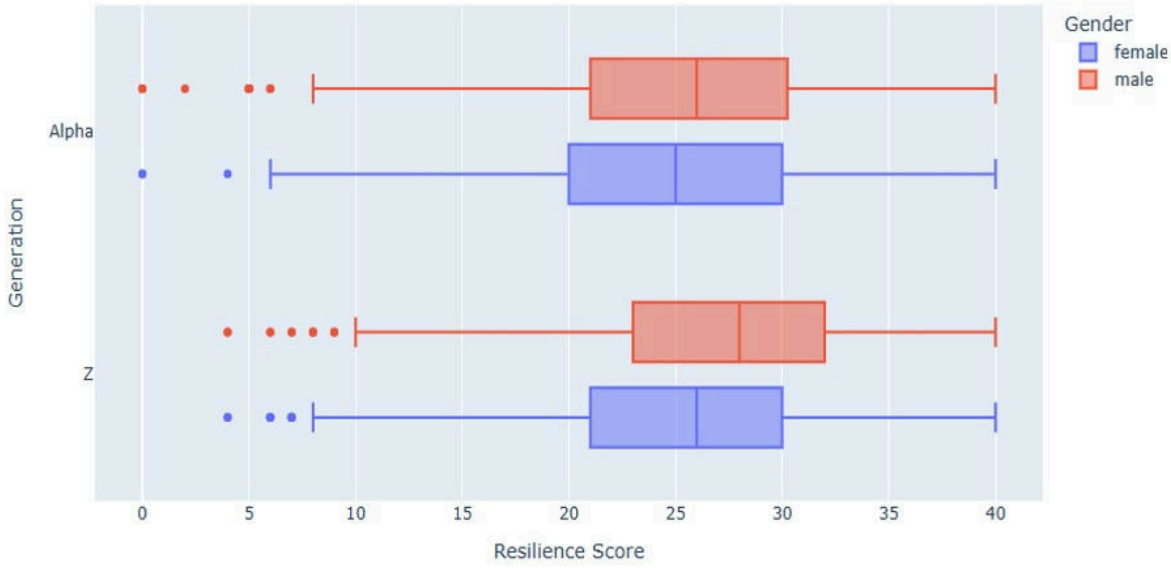
Generational and Gender Differences (Hypotheses H1, H2)

To test the first and second hypotheses (H1, H2), the distribution of total resilience scores (RISC) was examined by generation and gender. The results of the Shapiro-Wilk test indicated that the distribution of scores significantly deviated from normality in both the generational subgroups (Generation Alpha: *W(837)* =.979, *p*<.001; Generation Z: *W(2438)*=.985, *p*<.001) and the gender subgroups (males: *W(1746)* =.980, *p*<.001; females: *W(1529)*=.988, *p*<.001). Due to this violation of the normality assumption, the Mann-Whitney U test was used for group comparisons.

The first hypothesis (H1) posited a significant difference in resilience scores between Generation Z and Generation Alpha, in favor of Generation Alpha. The Mann-Whitney U test revealed a statistically significant difference between the two generations, *U*=923181.50, *z*=-4.119, *p*<.001. However, contrary to the original hypothesis, an examination of the mean ranks indicated that members of Generation Z possessed higher resilience scores (*Mean Rank*=1677.84) than members of Generation Alpha (*Mean Rank*=1521.96).

The second hypothesis (H2) investigated differences between genders, predicting that males would achieve higher scores. The Mann-Whitney U test conducted to compare genders also revealed a significant difference, U=1148668.50, z=−6.902, p<.001. In line with the hypothesis, males exhibited significantly higher resilience scores (*Mean Rank*=1744.61) than females (*Mean Rank*=1516.25).

Figure 3 — Distribution of Resilience Scores by Generation and Gender



Source: Author's own compilation

Figure 3 visually corroborates these findings. The box plot clearly shows that the median values for males are higher than those for females in both generations. Furthermore, the box plots for Generation Z – for both genders – are shifted slightly to the right compared to those for Generation Alpha, indicating the higher resilience scores of Generation Z.

Identification of Resilience Profiles (Hypothesis H3)

To identify resilience profiles, a two-step cluster analysis was conducted. In the first step, based on an analysis of the dendrogram derived from a hierarchical cluster analysis (using Ward's method with squared Euclidean distance) and an examination of the elbow method, a three-cluster solution was deemed optimal. Subsequently, participants were assigned to one of the three clusters using a K-Means cluster analysis. The algorithm reached a stable, convergent solution after 39 iterations.

The analysis successfully identified three distinct and interpretable profiles, thus supporting Hypothesis H3. The size and characteristics of the clusters were as follows:

Cluster 1: Low Resilience (“Vulnerable”)

This was the smallest group, comprising 23.6% of the sample (N=772). Participants in this cluster exhibited the lowest resilience profile. Their mean item scores (cluster centers) typically ranged between 1 (*rarely* true) and 2 (*sometimes true*). They scored particularly low on items related to areas such as stress management („Coping with stress strengthens me” M=1), self-esteem („I think of myself as a strong person” M=1), and a sense of control („I feel I am in control of my life” M=1).

Cluster 2: High Resilience (“Unstoppable”)

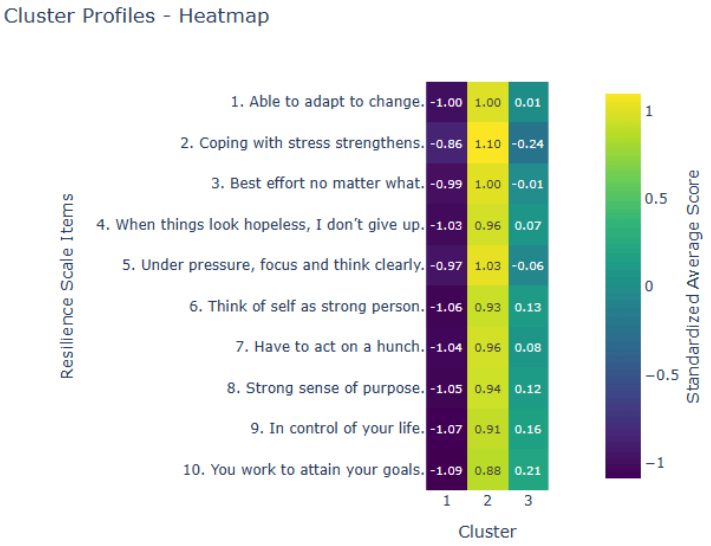
This group comprised 34.9% of the sample (N=1144) and represented the highest resilience profile. The cluster centers were approximately 3 (*often true*) for nearly all items, and they reached the maximum mean score of 4 on the item related to goal pursuit („I work to attain my goals” M = 4). This profile characterizes a group that is consistently confident, proactive, and effective in coping with adversity.

Cluster 3: Average Resilience

Constituting 41.5% of the sample (N=1359), their profile was positioned between the two extreme groups. This group represents a population with a moderate, average level of resilience, who may be confident in some situations but more uncertain in others, with their mean item scores typically falling between 2 and 3.

Figure 4 serves as a visual confirmation of the differences between the resilience profiles.

Figure 4 — Heatmap Representation of the Resilience Profiles



Source: Author's own compilation

The heatmap displays the standardized mean scores (Z-scores) for each cluster on every item of the resilience scale. The dark purple color indicates a systematic negative deviation from the total sample mean, representing lower resilience responses, while the bright yellow color signifies a systematic positive deviation, indicating higher resilience responses. For Cluster 1 („Vulnerable"), a consistent pattern of dark colors is observed, indicating that their responses are systematically below the average (*Z-scores* ≈ −1.0). In sharp contrast, Cluster 2 („Unstoppable") is dominated by bright yellow, signaling consistently above-average, high resilience scores (*Z-scores* ≈ +1.0). Cluster 3 („Average Resilience") is positioned in the middle of the scale, its Z-scores around zero, confirming that this group represents the average of the total sample.

Relationship Between Profiles and Demographic Variables (Hypothesis H4)

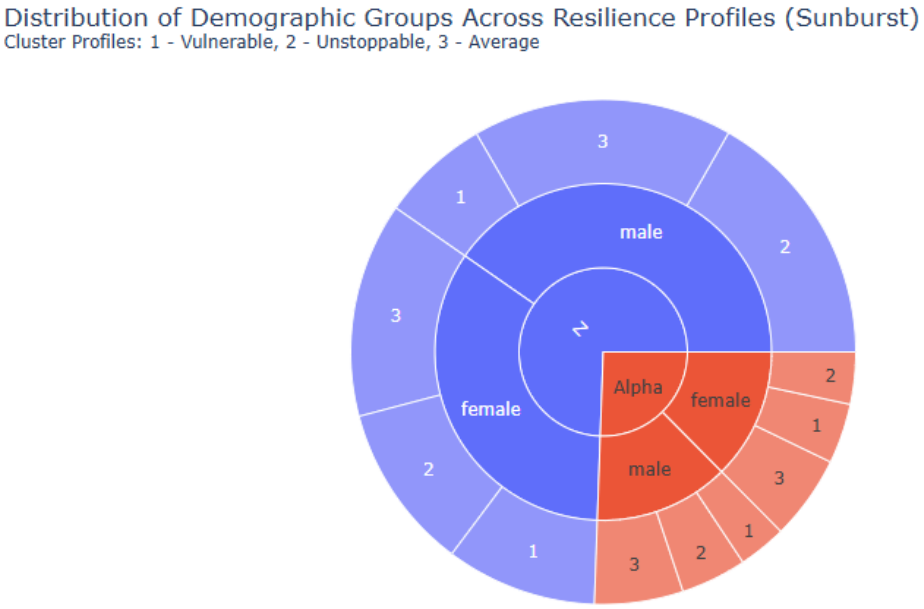
The fourth hypothesis (H4) examined whether cluster membership was significantly associated with generation and gender. The chi-square test revealed a statistically significant, weak association between cluster membership and generation, $\chi^2(2)$=16.415, p<.001, *Cramer's V*=.071. The analysis refuted a portion of the H4 hypothesis. Contrary to the hypothesis, members of Generation Alpha, not Generation Z, were overrepresented in the „Vulnerable" cluster (Gen Alpha 27.1%; Gen Z 22.4%). Correspondingly, members of Generation Z were more likely to be assigned to the „Unstoppable" cluster (36.8%) than members of Generation Alpha (29.5%).

A significant and stronger association was also found between cluster membership and gender, $\chi^2(2)$=55.949, p<.001, *Cramer's V*=.131. The results supported the part of H4 predicting that females would be significantly overrepresented in the „Vulnerable" cluster (females 29.0%, males 18.8%). Consistent with this, males were more likely to belong to the „Unstoppable" cluster (39.3%) than females (30.0%).

In summary, Hypothesis H4 was partially supported. Although cluster membership showed a significant association with both demographic variables, females were overrepresented in the low-resilience group as hypothesized; however, among the generations, it was members of Generation Alpha, not Generation Z, who were overrepresented.

The complex relationship between demographic groups and resilience profiles is summarized in Figure 3. Within the segments corresponding to female participants, the proportion of the „Vulnerable" (cluster 1) is visibly larger than within the segments for male participants. Concurrently, the segment for the „Unstoppable" (cluster 2) is more dominant among males. Generational differences are also observable in Figure 5. Among members of Generation Alpha (the red segment), the proportion of the „Vulnerable" (cluster 1) is slightly larger, whereas for Generation Z (the blue segment), the proportion of the „Unstoppable" (cluster 2) is more pronounced.

Figure 5 — Distribution of Demographic Groups Across Resilience Profiles where 1=„Vulnerable" 2=„Unstoppable" and 3=„Average"



Source: Author's own compilation

Exploratory Analyses

In the exploratory phase of the study, the relationship between resilience scores and additional demographic variables was examined. The results of the Kruskal-Wallis test indicated no significant difference in resilience scores by type of permanent residence, $\chi^2(3)$=6.947, p=.074. In contrast, parental education level had a significant effect on resilience, $\chi^2(3)$=20.135, p<001. Based on the mean ranks, the higher the parental level of education, the higher the students' resilience scores. The highest resilience level was observed among children of parents with university/college degree (*Mean Rank*=1700.38), whereas the lowest was found among children of parents with only a primary school education (*Mean Rank*=1364.15).

Similarly, significant differences were also found by institution type, $\chi^2(2)$=31.677, p<.001, and field of study, $\chi^2(2)$=26.559, p<.001. Students in higher education and secondary school had higher resilience rankings than those in primary school. By field of study, students in STEM (Science, Technology, Engineering, and Mathematics) programs exhibited the highest resilience (*Mean Rank*=1740.13), whereas those in a general curriculum showed the lowest (*Mean Rank*=1541.26).

Finally, a Spearman's rank correlation analysis revealed a significant, weak negative association between resilience and daily internet use, r_s=-.144, p<.001, indicating that more time spent online is associated with lower levels of resilience.

Discussion

The primary objective of the present study was to identify the resilience profiles of Generation Z and Generation Alpha, taking into account the potential effects of gender and other sociodemographic factors. The first hypothesis (H1), which predicted lower resilience in Generation Z compared to Generation Alpha, was rejected. In contrast, the results indicated that members of Generation Z possessed significantly higher resilience scores. This finding contradicts the strand of literature that describes Generation Z as a mentally more fragile and anxious generation, primarily in comparisons with older generations (M. Schmitt & Schmitt, 2024). The findings of this study suggest that members of Generation Z may have developed coping strategies and a degree of hardiness by confronting various life challenges and digital adversities. While previous research has primarily emphasized their vulnerability in comparison to older generations, our findings present a different picture when they are compared with Generation Alpha. The greater experience of Generation Z in managing challenges may explain their higher level of resilience compared to the younger members of Generation Alpha.

Hypothesis H2, which projected higher resilience scores for males compared to females, was supported. This finding is fully consistent with the international literature, which consistently demonstrates that adolescent females report higher rates of internal distress, anxiety, and depression (Kang et al., 2018), which can manifest as lower resilience (Haugan et al., 2021). The underlying reasons for this may include socialization differences, distinct coping styles, and the pressures stemming from societal expectations.

Hypothesis H3, which posited the existence of at least three distinct profiles, was supported. The cluster analysis identified three separate groups: „Vulnerable" (low resilience), „Average" and „Unstoppable" (high resilience) profiles. This person-centered approach confirms that resilience is not a simple linear dimension but rather a dynamic and complex set of patterns (Masten & Barnes, 2018).

Hypothesis H4 was partially supported. Females were significantly overrepresented in the „Vulnerable" cluster. In terms of generation, the results aligned with the findings for H1, showing that members of Generation Alpha, rather than Generation Z, were more frequently assigned to this vulnerable group. This suggests that fostering resilience warrants particular focus among the younger cohort, especially among females.

The exploratory analyses provided a more nuanced picture. The positive relationship between parental education and resilience aligns with research examining the links between socioeconomic status and mental well-being (Bøe et al., 2013), as more highly educated parents can typically provide more resources (financial, social, and cultural) for their children. The weak, negative correlation between daily internet use and resilience is also consistent with studies that call attention to the relationship between excessive screen time and deteriorating mental health (Hidalgo-Fuentes et al., 2023).

Strengths and Limitations

The strengths of this study include its large sample size (N>3000), which enhances the statistical power and reliability of the findings. Additionally, the comparison of two distinct generations and the application of a person-centered cluster analysis allow for a more in-depth understanding of the construct.

However, the study is not without limitations. Its cross-sectional design precludes the establishment of causal relationships. Furthermore, due to the lack of representative sampling, the findings cannot be generalized to the wider population. The use of self-report measures may also introduce potential biases, particularly among the younger generation of participants and the results should be interpreted with caution.

Summary
This study undertook a complex exploration of resilience in Generation Z and Generation Alpha within the context of gender and other sociodemographic factors. The analysis of a sample of 3275 participants successfully identified three distinct resilience profiles: a low-resilience „Vulnerable" group, a high-resilience „Unstoppable" group, and an „Average" profile that constituted the largest portion of the population.

Our findings offer a nuanced perspective on these younger generations. Contrary to expectations from the literature, it was members of Generation Alpha, not Generation Z, who exhibited lower levels of resilience and were more frequently assigned to the vulnerable cluster. However, gender differences were consistent with previous research: males proved to be more resilient, while females were overrepresented in the „Vulnerable" group. The results also highlighted the importance of parental background, confirming that higher socioeconomic status is associated with higher resilience.

Future longitudinal studies could help disentangle generational from age-related effects and track the developmental trajectories of resilience. Additionally, future research employing qualitative and mixed-methods approaches would be valuable for exploring the specific coping strategies and life experiences underlying the different clusters.

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Nidhi SACHDEVA

Microlearning as a Vehicle for Rosenshine's Principles of Instruction

Bridging Cognitive Science and Instructional Practice

Introduction

Microlearning – delivering instruction in small, focused segments – has gained traction as a modern, digitized strategy in both corporate training and formal education (De Gagne et al., 2019; Giurgiu, 2017). In parallel, Barak Rosenshine's *Principles of Instruction* have become a widely respected guide for effective teaching, grounded in cognitive science, classroom observations of expert teachers, and decades of empirical research (Rosenshine, 2012; Archer & Hughes, 2011). But it is rare that these two developments – microlearning as a delivery model and Rosenshine's framework as a pedagogical guide – are considered together. While Rosenshine's principles provide evidence-informed direction for teaching and learning, and microlearning offers a flexible, accessible and scalable format for instruction, the potential synergy between them remains largely unexplored.

This paper argues that microlearning when designed intentionally and grounded in cognitive principles can serve as a powerful vehicle for operationalizing Rosenshine's ten principles of instruction in both K–12 and higher education contexts. Rosenshine's principles encompass powerful research-backed instructional practices such as reviewing prior learning, presenting new material in small steps, checking for understanding, providing models and scaffolds, guiding practice, and ensuring opportunities for independent application.

Here I theorize that *microlessons* (bite-sized, structured learning units) are particularly well suited to instantiate these principles in diverse subject areas such as mathematics, science, and language instruction. While current research frequently claims that microlearning improves knowledge retention, lowers cognitive load, and boosts engagement (Mohammed et al., 2018; Nikou & Economides, 2018), many such claims are under-theorized or lack integration with robust learning science. Rather than accepting microlearning as inherently effective, this paper takes a different stance: microlearning can become effective when designed with the pedagogical precision that Rosenshine's principles demand. Conversely, microlearning also offers a powerful delivery mechanism for operationalizing those very principles creating a mutually reinforcing relationship between format and pedagogy.

Rosenshine's ten principles align closely with evidence-informed strategies from cognitive science such as retrieval practice, worked examples, scaffolding, and spaced repetition (Dunlosky et al., 2013; Pashler et al., 2007). Synthesizing insights from educational psychology, cognitive science, and instructional design, I discuss how *evidence-informed microlessons* offer a highly practical format to enact Rosenshine's framework in both online and face-to-face learning environments.

To my knowledge, no prior work has systematically mapped microlearning design to Rosenshine's ten principles in the context of formal education. This paper aims to contribute a conceptual model and practical rationale for using microlearning not just as a delivery tool, but as a structured method to implement Rosenshine's empirically derived principles. It is intended for researchers, instructional designers, and educators seeking to ground their design and practice in both cognitive science and pedagogical clarity. The sections that follow provide:

- an overview of microlearning, its definitions, scope and the need for deliberate design
- a review of Rosenshine's framework, its cognitive foundations, and a principle-by-principle mapping onto microlearning strategies,
- a discussion on research supports and insights for aligning microlearning with Rosenshine's work, and
- a discussion of implications, gaps, and opportunities for future research and instructional design.

Microlearning: Definitions, Scope, and the Need for Deliberate Design

Microlearning is generally defined as an instructional approach that delivers content in short, focused segments, typically designed to address a single learning objective or skill. While there is no universally agreed maximum length, microlearning units often range from a few seconds up to 10 – 15 minutes (Hug, 2005; Leong et al., 2021; Sachdeva, 2023a). These brief, self-contained lessons – often called "microlessons" – might include videos, quizzes, interactive simulations, or concise readings that learners can easily consume and revisit. Importantly, microlearning emphasizes scope and focus over strict duration: each unit targets a single concept or skill, in contrast to traditional lessons that cover multiple points simultaneously (Buchem & Hamelmann, 2010; Dingler et al., 2017).

Interest in microlearning has grown sharply over the past two decades, supported by technological advances that enable learning to occur "anytime, anywhere" via digital platforms, mobile apps, and online learning management systems (De Gagne et al., 2019; Giurgiu, 2017, Sachdeva, 2023a). Bibliometric analyses show a marked increase in publications on microlearning since the late 2010s, with much of this scholarship clustering around themes such as design, implementation, evaluation, and mobile delivery (Sankaranarayanan et al., 2022). However, many studies equated "effectiveness" with usability or learner perception, not actual learning gains. Some studies cited debunked theories; for instance, Aldosemani (2019) linked microlearning to learning styles, a theory widely refuted by cognitive scientists, including Pashler et al. (2008). Such examples reflect a broader issue: many claims about microlearning lack firm theoretical or empirical grounding (Khong & Kabilan, 2020).

While early applications of microlearning were particularly prominent in corporate training and professional development (Dolasinki & Reynolds, 2020) – valued for cost-effectiveness, just-in-time delivery, and accessibility – it has increasingly been adopted in higher education contexts, including healthcare education, teacher preparation programs, and undergraduate coursework (De Gagne et al., 2019; Javorcik et al., 2023).

Despite this growing interest, the research base on microlearning reveals persistent conceptual and empirical challenges. A major critique is that microlearning remains inconsistently defined, with varied and sometimes contradictory conceptualizations across contexts and disciplines (Khong & Kabilan, 2020). As a result, the term "microlearning" risks functioning as a buzzword – applied broadly to any short-form content without clear pedagogical coherence. Indeed, many implementations simply segment longer content into smaller pieces without fundamentally redesigning instructional goals, sequencing, or assessment practices (Sachdeva, 2023a). Such ad hoc approaches risk creating fragmented learning experiences that sacrifice depth and conceptual integration.

Empirical studies have similarly produced mixed evidence. Much of the existing literature focuses on learner satisfaction, usability, or engagement metrics rather than robust measures of learning gains or knowledge transfer (De Gagne et al., 2019; Sankaranarayanan et al., 2022). For example, scoping reviews in health professions education have found that while microlearning interventions were well-received by learners, they rarely demonstrated improvements in performance outcomes or long-term retention (De Gagne et al., 2019). Similarly, while claims such as microlearning improves motivation, reduces cognitive load, and enhances retention, these benefits are often under-theorized and insufficiently tied to established principles of learning science (Giurgiu, 2017; Sachdeva, 2023a; Taylor & Hung, 2022).

Proponents argue that microlearning can reduce cognitive load by segmenting content into manageable units, facilitate retrieval practice through frequent short assessments, and promote distributed practice with spaced delivery (Giurgiu, 2017). Indeed, some empirical studies have reported benefits such as improved retention, reduced perceived cognitive load, and increased learner motivation (Nikou & Economides, 2018; Mohammed et al., 2018). However, critics caution that microlearning is not inherently effective simply by virtue of being "short" (Neelen & Kirschner, 2017; Sachdeva, 2023a). Another

notable concern is that microlearning's promise of flexibility and accessibility may inadvertently encourage shallow or incidental design.

Without explicit instructional goals, opportunities for retrieval practice, scaffolded support, or structured feedback, microlearning risks becoming a series of disconnected "information snacks" rather than coherent learning experiences that build meaningful understanding. As Sachdeva (2023a) argues, simply shortening content does not inherently improve learning – what matters is how those short units are structured, sequenced, and connected to sound pedagogical principles from cognitive science.

These critiques underscore the need for **intentional, theory-informed design of microlearning experiences**. While microlearning's structural features – brevity, focus, digital accessibility – offer real advantages, they do not guarantee learning outcomes on their own (Sachdeva, 2023a). As Sachdeva has often said, "Just because it is *micro* doesn't automatically make it *effective* too." To move beyond superficial implementations, scholars and practitioners have called for microlearning to be embedded within robust instructional frameworks that emphasize clear learning objectives, meaningful sequencing, opportunities for practice and feedback, and strategies for knowledge transfer (Khong & Kabilan, 2020; Leong et al., 2021; Sachdeva, 2023a; Sachdeva, 2023b).

Recently, Sachdeva (2023c) has proposed coining a new term – MicroLearning (capital M, capital L) – to emphasize the need for pedagogically designed, cognitively aligned microlearning that goes beyond simply making content "short" and instead ensures meaningful, theory-informed learning outcomes. As Sachdeva (2023c) explains:

In this new term, I capitalize "Learning" to emphasize that the lesson is designed with certain evidence-based principles in mind. And I capitalize "Micro", not to refer to time length (although MicroLearning lessons do tend to be short), but rather to refer to the mental complexity of the material taught.

Keeping these varying perspectives in mind, this paper argues that Rosenshine's Principles of Instruction provide a powerful framework for implementing microlearning in learning design. Derived from decades of empirical research, cognitive science, and classroom observations of expert teaching practice, Rosenshine's principles emphasize structured review, presenting new material in small steps with practice, questioning, modeling, guided and independent practice, scaffolding, and planned cumulative review (Rosenshine, 2012). These principles align closely with evidence-based learning strategies such as retrieval practice, cognitive load management through segmentation, and spaced repetition (Dunlosky et al., 2013; Sweller et al., 2019).

By aligning microlearning design with Rosenshine's empirically supported principles, educators and instructional designers can transform microlessons from mere content fragments into structured, pedagogically coherent learning experiences. This approach ensures that the strengths of microlearning – its flexibility, focus, and accessibility – are harnessed in ways that genuinely promote durable learning and knowledge transfer.

In the following sections, this paper systematically maps Rosenshine's principles onto specific microlearning design strategies, offering a conceptual model for integrating these evidence-informed practices into both K–12 and higher education contexts.

Rosenshine's Principles of Instruction and Cognitive Foundations

Rosenshine's principles of instruction distill key strategies observed in effective teaching and supported by research (Rosenshine 2010, 2012). Prior to developing the famous ten principles of instruction, back in 1980s Barak Rosenshine and Robert Stevens[1] had synthesized decades worth of research on explicit teaching and laid out six instructional functions (1986). These functions were determined from prior research of successful teacher training and student achievement programs. They filtered all their obser-

[1]It's striking that this synthesis was published forty years ago, yet its guidance remains so relevant that anyone interested in effective instruction should make sure to read it.

vations down to the following six functions which even four decades later read as the gold standard for instructional practice.

- Review, checking previous day's work (and reteaching if necessary)
- Presenting new content/skills
- Initial student practice (and checking for understanding)
- Feedback and correctives (and re-teaching if necessary)
- Student independent practice
- Weekly and monthly reviews

Rosenshine later developed a set of instructional principles through his synthesis of research derived from three converging sources: (a) cognitive science research on how the brain learns (e.g. working memory limits and the benefits of practice), (b) studies of classroom practices used by highly successful/master teachers, and (c) research on instructional supports (like modeling and scaffolding) that help students master complex tasks. The fact that these independent research strands agree gives confidence in the validity of Rosenshine's guidelines. Rosenshine (2012) reported, "Even though these are three very different bodies of research, there is no conflict at all between the instructional suggestions that come from each of these three sources. In other words, these three sources supplement and complement each other" (pp. 12). While Rosenshine originally articulated 17 instructional procedures**,** the 10 principles presented in his 2012 *American Educator* article have gained wider traction in teacher education, policy, and professional development contexts. These ten offer a concise synthesis of his broader framework, making them well-suited for analysis and application. Accordingly, this paper focuses on the 10 key principles – without dismissing the broader context of the original 17 – as it examines how microlearning, and microlessons in particular, can instantiate and extend Rosenshine's evidence-informed vision of effective teaching. Here are Rosenshine's ten principles and a brief discussion on how each of these can be integrated into microlearning design:

Begin each lesson with a short review of previous learning

Daily review helps strengthen connections to prior material, promoting more fluent and automatic recall of essential facts and skills. By actively retrieving previously learned information, students activate relevant schemas in long-term memory, which frees up limited working memory resources for new learning. This process of retrieval practice – well documented in cognitive science as the "testing effect" – consistently outperforms passive review strategies like re-reading for long-term retention (Roediger & Butler, 2011; Dunlosky et al., 2013). Rosenshine (2012) emphasized that developing expertise requires extensive, repeated practice, and daily review provides a structured opportunity to build this practice into everyday instruction. When integrated into microlearning design, daily review can take the form of short, targeted microlessons or quizzes that reinforce key concepts and skills over time, supporting durable learning while reducing cognitive load.

Present new material using small steps, with student practice after each step

Because working memory has a limited capacity, instruction is most effective when new content is broken down into manageable, well-sequenced chunks. Presenting too much information at once can overwhelm learners and create high cognitive load, which impedes understanding and retention (Sweller, 1988; Sweller et al., 2019). To mitigate this, effective teachers present new material in small, coherent steps and check for understanding frequently, ensuring that students can process and integrate each segment before moving on. This practice is directly aligned with cognitive load theory, which emphasizes reducing extraneous cognitive demands and optimizing germane load for learning. In microlearning design, this principle is naturally operationalized through short, focused microlessons that deliver one concept or skill at a time, making it easier for learners to absorb, process, and retain new information without overload.

Ask a large number of questions and check the responses of all students

Questioning is a powerful instructional strategy for engaging learners and monitoring their understanding in real time. Frequent, well-designed questions prompt students to actively retrieve and apply recently learned material, strengthening neural connections through retrieval practice (Roediger & Butler, 2011). Effective questioning strategies – such as cold-calling, all-student response systems, or think-pair-share – ensure broad participation, uncover misconceptions, and foster active cognitive processing (Wiliam, 2014). Moreover, expert teachers often go beyond asking for correct answers, prompting students to explain their reasoning and the steps they used to arrive at a solution, also known as process questions. This emphasis on process supports metacognition and deeper understanding. In microlearning design, this principle can be embedded through short interactive quizzes, reflection prompts, or branching scenarios within microlessons, offering immediate feedback while ensuring that learners engage actively with the content rather than passively consuming it.

Provide models and worked examples

Explicit modeling – demonstrating how to solve a problem step-by-step – offers students a cognitive roadmap for their own practice. Worked examples and instructor think-alouds serve as powerful forms of scaffolding, reducing cognitive load by guiding learners through complex tasks in manageable steps (Sweller et al., 2011). By showing both the *how* and the *why* behind procedures, modeling supports schema construction and makes expert reasoning visible. Research on cognitive apprenticeship and observational learning further emphasizes that seeing an expert perform a task while articulating their thought process enhances learners' understanding, confidence, and ability to transfer knowledge to new contexts (Collins et al., 1989; Bandura, 1977). In microlearning design, this principle can be operationalized through short video demonstrations, annotated worked examples, or interactive tutorials that allow learners to pause, replay, and reflect – making expert strategies accessible anytime, anywhere while supporting mastery through repeated exposure.

Guide student practice

As Rosenshine (2010) notes, "It is not enough simply to present students with new material, because the material will be forgotten until there is sufficient rehearsal" (p. 16). After initial modeling, effective instruction requires leading students through guided practice with close teacher support. Rather than immediately leaving learners to work independently, instructors scaffold learning by solving problems together, often using structures such as the "I do, We do, You do" gradual release model (Fisher & Frey, 2021). During guided practice, teachers provide timely hints, feedback, and clarifications to help students achieve a high success rate before moving to independent work. In microlearning design, guided practice can be implemented through interactive microlessons that include step-by-step problem solving, embedded prompts for reflection, or adaptive feedback, enabling learners to rehearse and apply new concepts in a supported environment.

Check for student understanding

Continual formative assessment is essential to ensure that students are accurately grasping new material as it is introduced. Effective teachers regularly check for understanding using strategies such as asking students to summarize key ideas, solving sample problems together, or administering quick, low-stakes quizzes (Black & Wiliam, 1998). Cognitive science research shows that misconceptions, if left unaddressed, can become entrenched and impede further learning (Chi, 2005). Rosenshine (2012) emphasized that confirming understanding at frequent intervals enables teachers to provide immediate clarification or reteaching, closing knowledge gaps before they widen. In microlearning design, this principle can be realized through embedded formative assessments – such as short quizzes, reflective prompts, or interactive questions within microlessons – that offer learners and instructors timely feedback on comprehension while supporting active engagement and retrieval practice.

Obtain a high success rate

Rosenshine emphasized that during guided practice, teachers should aim for students to achieve approximately 80% success before moving on to new material. Maintaining a high success rate ensures that learners are sufficiently mastering the content, which builds their confidence, supports motivation, and reduces the likelihood of reinforcing errors (Rosenshine, 2012). This approach is closely related to mastery learning models, where instruction is organized into short, focused units and students are required to demonstrate a predefined level of performance – often around 80% accuracy – before advancing (Bloom, 1976). Research has shown that achieving high success rates not only strengthens self-efficacy but also helps narrow achievement gaps between faster and slower learners. In microlearning design, this principle can be implemented through brief, focused microlessons paired with low-stakes quizzes or formative assessments that allow learners to confirm mastery of each concept before progressing, thus supporting differentiated pacing and personalized learning.

Provide scaffolds for difficult tasks

Scaffolding involves providing temporary, targeted supports that enable learners to successfully engage with tasks that would otherwise be beyond their current level of independent ability. Examples of scaffolds include hints, cues, step-by-step checklists, visual organizers, and partially completed worked examples (Rosenshine, 2012). As learners gain proficiency, these supports are gradually reduced or removed – a process often likened to removing training wheels. This approach is grounded in cognitive theories of managing intrinsic load (i.e., the inherent complexity of the new material being learned), which emphasize breaking down complex tasks into simpler, more manageable components and supporting learners as they integrate these components into cohesive schemas[2] (Sweller et al., 2011). Effective scaffolding is a hallmark of explicit instruction, ensuring that students can practice challenging skills with appropriate guidance before moving to independent application. In microlearning design, scaffolding can be embedded through features such as interactive hints, layered content reveal, step-by-step demonstrations, and adaptive feedback within microlessons, enabling learners to progress confidently while managing cognitive demands.

Require and monitor independent practice

After guided practice and scaffolding, students need opportunities to practice independently to consolidate skills and knowledge, moving learning into long-term memory through repetition and application. Rosenshine (2012) emphasized that independent practice should focus on the same material that was initially taught and practiced with teacher support, thereby avoiding cognitive overload. Asking students to leap prematurely to entirely new or more complex tasks without support risks confusion and errors. Effective teachers carefully monitor independent practice – through strategies such as homework checks, in-class work review, or learning portfolios – to ensure learners remain on track and receive timely feedback. This approach aligns with well-established research showing that overlearning and repeated practice foster fluency, automaticity, and durable recall (Cepeda et al., 2006). In microlearning design, independent practice can be supported through follow-up microlessons, practice quizzes, and self-paced exercises that reinforce prior learning while allowing learners to apply concepts with increasing independence.

Engage students in weekly and monthly review

Beyond the daily review emphasized in Principle 1, Rosenshine highlighted the importance of planned, longer-term review to support durable learning. Weekly and monthly reviews help students retain information over the long term by integrating older material with new learning, reinforcing connections across topics (Rosenshine, 2012). This approach leverages the well-established cognitive phenomenon known as the *spacing effect*: distributing study and practice over time yields superior retention

[2] Organized structures of prior knowledge that help individuals interpret new information, recognize patterns, and make sense of complex tasks more efficiently. For example, all that one knows about dogs is part of their dog schema – including that dogs bark, have four legs, can be pets, and come in many breeds.

compared to massed practice or cramming (Cepeda et al., 2006; Dunlosky & Rawson, 2015). Regular cumulative review – through quizzes, practice sets, or revisiting key concepts – also serves as retrieval practice, strengthening memory by requiring students to actively recall prior learning. As Rosenshine (2012) noted, “the more one rehearses and reviews information, the stronger the interconnections between the material become” (pp.19), reflecting decades of memory research demonstrating that repeated, spaced retrieval enhances the consolidation and organization of knowledge in long-term memory. In microlearning design, this principle can be implemented through carefully sequenced microlessons that revisit essential content over time, cumulative low-stakes quizzes, or spaced push notifications that prompt learners to review and reinforce key ideas across weeks or months.

Together, these ten principles offer a research-informed blueprint for designing microlearning experiences that are not merely short, but instructionally rich and pedagogically sound. By aligning microlesson design with Rosenshine’s framework, educators and instructional designers can ensure that each brief learning unit contributes meaningfully to long-term understanding, skill development, and knowledge transfer. Rather than treating microlearning as an incidental or convenience-driven strategy, this approach grounds it in robust cognitive science and proven instructional practices. The result is a model of microlearning that is purposeful, structured, and capable of supporting both novice and advanced learners in K–12 and higher education contexts. Figure of Table 1 shows how each of Rosenshine’s ten Principles of Instruction can be intentionally operationalized through evidence-informed microlesson design. Rather than treating microlearning as simply “short content,” these strategies aim to align with cognitive science principles to promote meaningful, durable learning. This mapping demonstrates that microlessons can be deliberately designed to embody Rosenshine’s principles, transforming microlearning from disconnected “information snacks” into coherent, evidence-informed instructional experiences that support durable learning and transfer.

It is important to note that a single microlesson need not incorporate all ten of Rosenshine’s principles simultaneously; rather, effective design can target one or more principles depending on the lesson’s purpose and its role within the broader instructional sequence.

Figure 1 — Mapping Rosenshine’s Principles to Intentional Microlesson Design

Rosenshine’s Principle of Instruction	Intentional Microlesson Design Goal	Example Strategies
1. Begin each lesson with review	Activate prior knowledge; retrieval practice; reduce forgetting	Short review videos; daily/weekly micro-quizzes; spaced flashcard decks; recap microlessons revisiting key concepts
2. Present new material in small steps	Reduce cognitive load; manage intrinsic complexity	Single-concept microlessons; step-by-step video explanations; sequenced short modules; interactive slide decks focusing on one skill at a time
3. Ask a large number of questions and check responses	Promote active processing; surface misconceptions	Embedded formative questions; interactive branching scenarios; short-response prompts; in-video quizzes with feedback
4. Provide models and worked examples	Support schema-building; reduce cognitive load via scaffolding	Demonstration videos; narrated worked examples; think-aloud recordings; annotated problem-solving steps
5. Guide student practice	Provide supported rehearsal; ensure early success	Interactive problem-solving microlessons; adaptive feedback prompts; “I do, We do, You do” micro-activities; guided worksheets with hints
6. Check for student understanding	Identify misconceptions; enable timely feedback	Embedded short quizzes; reflective prompts; auto-graded questions; end-of-lesson checks for understanding
7. Obtain a high success rate (~80%)	Build confidence and mastery before moving on	Low-stakes practice quizzes with mastery criteria; repeatable exercises; feedback loops that promote achieving success thresholds
8. Provide scaffolds for difficult tasks	Support learners through complex skills; manage intrinsic load	Interactive hints; layered content reveal; partially worked examples; visual organizers; downloadable checklists
9. Require and monitor independent practice	Reinforce learning through retrieval and application	Self-paced follow-up microlessons; practice problem sets; cumulative review quizzes; learner portfolios for submission and feedback
10. Engage students in weekly and monthly review	Combat forgetting via spacing effect; strengthen retention	Sequenced spaced-review microlessons; scheduled push notifications; cumulative quizzes revisiting prior topics; reflective journaling prompts

Note. This table illustrates how microlearning design can deliberately operationalize Rosenshine’s ten principles of instruction.

In conclusion of this section, microlearning can be seen as a delivery mechanism that, if used thoughtfully, encapsulates proven instructional strategies. I claim here that each Rosenshine principle finds a

natural implementation in the microlearning model. This synergy suggests that an instructional design framework marrying the two could be highly beneficial for learners and learning designers. Educators could use Rosenshine's principles as guidelines when creating microlessons. The next sections discuss research and theoretical support for this synthesis, as well as any gaps or counterpoints we should be aware of.

Research Support and Insights For Aligning Microlearning with Rosenshine's Principles

The conceptual alignment between microlearning and Rosenshine's principles is not only intuitive but also well-supported by research in cognitive science and other fields.

Cognitive Load Theory (Sweller et al., 2019) directly supports the microlearning strategy of breaking content into small steps (Rosenshine's Principle 2). Human working memory is limited – typically processing only 4–7 items at once (Miller, 1956) – making segmented, bite-sized lessons cognitively efficient. Studies applying Cognitive Load Theory in higher education have shown that short modules can reduce perceived cognitive load and improve test performance compared to traditional lectures (De Gagne et al., 2019; Leong et al., 2020; van Merriënboer & Kirschner, 2018). By reducing extraneous load[3] and segmenting content, microlearning operationalizes Rosenshine's advice to present new material in small, manageable steps.

Retrieval Practice and Spaced Repetition emphasized in Rosenshine's Principles 1 and 10, are also central to effective microlearning design. Decades of research show that actively recalling information improves long-term retention far more than passive review (Roediger & Karpicke, 2006), and that spacing study sessions prevents forgetting (Carpenter et al., 2022; Cepeda et al., 2006). Microlearning systems often build in these effects by design – for example, with daily quizzes, spaced notifications, or adaptive review schedules. Studies have shown that spaced learning significantly reduced knowledge decay among medical residents, illustrating that frequent, low-stakes retrieval supports durable learning (Kerfoot, 2007; Matos et al., 2017).

Feedback and Mastery Learning are similarly well-supported. Rosenshine's principles highlight the importance of checking for understanding, providing scaffolds, and ensuring high success rates (~80% accuracy). Microlearning modules often feature immediate feedback and multiple attempts, allowing learners to identify misconceptions and improve iteratively. Studies have found that microlearning tools can promote self-regulation as students use feedback to target weaknesses strategically (Hosseini et al., 2020; Shamir-Inbal & Blau, 2022). Such design supports metacognition, learner confidence, and mastery – all goals central to Rosenshine's framework.

Empirical Evidence in Education also reinforces this connection between microlearning and Rosenshine's principles. Research on microlearning-enhanced flipped classrooms (Fidan, 2023) found improved performance and satisfaction among pre-service teachers when microlearning videos were added. Systematic reviews in K–12 contexts report improved test scores in subjects like math and vocabulary when daily micro-quizzes or short modules are integrated effectively (Magbago et al., 2025; Sabilla & Daulay, 2025). In higher education, studies (Gohar, 2023) have linked microlearning to improved vocabulary acquisition and lower cognitive load in foreign language courses.

Neuroscience Perspectives further support this synergy. Retrieval practice strengthens neural connections by repeatedly activating memory-related brain regions, including the hippocampus and prefrontal cortex, helping consolidate and integrate new information (van den Broek et al., 2014). Spacing promotes long-term memory consolidation by allowing synaptic changes to stabilize between learning sessions, consistent with evidence from neuroimaging and animal studies showing enhanced hippocampal encoding during distributed practice (Fields, 2005; Smolen et al., 2016). Short, focused

[3]Mental effort imposed by poorly designed materials that doesn't help learning, such as confusing layouts, poorly designed slides, unnecessary GIFs, background music or redundant on-screen text that distracts a learner and does not contribute to learning.

lessons also help manage attention: research suggests sustained attention during lectures often declines after approximately 10–15 minutes, indicating the need to reset attention periodically through brief, varied activities (Wilson & Korn, 2007). Microlearning aligns with this by offering multimodal, concise segments that can re-engage learners' focus. Finally, immediate feedback in microlearning can engage reward-related circuits in the brain, such as the striatum, reinforcing learning behaviors and supporting motivation through dopaminergic pathways (Schultz, 2016; Ripollés et al., 2016). This is an evolving field, and more research is needed to connect microlearning interventions directly with neural measures of learning – such as long-term changes in hippocampal structure, functional connectivity, or neuroplasticity markers. Future studies that link behavioral gains from microlearning to observable neural adaptations will be critical in fully validating its neuroscientific foundations.

In summary, the convergence of evidence from cognitive psychology, educational research, and neuroscience gives strong support to aligning microlearning design with Rosenshine's principles. By grounding microlessons in evidence-based strategies such as segmentation, retrieval practice, feedback, and spacing, educators and instructional designers can transform microlearning from fragmented "information snacks" into structured, effective learning experiences that truly promote durable understanding and knowledge transfer.

Gaps and Opportunities in the Literature

Despite their strong conceptual alignment, there remains a clear gap in the scholarly literature explicitly connecting microlearning with Rosenshine's Principles of Instruction. Most research treats microlearning as a standalone innovation or explores Rosenshine's principles in traditional teaching contexts, but few have formally integrated the two.

Existing connections are mostly informal or practitioner-focused. For example, Sachdeva (2023c) proposed the term *MicroLearning* to emphasize evidence-based, cognitively aligned design, specifically citing Rosenshine and Cognitive Load Theory in blog posts and sample microlesson designs. However, a search of academic databases reveals no comprehensive studies or frameworks explicitly combining microlearning and Rosenshine's principles in formal education settings.

Moreover, microlearning researchers themselves highlight related gaps. Silva et al. (2023) note the limited research on microlearning in primary education, calling for adaptations suited to diverse learners and contexts – a space where, I strongly view, Rosenshine's K–12-oriented principles could offer valuable guidance. Monib et al. (2025) suggest general design principles for microlearning (e.g., bite-sized objectives, engagement, personalization) can help improve learning outcomes. While these principles overlap with Rosenshine's ideas, but were developed independently and need further validation.

This gap represents a clear opportunity. This paper explicitly synthesizing Rosenshine's principles with microlearning aims to offer a unified, evidence-informed framework for educators and instructional designers. Such a framework would answer the question: *How can we ensure microlearning is truly effective form of learning?* – by anchoring its design in Rosenshine's proven principles.

By making this link explicit, microlearning can move beyond ad hoc or fragmented implementations or being simply "information snacks" toward coherent, pedagogically sound practice. It would also help counter skepticism that microlearning is merely corporate or informal training, showing instead how it can be rigorously applied in K–12 and higher education. In short, there is both a clear gap and a strong rationale for bridging these two domains, and this synthesis has the potential to advance research, instructional design, and teaching practice meaningfully.

Conclusion

This paper has argued that microlearning and Rosenshine's Principles of Instruction – often treated as separate threads in educational discourse – are in fact highly complementary. Microlessons, when thoughtfully designed, can serve as practical embodiments of Rosenshine's ten principles, enabling ed-

ucators to implement evidence-based teaching strategies in both classroom and online environments. From daily review and small-step instruction to questioning, guided practice, scaffolding, and cumulative review, each principle can be deliberately incorporated into microlearning design.

Research evidence and cognitive theory reinforce this synergy. Microlearning's segmentation aligns with Cognitive Load Theory by breaking complex content into manageable chunks. Its use of frequent, low-stakes quizzes supports retrieval practice and spaced repetition, core to Rosenshine's emphasis on review. Rapid feedback loops and opportunities for repeated success build learner confidence and self-regulation, fulfilling Rosenshine's call for high success rates and careful checking for understanding. Moreover, microlearning's flexibility – delivered via mobile, asynchronous, and on-demand formats – extends these effective practices beyond traditional classroom seat time, offering scalable options for homework, revision, and even teacher professional development.

At the same time, this synthesis remains underexplored in the academic literature. While both microlearning and Rosenshine's principles have strong independent research traditions, few studies have explicitly connected them into a unified instructional framework. This gap represents a clear opportunity for scholarship and practice. This paper aims to address that need by articulating such a framework – grounded in cognitive science and enriched with practical design examples – to help educators move beyond viewing microlearning as a buzzword and instead see it as a rigorous, evidence-informed approach.

Such an integration also directly addresses common criticisms of microlearning as superficial or fragmented. When each microlesson is intentionally crafted with Rosenshine's principles in mind – linking to prior knowledge, including practice and feedback, building in review – it becomes part of a coherent instructional sequence that supports durable learning. Rather than replacing traditional instruction, microlearning can enrich it. Instructors might blend direct teaching with microlessons for reinforcement and practice, or flip classroom models using microlessons for pre-class preparation followed by in-class guided practice.

From a cognitive science perspective, this alignment rests on solid foundations. It leverages spacing, retrieval, and chunking to match how human memory and attention work. By embedding effective learning strategies into daily, bite-sized experiences, microlearning can help ensure that principles long known to work in education are actually implemented at scale, with technology as an enabler rather than a distraction.

Ultimately, bridging microlearning with Rosenshine's empirically derived principles offers a promising path for instructional innovation that remains true to "what works" in education. This paper aims to fill this gap in the literature and practice by offering a synthesis that can benefit researchers (through a clear agenda and testable framework), educators (by providing concrete design strategies), instructional designers (by guiding the creation of effective microlearning content), and most importantly, learners (by ensuring that short, flexible learning experiences are pedagogically sound and genuinely effective). By doing so, it seeks to help move microlearning from hype to a mature, evidence-informed learning phase or pedagogical sequence that maximizes learning outcomes across K–12 and higher education contexts.

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Zsuzsa BEDA & Uddin Mohamed KAOSAR

The Role of University Training in Addressing Challenges in International Employment

Introduction

Higher education plays a crucial role in equipping graduates with the skills to thrive in a workforce that is global by nature. The universities in Malaysia are gradually reforming their courses according to the complexity of foreign employment (Mohd Thas Thaker et al., 2021). The need for graduates who can adapt to diverse cultural and professional environments increases as globalization intensifies. As globalization intensifies, there is a growing need for graduates who can adapt to a wide range of situations. Artistic and professional contexts increase. This makes Malaysian institutions critical centers for students not just to obtain technical know-how but also develop the adaptability, resilience, and global outlook necessary for success abroad (Margatama et al., 2023).

Many Malaysian graduates face severe challenges in finding jobs abroad despite repeated attempts. These barriers range from misalignments between academic training and corporate expectations to difficulties navigating cross-cultural situations. As an illustration, students might face difficulties in the soft skills needed for cross-border cooperation or remain unaware of overseas work customs even though they can be prominent academically (Mohd Thas Thaker et al., 2021). There has been pressure on universities to calibrate their offerings with global standards by including cross-cultural proficiency, international internships, and foreign language courses in their programs.

One focus for higher education institutions (HEIs) in Malaysia has been how their programs can help overcome problems in international employment (Rozaimie, 2024). Due to the growing process of workforce globalization and the dynamic nature of the employment environment, universities are being pressured to prepare graduates who are not only academically qualified but also possess the essential skills to thrive in the rapidly evolving global economy (Carvalho et al., 2023). This part examines what universities in Malaysia are doing to prepare graduates for employment worldwide, including what has been done, the issues encountered, and how it is implemented in Malaysian universities to build a pipeline of employable graduates.

This paper examines the trend of how university education is evolving in Malaysia and considers how educational institutions prepare their graduates for the real world of global employment. It highlights the innovative ideas being deployed to ensure graduates are prepared for the demands of a connected world, as well as the limitations of those ideas.

Literature Review

There has been a considerable amount of research on how higher education prepares graduates for employment, particularly in the context of a globally competitive job market (Tomlinson, 2017). According to research, universities are important in providing students with skills that are relevant to industry, international exposure, and exposure to soft skills to increase their competitiveness in foreign job markets (Jackson, 2019). The extent of consensus on the differences between university curricula and labor market expectations varies within countries (for example, between sectors), with scholars stressing the importance of improving bridging between academia and industry, career support services, and intercultural training to close employability gaps.

A study of Malaysian higher education has shown that, despite universities' efforts to integrate global perspectives into their curricula, graduates still encounter difficulties in obtaining international employment (Khalid et al., 2020). Pakistan has a dual-tier system of education, with both public and private institutions facilitating the learning process, albeit the adequacy of such institutions for preparing students as human capital is still a question in the global market (Abdullah et al., 2021). Public universities are typically responsive to local industry requirements and aligned with government-driven education

policies. In contrast, the private sector can be more innovative in studying international accreditation, foreign faculty, and international mobility programs (Chan, 2016). However, research shows that graduates of the two sectors encounter similar barriers, including language proficiency challenges, limited networking opportunities, and insufficient career counseling focused on international jobs (Zainuddin et al., 2019).

Research on the effects of university education on global employability highlights the complex interplay between academic training and labor market needs. Zainal et al. (2022) highlighted the growing need for colleges to internationalize their courses and prepare students with relevant skills for a global economy. Idris & Bacotang's (2023)work highlights the concept of internationalization at home, which suggests that, in the same way, technical skills are necessary, global competencies like cultural intelligence and multilingualism will be required.

Marfunizah Ma'dan, et al. (2020) explore how public universities in Malaysia could increase the employability of their graduates through boosting their competencies. This is very important in view of the worsening problem of graduate unemployment in the country. The research has highlighted that institutions can take several measures to enhance graduate employability. This involves aligning the curricula to industry needs, building more co-curricular activities, and aligning with industry partners to ensure graduates have the right skills.

"The Implications of Work-Based Learning Initiatives in Malaysian Universities" (2023) discusses how work-based learning initiatives (WBLi's) could facilitate international postgraduate students' employment readiness in Malaysian universities. It emphasizes that these initiatives are in development and shows that improvements are needed in the curricula of WBLi, the industry, and for policy changes to overcome obstacles to international employment. Thus, by taking these into account, Malaysian universities will be better able to prepare their graduates as transnational human capital able to satisfy the rise in demand for the progressive job market.

Belderbos, Tonatiuh (2019) investigates the employability of graduates from international branch campuses in Malaysia: Soft skills and personal attributes study of graduates, proving that IBC education helps build soft skills and other personal attributes that employers highly value. However, it notes that IBC education does not significantly raise transnational human capital compared with studying abroad. The study emphasizes the role of IBC educational attributes and exposure on global employability skills, suggesting that while IBCs have a positive influence, they only act as a limited substitute for overseas educational experiences.

According to Rozaimie (2024), to address international employment challenges, university education in Malaysia plays a vital role in aligning academic and practical syllabi with global employability benchmarks. It highlights the importance of internationalisation at home (IaH), intercultural competency, and global citizenship – to be enhanced with institutional support. To address the skills gap highlighted in Malaysia's Critical Occupations List (MyCOL) against the backdrop of the global digital economy, higher education institutions and their collaborators (stakeholders and the government) have to ensure that graduates are equipped with adequate skills to remain competitive.

In the Malaysian context, Zainal et al. (2022) found that graduates often face challenges to global career mobility as a result of not being adequately trained in soft skills. The findings suggested that Malaysian universities excel in providing academic knowledge but lack in fostering more practical, experiential learning that simulates workplace environments one may encounter after graduation, especially in an international context. (Idris & Bacotang, 2023) validated this statement, arguing that engaging in partnerships with international industries and exchange programs significantly improved employability.

Yusuf et al. (2024) explored the alignment of international education and national policy, with findings showing how policy at the international level shapes practice. His research found that even structured international exposure, such as virtual collaboration with worldwide universities or global research

projects, for instance, can help minimize the challenges that foreign graduate job seekers face as they enter foreign labor markets.

Research conducted by Demissie et al. (2021) explored employer perspectives, suggesting many international companies prefer candidates with prior overseas experience or understanding of diverse teams. It is consistent with the findings of Samaden et al. (2021), who argued that globally oriented experiences of an internationalized university could act as a connection for its graduates, transferring them into their roles in the world.

The body of literature highlights the importance of an integrated model of education in a university setting that balances academic excellence with practical training, cultural literacy, and industry relevance. Malaysian universities, however far advanced, have to keep adjusting to the new realities of employment around the world.

Methodology

Malaysian graduates had previously faced challenges in securing employment by pursuing a university education; therefore, the study adopted a quantitative research design to explore the effect of university education on the challenges Malaysian graduates faced in finding foreign employment. A structured survey was used to collect data from students enrolled in both public and private universities, capturing a comprehensive representation of Malaysia's diverse higher education system. All candidate universities (10 public, 10 private) were considered based on their institutional ranking, program diversity, and graduate employment rates. The inclusion of religious-owned and foundation-based universities aimed to study the effect of religious curricula on students' employability skills and career aspirations. The final sample consisted of 400 students (20 per university), derived according to the statistical formula for a representative sample:

Figure 1 — Statistical formula for a representative sample

$$n = \frac{Z^2 . p . (1 - p)}{E^2}$$

where Z=1.96 (the confidence level of 95%), p the estimated population proportion, and E the margin of error. Students were recruited through a method of stratified random sampling to control for disciplinary and class (e.g. first-year or fourth-year) representation. To analyze the data, a standardized questionnaire was used to collect the necessary information centered around three main constructs: perceptions of university education effectiveness in terms curriculum relevance, industry collaboration, and skill enhancement; barriers to employment abroad (language challenges, cultural adaptation, and job market competition); and international work readiness considering self-confidence, adaptability, and overall career preparation. Students' responses were objectively measured using a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). In terms of cultural background, given Malaysia’s multicultural environment, the study also sought to explore how religion and cultural background may shape their employability perception, especially among students who were attending religion-owned institutions. Although the research yielded important insights, several limitations were noted, including restrictions in the sample size; potential biases in self-reported data; and gaps in institutional representation, since smaller or specialized universities were underrepresented. Even with these limitations, the results provided valuable insights for improving Malaysian university curricula, enhancing industry collaborations, and broadening student support services to increase graduates' prospects for global employability.

Results

Study results presented according to the quantitative questionnaire sections and features 400 students sampled from 10 public and 10 private universities in Malaysia.

Demographic Profile of Respondent

The demographic characteristics of the participants are essential for context around the findings of the study. This study identifies age, gender, kind of university, and field of study as key variables to investigate how different demographics perceive the impact of university education more accurately on foreign employment outcomes. The below image shows the demographic distribution of university students:

Figure 2 — Demographic Distribution of University Students

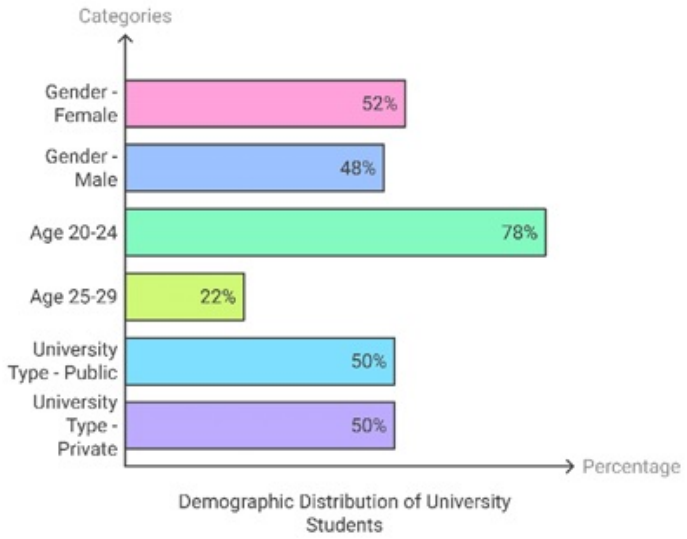


Figure 2 shows the sample distribution of students. The sample included 400 students from both public and private universities in Malaysia. Fundamental demographic traits include age, sex, discipline, previous international experience! This section explores these characteristics in detail, providing a window into the heterogeneity of the respondent pool and its implications for the study results. Here is an overview of the respondent's distribution:

- Gender: 52% female, 48% male
- Age Range: 20–24 (78%), 25–29 (22%)
- University Type: 50% public, 50% private

Assessment of Readiness to Work Internationally

Assessing the quality of university education hinges on how ready students are for overseas jobs. This section explores the opinions of students towards their preparedness, with an emphasis on aspects relevant in terms of both general academic and skill-based aspects contributing to their confidence to moving abroad.

Figure 3 — Survey Results on Education Alignment and Skills Development

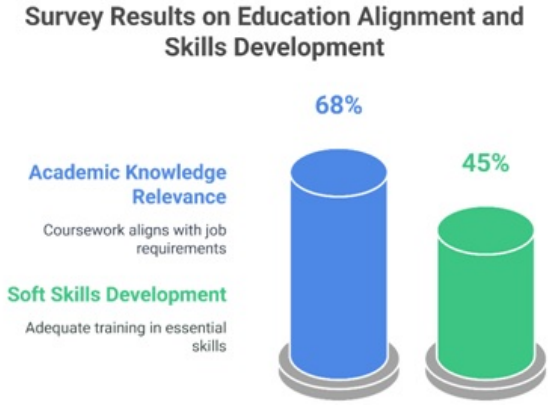


Figure 3 describes the survey results on education alignment and skills development among the respondents. 68% of respondents said their courses fit overseas employment criteria. This implies that while syllabi should be more closely aligned with changing industry norms, Malaysian institutions are making progress in offering globally relevant materials. 45% of respondents believed their institutions provided sufficient instruction in flexibility, teamwork, and communication. Although this shows some institutional effort, it also draws attention to a discrepancy whereby almost half of the respondents felt unprepared in these important spheres. By means of industrial partnerships, enhanced seminars, and experience learning, one can close the preparedness gap.

Access to International Experiences

Exposure to global happenings is crucial for students preparing for global employment, as it impacts their adaptability, cultural awareness, and practical understanding of work customs across nations. This section highlights the different approaches of Malaysian university students seeking to have exposure abroad and implications of such experiences on their job market ready.

Figure 4 — Distribution of Global Experience Among Graduates

As can be seen from the distribution of global experience, indicating various regions where graduates completed their training, as illustrated in Figure 4. 32% had done an overseas internship. These internships allow students to apply academic learnings to real-world scenarios, gaining an even strong industry network through real-world experience in international work environments. 27% of them participated in interchanges, with a studious abroad in an outside college. Such initiatives enable students to experience multiple educational systems and cultural contexts, thus broadening their perspective and developing their international competence (Manner, 2019; Zou et al., 2014). 40% said they had been instructed once on cultural diversity and business standards. Such instructions cultivate empathy, versatility, and effective cross-cultural communication skills among students while they navigate diverse workplaces.

Challenges Faced in Preparing for Global Careers

For students, the way to foreign jobs are fraught with as many challenges, even with university resources and training. Overcoming these hurdles will lead to better programs for our universities, and ultimately allow students to better achieve their ambitions across the globe.

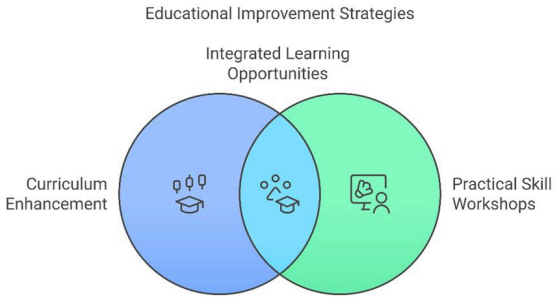
Figure 5 — Barriers to Global Professional Opportunities

Figure 5 represents the barriers to global professional opportunities. Particularly in professional environments, 55% of respondents voiced worries about their language competency. Although many students get some language instruction, learning industry-specific vocabulary and confidently interacting in a multicultural workplace remains major challenges. Sixty percent of respondents said that career counselling lacked knowledge about foreign employment markets. Students find it more difficult to make wise selections about abroad prospects, grasp changing industry needs, or properly customize their applications to foreign companies because of this gap. 48% of respondents mentioned financial restrictions as their obstacle to access to chances for global learning. Many students are unable to afford the expenses of study-abroad programs, foreign internships, and language classes, therefore depriving them of important practical experience in foreign environments. Expanding language support, improving career services with a worldwide focus, and scholarships for foreign exposure help students to overcome these obstacles and greatly increase their readiness for global professions.

Student Suggestions for Improvement

Increasing the appropriateness of university training programs for the international office will definitely rely a lot on student feedback. Students who have been on these programs are directly affected by this academic system, which provides great & relevant analysis regarding the improvements institutions need to make regarding their end products to bridge the gap between education and the global labor market.

Figure 6 — Educational Improvement Strategies



The strategy of educational improvement is shown in Figure 6. 72% recommended more globally based industry aligned courses including global case studies Students said they would also like practical situations integrated into their courses to better understand industry methods and dynamics of the global market. 65% of those surveyed requested more results-driven seminars focused on leadership

& problem solving. Such seminars would help students to actively develop key transferable skills like critical thinking, teamwork, and adaptability for working abroad. 58% favored that, along with more internships with multinational firms through universities. These partnerships would also offer students excellent opportunities for experiential learning by placing them in work environments abroad and thereby expanding their professional networks. Hence, adherence to these recommendations can be the penultimate way for the Malaysian university graduates to be globally prepared and making them able enough to cope and be successful in the foreign employment territory.

While Malaysian colleges are 'catching up' in terms of introducing international elements into their courses, according to the results, there remains a long way to go. Graduates' global employability could benefit far more from enhanced career support services, more access to global experiences, and a greater intensity of training to develop soft skills.

Discussion

Malaysian University Education's Current Situation

Towards developing a trained work forces the greater education system of Malaysia has considerably achieved. While public and private colleges highlight industry-relevant skills, graduates sometimes face hurdles when seeking foreign jobs. Accelerated courses of language, cultural adaptation, and work expectations, are the top issues for targeted instructional programs.

Significant Challenges in Global Employment

- Skill Gap: Companies constantly discover that graduates do not possess relevant, employable skills.
- The cultural differences: Many workplaces can be hard to understand and adapt to.
- The Global Competition: Malaysian graduates have to compete with students from countries where international education systems are better developed.

Curriculum Development and Employability Skills

One of the primary strategies implemented by Malaysian institutions to address foreign employment challenges is the development of employability skills through curriculum design. Graduates are increasingly recognizing that employ ability skills–communication, cooperation, problem solving, critical thinking necessary for success in the global job market. As part of this work-based learning initiative WBLi's and outcome-based internships (Asefer & Abidin, 2021), in Malaysia, universities have been integrating these skills into their programs.

As another example, the employability of international students studying in Malaysian universities has been shown to benefit from exposure to industry practices and work experience opportunities through the integration of work-based learning initiatives ("The Implications of Work-Based Learning Initiatives in Malaysian Universities: Developing International Postgraduate Students' Employability", 2023"). In order to bridge the gap between academic knowledge and industry expectations, outcome-based internships which focus on developing specific professional skills and career focus for undergraduates have also been introduced. (Marfunizah Ma'dan, et al., 2020)

Notwithstanding these initiatives, curriculum design suffers difficulties especially in terms of matching academic programs with industry needs. According to some research, graduate employability (Krishnappan, 2024) is a result of the mismatch between the skills taught at universities and the skills needed by companies (Hamid et al., 2022). Universities are urged to work with business stakeholders in curriculum development to guarantee that academic programs are relevant and sensitive to market needs.

Practical Training and Industrial Collaboration

Two important aspects of university education can further strengthen the employability of graduates: practical experience and cooperation with industry. One example of initiative is providing industrial

training programs, such as what the University of Malaya is doing, which could significantly enhance the employability skills of the graduate by exposing the students with relevant experience within the workplace itself (Raghavan et al., 2024). In addition to enhancing technical abilities, courses instill other soft skills such as communication, teamwork, and problem-solving, which are highly valued by employers (Basar et al., 2021).

However, the effectiveness of industrial training programs depends on the quality of the training and the collaboration between universities and industry partners. Some studies have identified issues such as mismatched tasks assigned to trainees and the need for continuous input from industry to ensure that the training benefits all parties involved (Belderbos, Tonatiuh, 2019). To address these challenges, universities are encouraged to establish strong partnerships with industry stakeholders and to continuously monitor and evaluate the effectiveness of their industrial training programs (Samaden et al., 2021).

The Role of Soft Skills in Employability

Soft skills, such as communication, leadership, and interpersonal skills, play a crucial role in graduate employability. Malaysian employers have consistently emphasized the importance of soft skills in hiring decisions, yet many graduates lack these skills, leading to employment challenges (Idris & Bacotang, 2023) (Zainal et al., 2022). To address this, Malaysian universities have integrated soft skills into their curricula, with some institutions adopting innovative approaches such as soft skills programs and co-curricular activities (Rozaimie, 2024).

And even with these initiatives, the development of soft skills has not received enough attention within university programs. For instance, according to some researchers, several universities have not adopted common standards for the teaching and evaluation of soft skills, hence differing graduate products may be produced (Azman & Abdullah, 2021). To overcome this, universities should work together toward standardized soft skills development, and cooperate with industry stakeholders (Margatama et al., 2023) (Yeap et al., 2021).

Global Collaboration and International Exposure

Global collaboration and international exposure are increasingly recognized as essential for preparing graduates for international employment. Malaysian universities have engaged in various forms of global collaboration, such as partnerships with overseas educational institutions, to provide students with international exposure and to enhance their employability (Othman et al., 2023). For example, the Malaysia-Japan International Institute of Technology (MJJIT) has been at the forefront of such collaborations, providing students with opportunities to learn from Japanese culture and technology, which has been shown to enhance their global employability (Othman et al., 2023).

However, there are challenges in providing international exposure to all students, particularly those from diverse backgrounds. Some studies have highlighted the need for greater inclusivity in global collaboration initiatives to ensure that all students have access to international opportunities (Othman et al., 2023). To address this, universities are encouraged to develop strategies that promote inclusivity and diversity in global collaboration initiatives, such as scholarships and exchange programs for students from underrepresented groups (Othman et al., 2023) (Wei & Yew, 2024).

The Role of TVET in Addressing Employability Challenges

Technical and Vocational Education and Training (TVET) plays a crucial role in addressing employability challenges in Malaysia. TVET programs are designed to equip students with the technical and practical skills required for specific industries, making them highly employable upon graduation. However, TVET in Malaysia faces several challenges, including fragmentation and decentralization, which can lead to inefficiencies and redundancies in program delivery (Ahmad & Rosnan, 2024).

To address these challenges, there is a need for greater collaboration and coordination among TVET stakeholders, including government agencies, industry partners, and educational institutions. Some

studies have highlighted the importance of establishing a cohesive accreditation system and improving policy implementation to enhance the quality and effectiveness of TVET programs (Ahmad & Rosnan, 2024). Additionally, there is a need for greater emphasis on employability skills, such as communication and interpersonal skills, in TVET programs to ensure that graduates are well-prepared for the workforce (Noor, 2023).

Policy Implications and Future Directions

This study has a number of implications for higher education policy and practices in Malaysia. I feel there should be a greater emphasis on employability skills incorporation in the University curricula, Soft-Skills, and practical training for in-depth understanding of theory. Second, universities can align their academic programs with industry needs by working closely with industry stakeholders. Third, we need to invest more in global collaboration projects that will not only help in making students globally exposed but also contribute to student's global employability.

In short, the Malaysian international employment challenge is included in the university training. With such refinement in shyster education, it is evident that Malaysian universities need to develop their curriculum, carry on with practical trainings having their soft skills trained and collaborative efforts need to be taken all over the world where people can assist students in getting these opportunities. There are challenges that must be overcome, including a mismatch between academic programs and industry needs, a lack of standardization in soft skills development programs, and a need for greater inclusivity in global collaboration initiatives. This will require a collaborative approach between all groups, from government agencies, through industry partners, to educational institutions.

Figure 7 — Key Aspects of University Training in Addressing International Employment Challenges

Aspect	Description	Citation
Curriculum Development	Integration of employability skills, such as communication and problem-solving.	(Raghavan et al., 2024)
Practical Training	Industrial training programs to enhance technical and soft skills.	(Mohammadi et al., 2021) (Carvalho et al., 2023)
Soft Skills Development	Emphasis on leadership, teamwork, and interpersonal skills.	(Che Ibrahim et al., 2021) (Mohammadi et al., 2021) (Mokal et al., 2023)
Global Collaboration	Partnerships with overseas institutions for international exposure.	(Hossain et al., 2024)
TVET Initiatives	Focus on technical and practical skills for specific industries.	(Samaden et al., 2021) (Singh et al., 2024)

This figure of table highlights the key aspects of university training in addressing international employment challenges, along with the relevant citations from the provided contexts.

Measures that promote both international exposure and lifelong learning could be encouraged by policymakers as a way to enhance the effectiveness of university training. Enhancing both public and private collaborations and ensuring that curricula are tuned in with global labor market developments will further bolster the capabilities of Malaysian graduates.

Conclusion

The study emphasizes the critical role of university education in equipping Malaysian graduates with advances in employability, which will enhance their global employment in the future. Even as colleges have made great strides toward aligning their curricula with the needs of the global market, deficits continue to exist in the areas of soft skills cultivation, career guidance, and access to international experiences. The outcome reflects that students want more relevant courses that align with the industry, practical workshops, and an improved university-industry connection.

Strategic improvements in these aspects, including increasing the availability of language programs, fostering international coalitions, and providing grants for studying abroad, can significantly enhance graduates' global competitiveness. Such alignment will help ensure that students graduate with skills and knowledge that are well-suited to migrate into foreign employment and apply the expertise gained in an international workforce.

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Changing Competency Expectations in the Labor Market

Introduction

Technological progress leads to the disappearance of certain professions, the creation of new job roles, and the significant transformation of existing positions. The rise of automation and generative artificial intelligence continuously reshapes the world of work, generating entirely new job structures that demand new types of competencies from employees (Frey & Osborne, 2017; McKinsey, 2022). Repetitive tasks are increasingly performed by machines, leading to the gradual disappearance of routine jobs while elevating the importance of roles that require human skills, creativity, and strategic thinking. Data-driven decision-making and the management of automated systems have become fundamental requirements across most industries, making digital literacy and technological adaptability essential competencies. Emerging technologies not only transform communication methods but also redefine collaboration and work organization (Manyika & Sneader, 2018).

The globalization of the labor market and the rise of the gig economy have introduced new challenges to the economy. The increasing prevalence of flexible, digital work necessitates different skills from employees, including independent time management, virtual teamwork, and intercultural communication. The COVID-19 pandemic (2020 – 21) accelerated these changes, leading to the widespread adoption of remote, hybrid, and online work arrangements (World Economic Forum, 2020). The expansion of the gig economy has also compelled workers to adopt an entrepreneurial mindset, as more people engage in contract-based or project-based employment rather than traditional full-time jobs.

Demographic changes, increasing diversity, and efforts to promote inclusion also shape the labor market (OECD, 2021). Aging societies necessitate lifelong learning and continuous upskilling of employees. Companies are increasingly recognizing the benefits of a diverse workforce and placing greater emphasis on equal opportunities and inclusive corporate cultures. These factors underscore the increasing importance of soft skills, including empathy, teamwork, and cultural awareness. Over the past decade, lifelong learning and retraining programs have gained increasing importance, becoming essential due to the rapidly evolving competency requirements (Lukács & Dorner, 2021).

Along with technological, economic, and social changes, the skills and competencies required for high-level professional practice are evolving, raising employers' expectations regarding workforce qualifications (Tóth et al., 2015). Employers are placing greater emphasis on both *transferable and specific competencies*. Transferable skills – such as communication, critical thinking, problem-solving, and adaptability – have become particularly valuable as they enable workers to adjust swiftly to an ever-changing environment (Cimatti, 2016; Bridgstock, 2009). At the same time, demand for industry-specific skills is also increasing, such as proficiency in programming languages, financial analysis, or project management (Autor et al., 2023). Knowledge economies thrive on employees continuously developing and updating their skills (upskilling). Knowledge workers, in particular, play a crucial role by contributing their creativity and problem-solving abilities to the advancement of economies driven by cutting-edge technology (Haragi, 2010). Acquiring a broad skill set, often requiring expertise in new disciplines, builds upon a high level of general education and continuous learning, enabling workers to perform various roles. In more flexible employment relationships (Szabó & Hámori, 2006), the focus is on task completion, and employers increasingly expect employees to adopt a responsible and self-sufficient approach to their work (Kiss-Répátzky, 2012). Consequently, future expectations anticipate a growth in the demand for transferable competencies that are applicable in various work situations and capable of evolving with experience.

Workforce (2016) described these evolving competency expectations as a *"skills revolution".* The report highlighted the enduring importance of skills such as creativity, emotional intelligence, and cognitive flexibility, which are essential for solving complex tasks or complementing machine functions. Over the

past decade, employers have increasingly sought workers with transferable expertise alongside specialized knowledge, valuing those who can adapt flexibly to rapidly changing circumstances (Zerényi, 2017). Randstad's 2025 report states, "*In times of unprecedented change, as traditional job roles transform and new ones emerge, skills can quickly become obsolete. Our study indicates that ensuring future-ready skills is more critical than ever for both employers and employees. This necessity is not only driven by the expected economic transformation due to artificial intelligence but also by the imminent emergence of the next disruptive technology, poised to push boundaries even further*" (Randstad, 2025, p. 30).

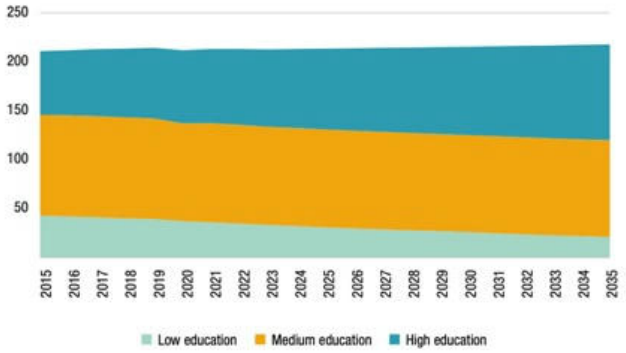
This study aims to explore labor market competency requirements over the past decade by analyzing literature and large-scale research findings. Our objective is to examine the restructuring of competencies essential for successful employment, identifying which skills are losing relevance, which remain critical, and what new knowledge, abilities, or personal attributes will become defining factors in the evolving labor market.

The Labor Market Implications of Competency Restructuring

Technological, economic, and social changes significantly reshape the value and content of competencies required in the labor market. *This restructuring may involve different directional changes in qualification and skill expectations*. The increasing requirements for workforce qualifications are referred to as "*upskilling*," while the expansion of required skill sets and the broadening of qualification content are termed "*multiskilling*" (Czibik et al., 2013). The 2018 Cedefop forecast projected a significant increase in the proportion of highly skilled job positions, expected to rise from 31% in 2016 to 40% by 2030. Concurrently, in some areas, a decline in expectations has been observed; the phenomenon of "*deskilling*" emerges in connection with automation and the spread of computer-controlled technologies. According to the 2018 Cedefop forecast, the share of low-skilled jobs is expected to decrease from 21% in 2016 to 15% by 2030 (Cedefop, 2018).

More recent forecasts from Cedefop in 2023 reaffirm these trends and emphasize the importance of skill development in adapting to changes in the labor market. According to the projections, European employment is expected to grow by 3.4% between 2021 and 2035, equating to approximately 7 million new jobs. This growth is primarily attributed to the green transition, the expansion of the service sector, and the increasing demand in the social care and healthcare sectors due to aging populations. The forecast for 2035 anticipates the dominance of skill-intensive employment in the labor market. The demand for highly skilled workers is expected to increase. In contrast, demand for medium-skilled workers is projected to remain relatively stable, and the number of low-skilled job positions is anticipated to decline (Figure 1). The new job opportunities created by 2035 are also expected to be more accessible to highly skilled individuals (Cedefop, 2023).

Figure 1 — Skills upgrading in the EU labour force, 2015-35



Source: (Cedefop, 2023)

The determination of which competencies lose value, which remain crucial, and what new knowledge, skills, or personal attributes will become dominant in the ongoing labor market transformation is

ultimately shaped by the interactions of key stakeholders. From a market perspective, workplace competency expectations emerge and evolve through the dynamic relationship between employers and employees, influenced by broader market changes (Tóthné & Hlédik, 2019). Consequently, expectations within organizations are not static variables but continuously adapt to the interplay between supply and demand. A more profound understanding of this process and the evolution of requirements is valuable for all stakeholders, including employers, employees, and the educational institutions preparing the workforce.

Demand-side changes in the labor market primarily drive the restructuring of competencies. In modern developed societies, it is economically advantageous for employers to hire only adequately skilled workers. As technological advancements progress, the demand for low-skilled labor is expected to decrease. At the same time, the need for highly qualified workers continues to grow – even though acquiring such talent becomes increasingly costly and often requires attracting workers from competitors (Kopátsy, 2011). The impact of technological, economic, and social changes is prompting significant transformations within companies, leading employers to rethink and extensively modify their organizational operations, human resource management, and employee expectations. However, *employers may differ in their evaluation of the role of specific competencies, both currently and in the future*. Some companies proactively build personal and organizational conditions aligned with expected macroeconomic shifts, while others respond more slowly, relying on previously established success criteria essential for maintaining their current performance. As a result, the timeline for changes in employee expectations can vary significantly across organizations.

Naturally, the skills and knowledge considered valuable differ across industries, as corporate strategies dictate diverse competency needs. The emergence of skill shortages is not solely driven by new demands from companies but also by the labor market's inability to adapt to these expectations swiftly. Wage disparities between workers with varying skill levels indicate that the economy increasingly favors highly skilled labor. The root cause of unequal compensation lies in the lag between labor supply and evolving employer expectations (Velden-García, 2010). Employers can choose among candidates with stronger or weaker qualifications, and the outcomes of these selection processes are reflected in salary distributions and job placements. Some workers adapt more easily to the changing expectation framework, while others struggle. Modernization has led to an expansion in employers' competency demands. However, in some areas, the workforce struggles to keep pace with new expectations, while in others, it may even exceed them.

Randstad's (2025) latest research report highlights that "*the workforce is well aware of economic changes and feels compelled to keep up with them*." In the workplace, employers and employees share a mutual responsibility for skill development, albeit to varying extents. According to the survey, 64% of respondents (56% in Hungary) reported that their employers helped them acquire future-proof skills in the past year, marking an increase from the previous year's figures (52% globally, 46% in Hungary). More than one-third (35%) of employees believe that they are more responsible for keeping up with technological advancements than their employers (27%). In Hungary, the results suggest the opposite: 25% attribute responsibility to employees, while 35% consider it the employer's duty (Randstad, 2025).

Labor market surveys do not distinguish between the demand for talent, knowledge, skills, and competencies, as these factors are difficult to separate in practice (Szabó, 2011). Gallardo et al. (2013) also highlight the similarities between the concepts of talent and competency. In the definition provided by Ulrich and Smallwood (2012), these two terms are treated as categories with overlapping content. Talent is a complex phenomenon with multiple interpretations in the literature. Renzulli (2003) defines talent as the intersection of exceptional intellectual abilities, creativity, and strong motivation. Talent can be understood as an inherent aptitude, potential, or outstanding performance (Szabó, 2011). This definition closely relates to the concept of competency in management, which links competency to excellent performance (McClelland, 1973). According to Szabó (2011), employers "*purchase talent as*

a package," seeking individuals with various competencies who can complete tasks. Achieving this level of general action competence (Wilkens, 2004) requires knowledge, expertise, aptitudes, skills, and motivation. According to Leplat, competency dynamically structures and integrates these components (Szelestey, 2008). From a pedagogical perspective, these elements consist of inherited motives and learned components, which determine their potential for development (Nagy, 2007). However, from a corporate perspective, the focus is primarily on identifying the personal success criteria and competency components necessary for outstanding performance (Tóthné Téglás, 2016). However, from a corporate perspective, the focus is primarily on identifying the personal success criteria and competency components necessary for outstanding performance.

Given that in the study of talent shortages, it is difficult to separate the demand for talent, competency, knowledge, or skills (Hámori-Szabó, 2017), a detailed examination of performance-related competency components can contribute to a more accurate understanding of talent shortages. In our study, we utilize the concept of competency expectations, as applied in management literature, to analyze employer expectations. This perspective primarily focuses on identifying the success criteria necessary for job performance and corporate operations.

Competency Expectations – International Trends

Over the past decade, expectations for competencies in the labor market have undergone a significant transformation, influenced by technological advancements, globalization, and economic and social changes. The objective of our research is to explore the direction and extent of these changes, with a particular focus on the evolving role of transferable competencies. The core of our analysis is to understand which competencies have gained value in the eyes of employers and what factors currently define workforce expectations.

The presented findings are based on a systematic review of the literature and a synthesis of large-scale international studies. Our study compares labor market expectations from ten years ago with current trends, with a particular emphasis on the observed changes in employers' general competency expectations. The analysis aims to identify which transferable competencies have become the most crucial and how their content components have expanded with new dimensions recently.

In tabular form (Figure 2.), we have organized large-scale empirical studies and labor market reports that provide relevant data for understanding changes in competencies. The analysis is based on global economic and regional trend reports.

Figure 2 — Large-Scale Labor Market Reports Analyzed in the Study

Labour market reports	*Date*	*Background of the study*
IFTF Future skills (update)	2011, 2016	In 2011, studies were conducted with the leaders of key organizations using a variety of methodologies, and in 2016, the results were reviewed through a literature analysis.
WEF Future of Jobs Report	2016, 2025	In 2015, a survey was conducted with 371 employers worldwide across 9 industries, providing interpretable results for 13 million employees; in 2024, a survey was conducted with over 1,000 employers across 22 industries, providing interpretable results for more than 14 million employees.
Cedefop, 2018 Cedefop "*Skills in transition: The way to 2035*"	2018, 2023	Skill forecasts, based on industry forecasts.
OECD Future skills	2024	Based on literature analysis.

Source: (Own editing)

Labor Market Expectations According to 2015 Forecasts

As mentioned in the introduction, Manpower described the changes in competency expectations for employees as a "*skills revolution*" in 2016. However, how did key labor market players and experts in 2015 – 16 perceive the personal factors that would determine success in the coming years? Our examination of competency expectations from a decade ago is based on the findings of two labor market forecasts. The key personal attributes identified by experts are presented in *Figure 3.*

The *Institute for the Future (IFTF)* is a non-profit organization with decades of experience in forecasting the future of work. It has played a leading role in the development of future research methodologies, such as the Delphi technique, expert opinion aggregation methods, and the use of gaming platforms. In their research (ITFI, 2011), these diverse methods were applied in surveys of Fortune 500 companies, government agencies, and non-profit organizations. As a result of the study, *10 key competencies* were identified as crucial for success in the workplace by 2020. In 2016, the organization collaborated with the *ACT Foundation* to further refine its research through a literature review and expert consultations, which led to the development of detailed descriptions of these ten competencies, along with measurement and development methodologies (IFTF, 2016).

The *World Economic Forum (WEF)* regularly publishes reports on global economic trends, including expected changes in the world of work. The WEF's *2016 labor market report* was produced with the support of the *Adecco Group, Manpower Group, and Mercer*. Their large-scale survey gathered insights from human resource executives of the world's largest employers, asking how they expected jobs in their industries to evolve by 2020. Given that these multinational employers serve as reference points for smaller market participants, they were seen as playing a decisive role in shaping labor market trends.

According to the HR leaders surveyed, by 2020, more than *one-third of the core skills required for most occupations* would consist of skills that were not yet considered essential by employers at the time of data collection. The report projected that between 2015 and 2020, the most significant increases in importance would be seen in *complex problem-solving, social skills, process regulation, systems thinking, and cognitive abilities* (WEF, 2016). According to the report, the competency list published on the WEF website (Zahidi & Leopold, 2016) presents the success criteria projected for 2020 in order of importance.

Figure 3 — Success Criteria Projected for 2020 Based on IFTF and WEF Forecasts

Sources: (IFTF, 2011 ; IFTF, 2016; WEF, 2016; Zahidi & Leopold, 2016)

Based on labor market analyses, the content components of employer competency expectations were categorized into four competency groups in our study to ensure comparability. By examining the range of skills and knowledge included in the forecasts, we summarized the success criteria for the future as projected by experts a decade ago.

Personal and social skills necessary for work appear as fundamental success criteria in both of the examined forecasts and in other international labor market analyses (PwC, 2017; Manpower, 2016; Tóthné & Hlédik, 2019). These skills can be clearly interpreted as *transferable competencies*, as they provide a foundation for work regardless of context. Among personal competencies, Harangi (2010) highlights *motivational skills and an open, research-oriented attitude,* while the IFTF (2011) forecast emphasizes *new and flexible thinking*, and the World Economic Forum (2016) projection underscores *the importance of emotional intelligence*. The PwC (2017) CEO survey draws attention to the fact that future workers will need a significantly more *flexible approach and greater autonomy* than before. Accordingly, companies will require *ambitious, enthusiastic, and highly performance-oriented employees* to achieve their future business objectives.

Among social competencies, the IFTF (2016) forecast emphasizes the *importance of collaboration in multicultural and virtual environments,* while Harangi (2010) considers *effective verbal and written communication*, as well as *the ability to communicate proficiently in both private and public settings*, to be equally critical.

The competency of learning did not appear among the top ten most important categories in either the IFTF (2016) or WEF (2016) reports. However, the concept of *lifelong learning* has been widely discussed in academic literature. The observed labor market transformations require the simultaneous presence of multiple competencies, favoring *versatile (versatil) and learning-capable (docilis) employees* (Szabó & Hámori, 2006). In this context, learning takes on a new meaning, extending beyond externally directed education to *self-directed learning*, which enables individuals to *adapt to changing conditions* (Cserné, 2017).

In a narrower sense, the *"learning to learn"* concept refers to *learning skills and techniques*. Habók (2004) interprets learning more broadly, defining it as a *cognitive ability* that facilitates *higher-level information processing and problem-solving*. Based on international DPR research, Sági (2013) emphasizes that individuals must not only be prepared to update and expand their knowledge within their field rapidly *but also to acquire multidisciplinary expertise*. Moreover, it is essential not only to *adapt to constantly changing challenges* but also to *interpret them as sources of new opportunities and capitalize on them.*

The competency of problem-solving is identified as a key driver of future labor market success by Harangi (2010), particularly in relation to *knowledge workers*. According to Harangi, these are highly *competent, up-to-date, and creative employees with strong problem-solving skills*. The World Economic Forum (2016) research ranked *complex problem-solving* as the most critical competency for the future workforce. The IFTF (2016) and WEF (2016) forecasts highlight *the importance of flexible yet critical thinking,* as well as *information processing, situational awareness, and decision-making skills* in ensuring employee success. These forecasts also predict *a growing emphasis on employee responsibility, risk-taking, and creativity*. Regarding professional expectations, some labor market projections (Manpower, 2016) anticipate the emergence of new specialized knowledge areas and increasingly specific requirements in response to rapidly evolving professions driven by technological changes. Forecasts from PwC (2017) and IFTF (2016) also emphasize *higher levels of autonomy and advanced problem-solving abilities*, which inherently imply heightened professional expectations.

At the same time, the IFTF (2016) report identifies proficiency across multiple disciplines as a key competency for the future workforce. The seemingly contradictory forecasts – one predicting highly

specialized professional requirements and the other emphasizing broad, multidisciplinary knowledge – suggest that employers may adopt different approaches to workforce expectations, tailoring competency requirements to their specific industry needs.

The *role of digital competencies*, specifically *information and communication technology (ICT) literacy,* has become indisputable for individuals in the 21st century. However, there is no single, universally accepted definition of this emerging competency, as interpretations continue to expand and incorporate new elements (Tongori, 2012). The concept of digital competence is evolving both in name and content; in academic literature, *digital literacy* is no longer limited to *the knowledge and use of computers, digital mobile devices, and basic software applications*. Instead, it now encompasses *cognitive abilities, social skills, and the legal and ethical competencies necessary for the responsible use of technology*. The elements of ICT literacy are increasingly integrated into the complex framework of 21st-century skills (Horváth et al., 2022).

Harangi (2010) includes *analytical skills*, while the IFTF (2016) report emphasizes computational thinking and the use of new media as key success criteria. According to Manpower's (2016) research report, although automation may lead to the disappearance of many jobs in the long run, in the short term, *the preparation and implementation of digitalization have generated labor demand*. Among the surveyed companies, only 12% planned workforce reductions due to automation, while 83% maintained or increased their workforce in the following year. As a result of technological advancements, not only the quantity of employees but also their qualifications and competencies are playing an increasingly significant role (Szabó, 2011).

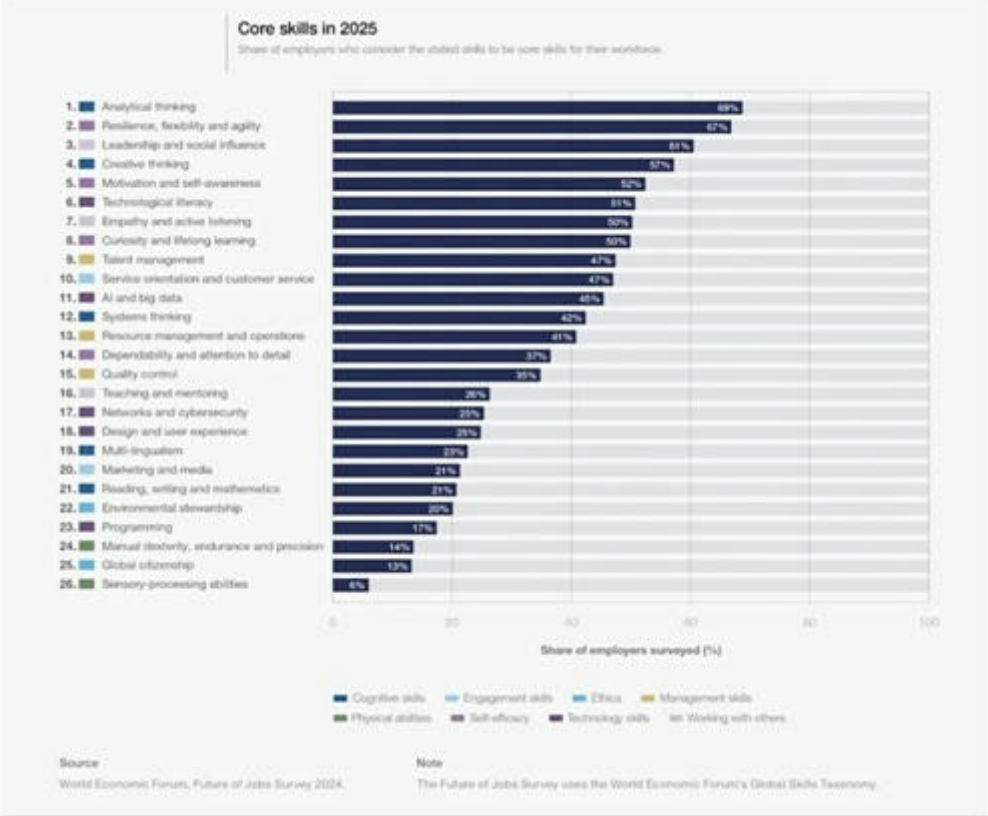
Current Labor Market Competency Expectations

To examine the evolving competency expectations of the past decade, we reviewed three international labor market forecast reports, namely the World Economic Forum (2025), OECD (2024), and Cedefop (2023). These labor market reports primarily highlight key competencies essential for shaping a digital and sustainable future.

According to the World Economic Forum's "Future of Jobs Report 2025," *analytical thinking* remains the most critical competency required in today's workforce (Figure 4). Additionally, the report emphasizes the importance of *flexibility, adaptability, and agility*, as well as leadership and social influence – the ability to *inspire, motivate, and guide individuals or groups*. Other key competencies include *creative thinking, motivation, and self-awareness*.

The report projects that by 2030, the most in-demand skills will include competencies related to *artificial intelligence (AI) and Big Data*, an *openness to and ability for lifelong learning*, and *strong collaboration skills.* Moreover, the analysis highlights that in an increasingly VUCA (Volatile, Uncertain, Complex, and Ambiguous) world, coupled with slowing economic growth, there will be a growing demand for resilience, flexibility, and agility among employees.

Figure 4 — Expected Competencies in 2025



Source: (World Economic Forum "Future of Jobs Report 2025")

The OECD's "Future Skills Summit 2024 - Issues for Discussion Paper" identifies a *broad spectrum of key competencies* necessary for the future economy and society. Among these, *fundamental cognitive skills* – such as *literacy, numeracy, and digital literacy* – are essential, as they enable individuals to *access, analyze, interpret, and communicate information*, thereby preventing economic and social exclusion. *Social-emotional and communication skills* – including *collaboration, emotional regulation, perseverance, conflict resolution, and collective knowledge-sharing* – are also crucial, as they help individuals navigate social environments and make responsible decisions.

The *report also emphasizes metacognitive skills*, referring to *competencies that allow individuals to reflect on, regulate, and evaluate their own thought processes, learning, and understanding*. These include planning, goal-setting, and strategy adjustment, which are essential for successfully achieving objectives. Metacognitive skills play a pivotal role in enabling individuals to self-regulate their behavior, adapt to changing situations, and develop more effective learning processes. Additionally, the OECD highlights the growing demand for *AI-related skills* in the labor market, including *AI development capabilities, data processing and analysis skills, and AI application proficiency*.

The Cedefop report "Skills in Transition: The Way to 2035" emphasizes that Europe requires a *"skills revolution"* to navigate sustainable and digital transformations successfully. This shift necessitates technical, digital, and professional competencies, particularly knowledge and skills related to renewable energy and the circular economy. The report underscores that the green transition is not only about *job-specific skills* but also requires *proficiency in STEM fields (Science, Technology, Engineering, and Mathematics)* as well as *digital skills at all levels*. It forecasts that by 2025, most newly created jobs will require a high level of qualification. Moreover, the report highlights a *transition away from labor market polarization*, where jobs were historically divided between *high-skilled, well-paid positions and low-skilled, lower-paying roles, with a shrinking share of middle-skilled jobs.* Instead, the increasing knowledge intensity of jobs is leading to a "job upgrading" process, where workplaces demand

higher levels of qualification and expertise. In addition to technical and professional skills, the report stresses the rising importance of transversal skills and soft skills, including *communication, persuasion, adaptability, systems thinking, and problem-solving abilities*. Soft skills that facilitate cross-functional collaboration within organizations and enable effective engagement with an expanding network of stakeholders are becoming increasingly valuable. Furthermore, in alignment with the European Green Deal (EGD), the report highlights the necessity of ensuring a just transition, making empathy and human-centered approaches essential in management and process planning.

Finally, using the previously identified four competency groups, the study will further analyze how the three reports discussed above outline employer competency expectations, identify changes, and predict future labor market trends.

Personal and Social Competencies Required for Work

International labor market reports consistently highlight the *increasing significance of personal and social competencies* in employer expectations. Due to technological advancements, globalization, and economic-social transformations, adapting to the constantly evolving workplace environment requires not only technical expertise but also high-level interpersonal and self-regulation skills. All three reviewed reports confirm that employers place growing emphasis on adaptability, leadership, collaboration skills, and the ability for independent development and learning (WEF, 2025; OECD, 2024; Cedefop, 2023).

According to the latest World Economic Forum (WEF) labor market report, *flexibility, adaptability, and agility* rank as the second most important core skills valued by employers (Figure 4). Given the economic uncertainties, technological disruptions, and geopolitical challenges, both businesses and employees must rapidly respond to new situations, making these skills indispensable. The report states that 75% of employers anticipate the increasing importance of these skills by 2030 (WEF, 2025). Similarly, the OECD employment report highlights that individual resilience and emotional stability are crucial in adapting to dynamic labor market conditions. The OECD highlights socio-emotional and metacognitive skills – including self-reflection, conscious application of learning strategies, and goal-oriented thinking – as determinants of success in future workplaces (OECD, 2024).

Leadership skills and social influence are also becoming key expectations for employees. Employers seek leaders who can effectively motivate teams, guide subordinates, and exert influence in both collaborative and negotiation settings. According to the WEF report, leadership and social influence rank as the third most valued competency, with 76% of employers predicting their growing importance in the future (WEF, 2025). The Cedefop analysis supports this trend, indicating that *collaborative skills and the ability* to manage organizational dynamics have become essential across various industries (Cedefop, 2023). The OECD research also underscores the increasing importance of leadership and social competencies, particularly in the areas of conflict resolution, group dynamics, and organizational efficiency enhancement (OECD, 2024).

Communication and teamwork skills have emerged as fundamental expectations in the labor market. The Cedefop report highlights that *persuasion and communication abilities* are gaining importance, particularly in service-oriented sectors. Effective collaboration and stakeholder engagement are critical in modern work environments, where digitalization and sustainability concerns demand new forms of teamwork and interpersonal skills (Cedefop, 2023). Both the OECD and Cedefop reports emphasize that empathy, active listening, and cultural sensitivity play a pivotal role in workplace collaboration. These soft skills are particularly valuable as they cannot be easily replaced by automation or artificial intelligence (OECD, 2024; Cedefop, 2023).

Learning Competency

In earlier labor market reports, learning competency did not feature prominently among the prioritized skills, despite the widespread recognition of the Lifelong Learning (LLL) concept since the early 2000s.

However, analyses conducted after 2020 indicate that technological advancements, economic transformations, and sustainability challenges have made the ability and willingness to engage in continuous learning not just an advantage but an increasingly essential core competency (WEF, 2025; OECD, 2024; Cedefop, 2023).

The WEF report highlights *curiosity and lifelong learning* as crucial factors, ranking them eighth among the top ten core skills that employers expect. While 50% of employers currently consider this skill fundamental, 72% anticipate its further rise in importance by 2030. It clearly underscores that continuous self-development and maintaining up-to-date competencies are indispensable for long-term labor market success. The rapid pace of technological advancement necessitates constant adaptation, and employees who can quickly acquire new skills and adjust to evolving workplace expectations will have a competitive edge in the job market.

The growing emphasis on continuous learning is further supported by employers' increasing investments in *upskilling* and *reskilling* initiatives. According to the WEF's 2023 report, 41% of employees were already engaged in long-term learning strategies, and this figure is expected to rise to 50% by 2025. This trend is not limited to information technology or highly specialized sectors but extends across various industries, as companies recognize the importance of continuous development and workforce training. In specific sectors, knowledge updating and learning abilities play a particularly decisive role – especially in telecommunications, education and training, and the insurance sector, where 83% of respondents identified lifelong learning as a fundamental skill (WEF, 2025).

The ability for independent development and openness to continuous learning has become a focal point in labor market forecasts. According to the WEF report, motivation and self-awareness rank as the fifth most critical core skill, essential for personal development and independent work. 72% of employers anticipate an increase in the importance of this skill, as technological progress and evolving work methods demand greater adaptability and a proactive approach to learning (WEF, 2025).

The OECD report reinforces this trend, emphasizing that continuous learning is not only crucial from an economic perspective but also carries broader societal implications. According to OECD data, participation in lifelong learning has steadily increased over the past decade. In 2012, 13% of adults in OECD-EU countries were engaged in learning activities, whereas by 2022, this figure had risen to 16%. The OECD underscores that *lifelong learning enhances employability, workforce flexibility, democratic participation, and social stability*.

The report further highlights that higher levels of education correlate positively with higher employment rates, increased earnings, greater social engagement, and improved health indicators. The OECD recognizes the pivotal role of education systems in fostering a culture of lifelong learning. Pedagogical methods, critical thinking skills, and learning motivation cultivated in educational institutions significantly influence an individual's ability to adapt to dynamic labor market demands.

The report suggests that teachers' pedagogical approaches and the promotion of critical thinking in early education can foster a long-term commitment to lifelong learning. Additionally, family background and social environment impact an individual's learning willingness, demonstrating that continuous learning is not just a personal but also a systemic issue. The OECD highlights explicitly the role of metacognitive skills, which enable individuals to regulate their own learning processes, enhance problem-solving abilities, and respond effectively to new challenges (OECD, 2024).

The Cedefop report contextualizes learning competency within the framework of green and digital transitions. The document asserts that Europe requires a *"skills revolution"* to ensure that workers can adapt to rapidly changing industrial and economic environments. Similar to the WEF report, it identifies skill development, knowledge updating (*upskilling*), and acquiring new competencies (*reskilling*) as fundamental labor market requirements.

The report also acknowledges that while learning opportunities are available, participation in adult education remains low. Therefore, collaboration between employers and governments is essential to develop effective training systems and expand access to learning opportunities. Additionally, flexible learning formats – such as short courses, micro-credentials, and online training programs – are playing an increasingly significant role in skill development. The Cedefop report emphasizes that the most effective learning competency development occurs through the active involvement of employers (Cedefop, 2023).

Problem-Solving Competency

Problem-solving skills, particularly their *analytical and creative components*, have become increasingly crucial in employer expectations. According to the competency framework outlined in the WEF report, *analytical thinking* – which is closely linked to *problem-solving* – is the most important core skill sought by employers. Seventy percent of companies consider it indispensable, indicating that the ability to analyze problems and draw logical conclusions is already a critical factor in employability. In addition to the skills required for analysis and decision-making, creative thinking is also of high significance; the report ranks it as the fourth most important competency on the list of expected skills. The ability to *think innovatively* and *develop new solutions* to emerging challenges is essential in occupations and industries experiencing rapid technological and business transformations. The report further highlights that for jobs with growing demand, analytical and problem-solving skills are becoming increasingly vital, meaning that workers who possess these competencies are more likely to secure competitive job opportunities in the labor market. While *generative artificial intelligence (AI)* can assist in processing and utilizing theoretical knowledge, solving complex problems continues to require human abilities that AI cannot fully replace (WEF, 2025).

The OECD report similarly emphasizes the importance of problem-solving, particularly in terms of transversal skills. According to the OECD, alongside collaboration and creativity, problem-solving is one of the most critical competencies enabling workers to navigate the evolving labor market successfully. These skills are not only applicable to specific job roles but are also valuable across industries and professional domains. The OECD underscores that problem-solving is among the few skills that cannot be easily automated, emphasizing its growing importance despite AI advancements. Employees must possess competencies that allow them to rapidly assess situations, make decisions, and take effective action in unexpected or complex scenarios (OECD, 2024).

While the Cedefop report does not explicitly list *problem-solving competency*, it highlights several interrelated skills. *Systems thinking* is particularly significant in the context of circular economy models and ecological sustainability, as understanding and effectively managing complex challenges require identifying interconnections and applying strategic thinking. *Analytical skills* play a critical role in the IT and technology sectors, where problem identification and the development of solution strategies are fundamental expectations. The report also emphasizes critical thinking as a key competency for addressing labor market challenges and industry transformations. Due to technological and economic shifts, employees must quickly learn and adapt, necessitating flexible and proactive problem management. Innovation is also a central aspect of problem-solving, particularly in the context of the green and digital transitions, where new, creative solutions are required to enhance the sustainability of industrial and service processes (Cedefop, 2023).

Digital Competencies

The role of digital competencies, particularly information and communication technology (ICT) literacy, has become indisputable in the 21st century. All three reviewed reports emphasize that digital skills are no longer exclusive to the ICT sector, but have become *fundamental across all industries and job roles.*

According to the WEF report, digitalization is one of the primary drivers of labor market transformation, with 60% of companies worldwide anticipating that this trend will significantly impact their organizational operations. The report specifically highlights *the increasing demand for generative arti-*

ficial intelligence (GenAI) skills, referring to the capabilities and knowledge necessary for developing, implementing, and optimizing GenAI-based systems. Between 2022 and 2024, this demand has grown significantly. Additionally, skills related to artificial intelligence (AI) and Big Data – including *data mining and machine learning applications* – are expected to increase in importance, with 81% of respondents anticipating growing demand for these competencies by 2030.

Among digital skills, expertise in networking and cybersecurity is also receiving considerable attention, with 70% of employers expecting an increasing need in this area. Furthermore, technological literacy has become a core competency, with 73% of companies predicting its growing significance in the coming years. Technological literacy encompasses *understanding, applying, and critically evaluating technological tools, systems, and processes*, while also working effectively and responsibly with them. This competency extends beyond the mere use of tools and software to include understanding their underlying mechanisms and recognizing the social, economic, and ethical implications of technological innovations. *Programming skills* remain highly significant, particularly in technology-driven industries, but are also increasingly emphasized in sectors undergoing digital transformation. The report highlights the rising demand for digital transformation specialists and e-commerce professionals (WEF, 2025).

The OECD report asserts that digital skills have become essential for active participation in society over the past few years. The COVID-19 pandemic accelerated the shift toward *remote work and online learning,* further increasing the demand for digital competencies. The report highlights that information management skills are also becoming increasingly important, as navigating the digital environment and processing information efficiently are now essential for employees*. Digital literacy is identified as a key factor for labor market success,* with its development being a priority not only for younger generations but also for adults. However, according to OECD data, as of 2023, only 55% of adults in the EU possessed at least basic digital skills, indicating a significant gap in this area. The lack of digital competencies can hinder adults' participation in online and hybrid learning opportunities, ultimately affecting their employability and integration into the labor market (OECD, 2024).

The Cedefop report underscores that *digital skills have become a transversal requirement* across almost all job roles. The accelerated digitalization triggered by the COVID-19 pandemic has further increased the value and demand for digital competencies, a trend observed across all industries. The report highlights that workplaces are becoming increasingly digital-intensive, even in occupations that traditionally required lower levels of qualification. The expansion of automation, robotics, and AI is raising digital skill requirements at all levels of employment. According to the report, the European Commission's Digital Decade program has set ambitious targets for 2030, including the training of 20 million ICT specialists and ensuring that at least 80% of the population possesses basic digital skills (Cedefop, 2023).

Conclusion

The labor market transformations presented in this study necessitate adaptation from all labor market stakeholders, including employers, employees, and educational institutions responsible for workforce preparation. As stated in the World Economic Forum report, *"Given the rapid pace of change, disruptions to business models almost simultaneously impact employment and the demand for new skills, necessitating urgent and coordinated efforts for adjustment."* (WEF, 2025, p. 8). As a result of technological, economic, and societal transformations, industries are adapting, workplaces are restructuring employment models, and the nature, location, and content of work are evolving. Many occupations are undergoing fundamental transformations, requiring the acquisition of new knowledge and competencies.

These ongoing changes are reshaping the scope and content of competencies required in the labor market. In this study, we examined the growing significance of transferable competencies in the labor market, aiming to identify and understand the components of these broad labor market expectations.

Figure 5 — Comparative table, own editing based on the forecasts presented in the study

Sources: (IFTF, 2011 ; IFTF, 2016; WEF, 2016; Zahidi - Leopold, 2016; WEF, 2025; OECD, 2024)

International labor market reports consistently indicate that technical expertise and professional competencies alone are no longer sufficient for labor market success. Employers are increasingly prioritizing *personal and social skills*, including adaptability, leadership, collaboration, and a willingness to engage in lifelong learning. The findings suggest that as workplace expectations evolve, human-centric skills are becoming more valuable, as they enable employees to adapt swiftly to an ever-changing work environment.

Labor market reports strongly reinforce the rising importance of *learning competencies and lifelong learning expectations*. Employers recognize that successful employees not only rely on their existing knowledge but must also quickly adapt to new challenges, acquire new skills, and respond to technological and economic shifts. According to survey data, 72% of employers expect learning competencies to become even more critical in the future, while 50% already consider them a fundamental requirement today. The OECD and Cedefop emphasize that continuous learning extends beyond individual benefits, *holding significant economic and societal value* by enhancing employability, social participation, and labor market flexibility.

Problem-solving skills are among the most essential current and future labor market expectations. According to employers, 70% consider analytical thinking a key skill today, while creative thinking is also ranked among the most in-demand competencies. The OECD underscores the importance of transversal skills, which allow workers to apply their problem-solving abilities across different work environments and industries. The Cedefop report highlights that systems thinking, analytical skills, and critical thinking are essential for effectively addressing labor market challenges. Despite the advancements in artificial intelligence (AI), human problem-solving skills and creative thinking remain irreplaceable, as they complement automated processes and enable the resolution of complex tasks.

Digital competencies have also become a fundamental requirement across nearly all professions. 81% of employers identify AI and Big Data skills as highly important by 2030, while 73% predict that technological literacy will play an even greater role in shaping workforce expectations. Reports from the OECD and Cedefop emphasize that digital skills are not only crucial for high-skilled occupations but are increasingly required in lower-skilled roles as well, due to the widespread adoption of automation and digital systems across all sectors. Thus, developing digital competencies is not only essential for enhancing individual employability but also serves as a key driver of economic and social progress.

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Ferenc RIBNÍ

Deep Analysis of Higher Education Students' Attitudes Towards Artificial Intelligence

Introduction

From an interdisciplinary perspective, AI is more than a system of algorithms (*alg.*) and data sets: it is a new kind of dialogue between man and machine (Molenaar, 2022; Beishui, 2022). Our study invites the reader to view AI not only as a tool, but as a system whose deeper understanding can help push our intellectual limits.

Our research has explored in detail and empirically confirmed this phenomenon, emphasising that the lack of knowledge or the superficial, fragmentary possession of knowledge not only limits us, but also acts as a kind of internal boundary that narrows the horizon of understanding (Ribní, 2025a). This insight points to the paradox that the precondition for the development of human thought is precisely the awareness of the lack of knowledge: the lack that generates both anxiety and desire, but also the dynamic that drives the search for knowledge. Thus, ignorance becomes not merely a limitation but a compass of cognition that permeates the fundamental structure of intellectual progress (Foucault, 1970). Following this line of theoretical reasoning, our research model is built on three fundamental pillars:

- knowledge,
- trust,
- and the resulting application of the concept of knowledge and its social embeddedness.

The following factors are critical determinants of the effective and efficient application of AI. Hence, for the application of AI, it is important that users have the appropriate knowledge, are active users of the technology, and have confidence in the functioning of AI systems.

The use of AI in education and research is indeed a complex issue that requires a combination of positivist and constructivist approaches (Davis, 2005). The benefits of using AI, such as the ability to process data quickly and accurately, can undoubtedly be beneficial. However, it is essential not to overlook the role of subjective interpretations, particularly in areas where human experiences, ethical considerations, and social contexts significantly influence decisions (Bredenoord, 2016; Sen, 2009). Nevertheless, the use of AI is essential in modern education and research processes, but should always be treated with caveats. When using this technology, the following should be considered:

- **Ethical and social issues:** The decisions made by AI are often not entirely transparent, and there may be biases in its outputs. For this reason, it is important to use AI applications within an ethical framework and to ensure that they do not violate social norms and values (Négyesi, 2023; Glavanits, 2022).
- **Subjective interpretation and context:** Since AI primarily processes data objectively, it is essential to consider the role of human interpretation, especially when AI-generated data or results have social implications (Négyesi, 2023; Glavanits, 2022).
- **Learning and application:** AI should not only be used for pure data analysis, but also to gain a deeper understanding of learning and research processes by taking into account human experiences and subjective interpretations (Négyesi, 2023; Glavanits, 2022).

Consequently, while AI should be utilised, its development and applications must ensure that it does not become a fully autonomous decision-maker, but rather that human oversight and ethical considerations remain paramount.

Methods

The objective of our current research is to explore the threefold structure outlined above (knowledge, use, trust - see *Figure 1*), which is one of the fundamental requirements for the growing use of AI. Furthermore, our research aims to emphasise the role of teachers in raising awareness of the importance of these factors in the use of AI. The research questions guiding our study were as follows:

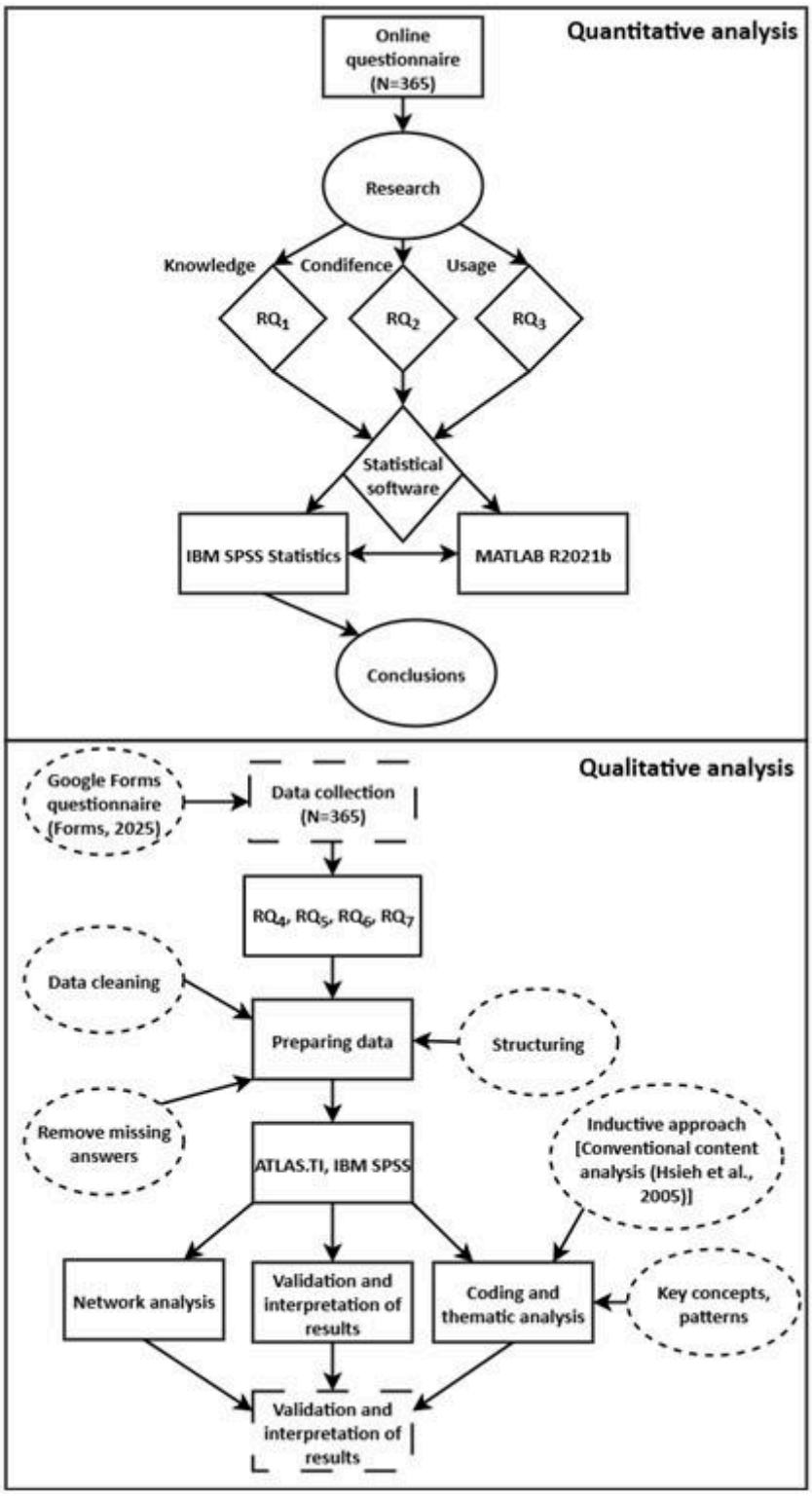
- **RQ1:** To what extent do students have knowledge about AI, and what sources do they use to learn about it?
- **RQ2:** To what extent do students trust the answers and results provided by AI?
- **RQ3:** How willing are students to utilize AI in their studies, and what are their future expectations for AI?

The study aims to explore in depth the knowledge, confidence level, and willingness to use AI among the higher education students mentioned above. Our primary objective was to assess the extent of knowledge of AI technology, as well as its perception and attitudes towards its use in educational settings. It was imperative to explore the extent to which students perceive AI as a trustworthy source and how confident they are in its responses compared to traditional methods. Furthermore, the research also aimed to determine the extent to which students are willing to incorporate AI into their learning process (see *Figure 1* for the research design).

Validation of the questionnaire

Before the research, a pilot study (*N=150*) was conducted in which we tested the reliability and validity of the questionnaire, as our questionnaire was self-developed and not adapted. Reliability was measured using the Cronbach's alpha coefficient ($\alpha=0.806$), which showed a value above 0.80, indicating a good level of internal consistency of the questionnaire. In terms of validity, both content validity and construct validity were examined, with the results confirming that the questionnaire adequately measures the targeted concepts.

Figure 1 — Research design



Source: Author's creation (draw.io, 2025)

Research design and data collection

A total of 365 respondents participated in the survey (N = 365). The target group of our research were students in higher education (students of the *Budapest University of Technology and Economics* and *Eötvös Loránd University*). Fifty-five percent, thirty-four (55.34%, *N=202*) of the respondents were female, and forty-four percent, sixty-six (44.66%, *N=163*) were male. They were asked to complete the questionnaire online, with no time limit. The results were conducted using IBM SPSS Statistics (*version*

20) software; the analyses used were: descriptive statistics, Cronbach's alpha test, correlation analysis, linear regression, VIF test, Breusch-Pagan test, Durbin-Watson statistic, Q-Q plot, and Shapiro-Wilk test, and MATLAB was used for data visualisation (MATLAB, 2021). Our questionnaire was considered reliable, as Cronbach's alpha (α) was *0.805*. The questionnaire included Likert scale statements, as well as open-ended and multiple-choice questions.

In terms of place of residence, the data show the following distribution: 30.41% live in a village (*N=111*), 22.2% in a small town (under 50,000 inhabitants, *N=81*), 26.84% in a big city (over 50,000 inhabitants, *N=98*), 20.55% in the capital (*N=75*). 56% (*N=204*) of the respondents were undergraduate students, 44% (*N=161*) were master's students.

Most participants fell within the 18–23 age range, while the least represented group consisted of those aged 27 and older [μ*=24.25* years (mean), σ*upper=29.54* (upper standard deviation), σ*lower=18.96* years (lower standard deviation)]. The distribution between age groups shows that the surveyed group mainly represents the younger generation.

Qualitative analysis

The study has been supplemented with a qualitative section that analyses the open-ended questions. The text's length is 2.8 sheets, comprising 92,862 non-space characters (NSP), and was constructed around the following items, which served as the foundation for the research questions:

- **Q1item:** How would you briefly define AI?
- **Q2item:** Briefly summarise how you think AI works.
- **Q3item:** What do you see as the advantages and disadvantages of using AI in your studies?
- **Q4item:** In 10 years, how do you think AI will be used at university?

The qualitative analysis aims to identify, through qualitative content analysis (Hsieh et al., 2005; Elo et al., 2008), students' understanding of the concept of AI, basic knowledge of how AI works, and the educational benefits, drawbacks, and future potential of the technology. Building around the following research questions:

- **RQ4:** How do students define AI, and what are the differences between the definitions?
- **RQ5:** What are students' perceptions of how AI works, and to what extent do these perceptions reflect reality?
- **RQ6:** What advantages and disadvantages do students identify in using AI in their studies?
- **RQ7:** What future role do students envision for the use of AI in education, particularly in the university environment, over the next decade?

Qualitative methods

For analytical purposes, we applied the ATLAS. TI software is an advanced qualitative data management tool that allows for the systematic coding and analysis of large amounts of textual data (*corpus*) (*Figure 1*). Using the software, we coded the data in a structured way, allowing for the identification of patterns and themes, thus contributing to a more comprehensive understanding of the research questions (Tenny et al., 2006; ATLAS.ti, 2025).

The use of ATLAS.ti is significant as it offers a range of tools for thematic analysis, for fast and accurate coding and categorisation, thus supporting the reliability and validity of qualitative research. An inductive approach [conventional content analysis (Hsieh et al., 2005)] was used for coding, i.e., themes were identified based on patterns and contextual relationships in the responses. This procedure provides an opportunity to explore the context and hidden structures of the responses in depth. Deductive coding elements were also used to a lesser extent, essentially starting from the data to identify themes based on patterns and contextual relationships in the responses, while also using prior conceptual frameworks

to guide the fine-tuning of specific categories. This approach can be interpreted as a mixed-method approach, but due to the dominance of inductive analysis, it is referred to scientifically as inductive analysis. The following analytical steps were carried out in the research:

- **Coding and categorization:** Key concepts and patterns were identified during the coding of the responses. Coding provided an opportunity to get a clear picture of students' attitudes by processing the data in a structured, analytical way.
- **Thematic design:** Based on the codes and categories, a thematic grouping was conducted, which articulated the advantages, disadvantages, and potential for future use of AI. In constructing the themes, we used the central concepts and their relationships to create a coherent, science-based theming that provides deeper insights into students' opinions and attitudes.
- **Network analysis:** Using the network analysis feature of ATLAS. Then, we plotted relationships and connections between students' responses. The purpose of network analysis is to examine the complex interactions between responses, allowing for a more accurate interpretation of the opinions and attitudes expressed by students.

This approach of qualitative analysis allows for a deeper, more in-depth understanding of the knowledge and attitudes of the students involved in the research about AI. The use of the ATLAS. TI software ensures that the analysis is transparent, reliable, and structured, providing a scientific basis for interpreting the results and validating the trends revealed by the research. In order to assess the intra-coding reliability of the text, a repeat coding was performed one month after the first coding. Reliability was measured using Krippendorff's alpha (α) index, which was found to be *0.87*, indicating a high degree of coding consistency and reproducibility, supporting the reliability of the procedure.

Results

The following section provides a synthesis of the qualitative and quantitative findings of our research. A detailed analysis of these results can be found in the two referenced articles (Ribní, 2025a; Ribní, 2025b).

Quantitative summary

The results of the survey showed that students self-assessed their knowledge of AI at a medium-high level (μ=3.47). However, the responses to the open-ended questions indicated that only 21.92% of the respondents could correctly define how AI works. This indicates that the students' subjective sense of knowledge differs significantly from their actual level of knowledge. Surprisingly, social media is the primary source of information about AI (74.6%), followed by formal education (43.3%) and professional articles (40.3%). The fact that a significant proportion of students obtain their information from social media may pose a risk, as these platforms tend to spread disinformation, which can distort students' perceptions of AI. This mixed information environment is reflected in students' overall moderate confidence in AI (μ*=3.17*). However, the level of confidence is highly dependent on the specific application. Respondents are more confident in scientific information (57.7%) and educational aids (75%), but more sceptical about health (8.7%) and financial applications (6.7%).

Importantly, AI-generated errors and misinformation significantly reduce trust: 56% experienced a slight loss of trust, while 32.8% experienced a significant loss of trust. Gender differences were also found, with men generally showing more trust in AI than women ($p<0.05; V=0.34$). Despite these concerns, students' overall frequency of AI use is moderate ($\mu = 3.07$), but they rate the usefulness of AI as high ($\mu = 3.66$). The image of the future of AI is optimistic, particularly regarding its role in performing creative tasks ($\mu = 4.07$).

Although students hold an optimistic outlook on AI's capabilities and use it moderately, the role of AI in education is divisive: 41% believe that AI can bring significant change. In comparison, 32.8% prefer education led by human teachers. Ethical concerns are also prominent, with 57.5% of respondents

concerned about privacy and 45.5% about bias in algorithms. Interest in AI education is moderate but significant, with 50% of students indicating they would take AI courses, while 23.1% are not interested and 26.9% are undecided. The way students interact with AI tools provides further insight into how they perceive the value of AI. There is a strong positive correlation between frequent use of AI and perceived level of usefulness ($r=0.725$; $p<0.01$), indicating that the more students use AI, the more useful they perceive it to be. The moderately strong correlation ($r=0.566$; $p<0.01$) between the perception of the importance of knowledge and the usefulness of AI highlights the importance of knowledge in the adoption of technology.

Supporting this, the regression analysis shows that knowledge of AI and confidence in AI significantly affect the frequency of AI use ($R^2=0.458$). Knowledge of AI has the most significant impact on its use, indicating that educational institutions should prioritise the effective integration of AI-based tools.

The results highlight a gap between students' perceived and actual AI knowledge, emphasising the need for structured AI education. While AI is seen as applicable, confidence varies by application, and ethical concerns remain significant. Social media as a primary information source raises misinformation risks. AI knowledge and confidence strongly influence usage, underscoring the role of education in AI adoption. Institutions should focus on effective AI integration while addressing trust and ethical issues. A more detailed analysis of the results is available in our previous paper (Ribní, 2025a).

Qualitative summary

The results of the qualitative content analysis can be structured along four research questions (RQs), which explore university students' definitions, perceptions, impact on education, and future role of AI. Based on the responses analysed, definitions of AI can be grouped into four main categories:

- **Technical definitions (47.11%)**: AI has been defined as systems based on algorithms., ML and big data processing. Students mentioned neural networks, natural language processing, and deep learning models as examples of these technologies.
- **User-centred approaches (34%)**: AI was described as a tool to help people perform everyday tasks, for example, through smart devices, chatbots, and personal assistants.
- **Ethical and societal aspects (12.05%)**: This category focused on the impact of AI, including concerns about privacy, bias and workplace transformation.
- **Philosophical and abstract approaches (6.85%)**: A smaller group described AI as systems similar to human thinking, capable of autonomous decision-making.

By discipline, it was observed that students in engineering and science faculties typically used technical definitions. In contrast, students in social sciences and humanities placed more emphasis on ethical and philosophical aspects. Students' perceptions of how AI works, and their accuracy, fall into three main categories:

- **Moreover, ML-based approach (53.97%):** Students in this category gave relatively precise technical descriptions of how AI works, for example, by mentioning predictive models, neural networks, and deep learning systems.
- **Autonomous decision making and mimicking human thinking (27.95%):** A proportion of respondents believed that AI is capable of simulating human thinking and making certain autonomous decisions. However, this perception was often exaggerated or inaccurate, as AI does not have autonomous consciousness or intentionality.
- **An approach focused on everyday applications (17.81%):** In this category, students described AI as a tool that mainly appears in smartphone applications, search engines, and social media.

Engineering students provided more detailed and accurate descriptions of how AI works, while social science students were more inclined to portray AI as an entity similar to human intelligence. When

it comes to AI in university education, students recognized both its advantages and disadvantages as follows.

Benefits

- **Personalised learning (64.93%):** Students felt that AI's adaptive learning systems allow for personalised learning.
- **Increased efficiency (58.08%):** AI can make assessments faster and more accurate through automatic monitoring and feedback mechanisms.
- **Automated assessment systems (52.04%):** In particular, the use of AI can be beneficial for the assessment of test papers and essays.
- **Access to academic materials (47.12%):** AI-based search systems and recommendation engines can help students find relevant literature and research resources more quickly.

Disadvantages

- **Lack of digital skills (38.90%):** Several students expressed concern that the technical skills needed to use AI-based tools are not equally accessible to all students.
- **Reduction in face-to-face interaction (32.88%):** AI-driven learning environments have the potential to reduce face-to-face communication between instructors and students, which many believe is key to the quality of education.

Respondents agreed that AI is expected to play an increasing role in education over the next decade. The most frequently mentioned future trends are:

- **Evolution of adaptive learning systems:** AI is increasingly enabling students to follow personalised learning pathways.
- **The proliferation of automated assessment mechanisms:** AI can help make essay revision and assessment processes more efficient.
- **Supporting scientific research:** AI-based data processing and analysis tools can help researchers.
- **Growing importance of ethical and societal issues:** Students argue that the long-term implications of the use of AI need to be considered from a regulatory and ethical perspective.

Overall, the majority of students have a positive attitude towards the role of AI in education, but are aware that there are challenges and risks in using the technology. The results highlight that the integration of AI in education requires not only technical development but also the development of appropriate pedagogical and ethical guidelines. The detailed qualitative analysis can be found in the conference proceedings of Imre Sándor II (Ribní, 2025b).

AI Knowledge and Perception: Lessons learned and final reflections

The growing presence of AI in education and society raises new questions about knowledge, confidence, and applicability. The results of this research highlight a significant gap between students' self-assessment and their actual knowledge. Although students self-report a medium-high level of knowledge of AI, responses to open-ended questions indicate that their actual knowledge of its definition and operation is limited. This asymmetry reflects the classic problem of human self-evaluation: a subjective sense of knowledge does not necessarily correlate with objective knowledge.

One of the most fascinating aspects of the research is the analysis of students' sources of information. The data shows that social media dominates the information landscape, ahead of formal education and professional articles. This phenomenon raises critical questions about the credibility and reliability of information. Social media, although a quick and widely available source of information, tends to disseminate disinformation that can distort students' perceptions of AI. This means that universities and educational institutions have a crucial role in disseminating scientifically sound knowledge about AI and

fostering critical thinking. Students' confidence in AI is moderate, but strongly dependent on the field of application. While confidence in AI systems for scientific and educational purposes is relatively high, there is scepticism about applications in health and finance. This distinction suggests that perceptions of AI are influenced not only by the technology itself but also by its contextual application.

One of the primary sources of loss of trust is AI-generated errors and misinformation, highlighting the need for increased attention to transparency and trustworthiness by both technology developers and users. The research pays particular attention to the role of AI in education, which is a highly divisive issue. A significant proportion of students believe that AI can bring radical changes to education, while others continue to emphasise the central role of human teachers. This contrast also highlights the impact of AI on human interactions. While technology can make education more effective and personalised, it can also reduce the number and quality of direct human interactions.

Qualitative analysis will further deepen our nuanced understanding of definitions and perceptions of AI. Based on student responses, definitions fall into four main categories: technical definitions, user-centred approaches, ethical and social aspects, and philosophical and abstract approaches. Interestingly, the disciplinary breakdown also shows significant differences. While engineering and science students interpret AI from a technical perspective, social science and humanities students are more inclined to compare AI with human intelligence and to consider its social impact.

There is a strong positive correlation between students' attitudes towards AI and the frequency of AI use. The more students use AI, the more useful they perceive it to be. However, it also raises the question of the extent to which frequency of use is associated with the development of critical thinking: do students use AI as a mere tool, or are they able to understand its deeper mechanisms of operation?

The research also has an important message for education policymakers. The results suggest that increasing the knowledge of AI and the effective integration of AI-based educational tools can be key factors for the successful adoption of technology. Emphasising the teaching of AI means not only developing technical skills but also raising awareness of its ethical and social dimensions. AI is not just a new technological tool, but part of a paradigm shift that will have a profound impact on society and the future of education.

Overall, the results of the research confirm that there are still significant challenges in understanding and applying AI, mainly due to the gap between students' subjective knowledge and actual knowledge. Attitudes and trust issues related to AI further nuance the discourse, while several opportunities and dilemmas arise regarding its role in education. How universities and other educational institutions respond to these challenges and shape the future vision of AI-based education in a world where AI is playing an increasing role will be key to the future.

Limitations and Supplementary Information

This study has certain limitations. The sample is limited to students, which may not fully represent broader societal attitudes toward AI. Additionally, self-reported data can introduce bias, as responses may reflect subjective perceptions rather than objective knowledge. Future research should expand the sample and incorporate longitudinal data to track changing attitudes over time. Further detailed data are available in the referenced study, and the questionnaire, along with the dataset, can be provided upon request. The Grammarly tool was employed to enhance the grammatical accuracy and overall clarity of the manuscript (Grammarly Inc., 2024).

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Volunteer Teachers' Intrinsic Motivation in Myanmar's IDP Camps through the Lens of Self-Determination Theory

Introduction

Since the military coup in February 2021, Myanmar has faced a major political crisis. This crisis forced people to flee across the country for different reasons (Saito, 2021). One of the significant impacts after the military coup was the collapse of formal schooling, particularly in Sagaing, Magway, Chin, and Karenni regions. In these regions, the Myanmar military carried out air strikes in civilian areas, including villages, religious buildings, hospitals, and schools. As a result, many of these structures were severely damaged. In these dangerous situations, teachers and parents could not keep children safe, so schools were shut down (UNICEF, 2024a).

Before the military coup in Myanmar, the country had more than 47,000 Basic education facilities throughout the country. According to the reports of UNICEF (2004a), some of these schools were bombed, and others had to be closed under the military threat. Rinehart et al. (2024) note that in many places, the only option left is small community schools or makeshift classrooms. These schools rely on volunteer teachers with little or no pay. They often have very short formal training and limited resources to use for their teaching. Despite these different barriers, volunteer teachers continue to make education alive for displaced children (UNICEF, 2024a; Rinehart et al., 2024).

By 2024, UNICEF estimated that over five million children in Myanmar needed humanitarian aid. According to the UNICEF data, education for displaced children was one of the least funded areas (UNICEF, 2024b). Most research on education in emergencies looks at access, government policy, or student results (Amiri, 2020; Rinehart et al., 2024). However, fewer studies talk about teachers in these areas. However, without teachers, there is no classroom and no learning, especially in crisis areas. Therefore, it is essential to understand what motivates these volunteers to continue working in these crisis areas. It can improve education for children and also protect the well-being of teachers.

Scholars have used different theories to explain why teachers stay motivated. One of the most common is **Self-Determination Theory**, or SDT (Deci & Ryan, 1985; Ryan & Deci, 2017). Others include the Integrative Framework of Motivation in Education (Urhahne & Wijnia, 2023). Another well-known model is TPACK, which links pedagogy and technology (Mishra & Koehler, 2006). For this study, we focus on SDT to look at the work of volunteer teachers in Myanmar's IDP camps. This area of research remains underdeveloped. There are two main reasons why SDT is used here instead of the other theories.

The first reason for using SDT is that it explains how people stay motivated from within, even when there are no outside rewards or proper teaching resources. It makes the valuable theory in crisis settings, where many teachers continue their work despite danger and hardship. The second reason is described by Ryan and Deci (2017). They argue that three basic needs – autonomy, competence, and relatedness – are at the center of intrinsic motivation. These needs are especially relevant for volunteer teachers in IDP camps, where material and institutional support are almost absent. Studying their experiences via this lens helps fill a clear gap in research on Education during crises in Myanmar. The study also aims to provide practical guidance for NGOs, humanitarian groups, and policymakers to improve support for teachers in conflict-affected areas.

Literature Review

Myanmar's Socio-Political Crisis and Educational Context

For many years, Myanmar's education system was shaped by central control and exclusion of ethnic groups (Rinehart et al., 2024). After the 2021 military coup, schools were disrupted even more by violence and the collapse of public services. Many children lost access to Education (King, 2022; Lwin, 2019). In response to these situations, communities set up informal learning centers and schools led

by volunteers. These were often kept running by teachers who worked without pay or a minimal salary (Saito, 2021).

Some ethnic education systems, such as those of the Karen and Mon, continued to teach in mother tongues and use local curricula (South & Lall, 2014). Similar community schools in Shan State also provide psychosocial support and inclusive practices for displaced learners (Jolliffe, 2014). Higher education in Myanmar also faced many problems after the coup. Hopes for reform during the democratic transition were dashed, and instead, there was increased surveillance, diminished academic freedom, and fewer opportunities for international cooperation (Proserpio, 2022). Even with these challenges, community-based and ethnic education systems remained important. Local groups such as interim education councils, volunteer teachers, and CDM teachers set up learning opportunities for children who were out of school and worked to keep them going. They promote mother-tongue instruction and establish flexible learning spaces. They also support schools through grassroots efforts (ERICC, 2024). These initiatives have enabled children to continue learning and demonstrate the strong value communities place on education in conflict-affected areas.

Teacher Motivation in Conflict and Low-Resource Settings

In conflict-affected areas, teachers are essential for keeping Education when formal schools collapse. Their effort is significant for students to continue learning. In Afghanistan, research shows that teachers supported their students even under serious security threats (Amiri, 2020). A study from Uganda also found that refugee education depends mainly on the commitment of teachers (Kisaakye et al., 2024). It is the same for Myanmar volunteer teachers in IDP Camps. Volunteer teachers there remain central to Education, even while facing insecurity and a shortage of resources.

The work of teachers in crisis settings goes far beyond teaching lessons. They also give their students emotional support and a sense of stability. According to investigations of studies in crisis areas, female teachers often play a significantly larger role in many camps. They are not only educators but also the symbols of resilience for their students (Ullah et al., 2017; Kipgen, 2022). Self-Determination Theory (Deci & Ryan, 1985) helps explain these experiences. The theory shows that the basic needs of autonomy, competence, and relatedness are still crucial for sustaining motivation. These needs remain central to teachers' commitment, even when resources are scarce and conditions are insecure.

Self-Determination Theory and Teacher Motivation

Self-Determination Theory (SDT) was first developed by Deci and Ryan (1985) and later refined in their more recent work (Ryan & Deci, 2017). It has become one of the leading theories of motivation in cognitive and educational psychology (Kálmán, 2018). Legault (2017) even describes SDT as a metatheory because it includes several smaller theories that together give a broad picture of human motivation and behavior. Within this framework, Deci and Ryan (1985) outlined two main types of motivation: intrinsic and extrinsic motivation. Intrinsic motivation describes the natural human drive to engage in activities for genuine interest, enjoyment, or personal satisfaction.

In contrast, extrinsic motivation occurs when a person does a task without genuine interest. Instead, they act because of external rewards, such as promotion, or to avoid negative consequences (Deci & Ryan, 2000; 2020; Dörnyei & Ushioda, 2011). This theory has been applied to research on teacher motivation, particularly in examining the relationship between teacher motivation and learner motivation (Han & Yin, 2016).

Researchers argue that teacher motivation can be studied through different theories. These include self-efficacy theory (Calkins et al., 2024), expectancy-value theory (Abrami et al., 2004), goal-orientation theory (Malmberg, 2006), goal-setting theory (Locke & Latham, 2015), and self-determination theory (Kunter et al., 2008). To explore the factors that significantly influence the complex nature of motivation associated with teaching, Dörnyei and Ushioda (2011) have highlighted four significant motivational aspects in relation to teacher motivation: intrinsic component, social contextual factors, temporal axis,

and fragility (i.e., negative influences). Since a primary focus of this study is teacher intrinsic motivation, the intrinsic aspects of teacher motivation through the lens of SDT will be discussed in the following sub-section.

The Intrinsic Aspects of Teacher Motivation

Dörnyei and Ushioda (2011) stated that teaching is closely linked to intrinsic motivation and pursuing teaching as a profession has been connected to the inner desire to educate others, to share knowledge and values, and to contribute to the betterment of a community or even a whole nation. Reviewing the literature, two sources of intrinsic rewards or values of teaching suggested by Csikszentmihalyi (1997) are the educational process itself and the subject matter. The first one involves engaging with students, fulfilling their needs, and experiencing the progress of their performance because of teachers' efforts, and the second one represents teachers' genuine interest and curiosity in their discipline, leading to the sources of joy and fulfillment within their career. Therefore, teachers' most incredible joy and satisfaction might be observed not in extrinsic rewards or incentives, but in intrinsic rewards (e.g., being deeply immersed in pedagogical practice). According to educational psychology research, when people meet the three basic psychological needs, they are intrinsically motivated (Deci & Ryan, 1985; Ryan & Deci, 2017, 2020; Ryan et al., 2019). For teachers in IDP camps, meeting these basic needs is important because only intrinsic motivation helps them keep their passion and commitment even under challenging circumstances (Ryan & Deci, 2017). It also encourages genuine interest in professional growth and supports adaptability in different educational contexts (Ryan et al., 2019). In addition, intrinsic motivation can strengthen teaching practices and lead to better student outcomes (Ryan & Deci, 2017, 2020; Slemp et al., 2020; Wagner & French, 2010).

The first basic psychological need, "autonomy", means having the freedom over an individual's actions (Deci & Ryan, 1985; Ryan & Deci, 2020). When people fulfil their autonomy, they can adjust their actions to fit their own needs and abilities. It helps them manage and prioritize both personal and professional responsibilities more effectively (Zhang et al., 2021). Scholars further emphasize that teacher autonomy involves a sense of control over professional responsibilities, including the organization of teaching practices and lesson design, which reflects their pedagogical decision-making. Such autonomy is strengthened when it is recognized and supported by institutional leaders and colleagues. This view was supported by Ertürk (2023), who stated that teachers having professional autonomy to plan new tasks and take part in innovative practices possess motivation and professional dedication. Therefore, in the field of Education, teacher autonomy is linked to having control over teaching practices and making instructional decisions that are essential for maintaining or sustaining their motivation.

The second basic human need is "competence". It refers to feeling effective and confident in one's abilities, along with a sense of accomplishment (Deci & Ryan, 1985; Ryan & Deci, 2020). For teachers, competence means being able to complete their tasks. It is also about achieving their goals effectively (Krapp, 2005). This need is best met in environments that provide the right level of challenge. It also requires constructive feedback and chances for personal growth (Ryan & Deci, 2020). In schools, competence means teachers feel successful in their work. It also reflects how their abilities are recognized in daily teaching. Competence is closely linked to teachers' sense of efficacy. It refers to their belief that they can positively influence student learning (Ashton, 1985, p. 142; Lazarides & Warner, 2020).

The concept of the teachers' self-efficacy can be understood at two levels. The first one is teaching efficacy, and the other is personal efficacy (Dörnyei & Ushioda, 2011). Teaching efficacy refers to teachers' belief that they can improve student learning, even when facing educational barriers (Dörnyei & Ushioda, 2011; Lee et al., 2013). This confidence shapes not just what teachers do but how persistently and resiliently they act in the face of obstacles (Lazarides & Warner, 2020; Özcan & Özgür, 2010). Personal efficacy involves teachers' belief in their own skills and capabilities and the evaluation of their effectiveness to accomplish the tasks (Dörnyei & Ushioda, 2011; Özcan & Özgür, 2010). In an educational context, teachers' personal efficacy supports their intrinsic motivation and resilience (Rai, 2025).

The third basic human need, “relatedness”, represents the feeling connected to others, facilitated through respect and care (Deci & Ryan, 1985; Ryan & Deci, 2020). According to Zhang et al. (2021), teachers’ relatedness involves social connections with their colleagues, students, and school community, feeling accepted and appreciated by school leaders, and having positive relationships with their colleagues. Ideally, teaching fulfills the first two fundamental psychological needs (Dörnyei & Ushioda, 2011). Teachers have autonomy to some extent in managing their classes, and the school community (i.e., both colleagues and students) offers a rich and engaging environment.

Dörnyei and Ushioda (2011) argued that the key components of teacher motivation are their intrinsic interest and enjoyment in teaching. On the other hand, Latham et al. (1997) claimed that teachers tend to be more persistent if they have specific and achievable goals based on goal-setting theory. Latham and his colleagues also emphasized the fact that setting appropriate goals along with constructive feedback could enhance teachers’ performance and motivation. It could be said that the combination of these concepts and the above-mentioned intrinsic motivation reflects the framework of work motivation proposed by Hackman (1991).

The framework suggests that people are more motivated when their work has purpose, when they have freedom in how they approach it, and when they receive feedback on their performance. Therefore, the intrinsic aspect of teacher motivation stems from the genuine satisfaction of engaging in meaningful tasks in relation to one’s subject interests, in an autonomous manner, within a supportive professional community. In addition, factors such as self-efficacy, goal clarity, and performance feedback play significant roles in influencing teachers’ effort and persistence, as well as their intrinsic motivation (Dörnyei & Ushioda, 2011).

Methodology

Research Design

In this study, a qualitative research design was used. Researchers carried out a thematic analysis, guided by the Self-Determination Theory (SDT) framework (Ryan & Deci, 2017). The purpose of the study was to gain a deeper understanding of how volunteer teachers in Myanmar’s internally displaced person (IDP) camps experience and explain their motivation.

Participants and Context

For this study, the researchers conducted interviews with seven volunteer teachers from IDP camps in the Sagaing and Karenni regions of Myanmar. The participants were selected through purposive sampling. It meant that teachers were identified with the help of trusted teacher networks and support groups within the targeted communities. This approach ensured the inclusion of teachers who were both willing and able to share their experiences in detail, which is essential for collecting meaningful qualitative data (Dörnyei, 2007). Information about the participants is presented in figure of Table 1.

Figure 1 — Biographical Data of the Participants

Participant	Age	Gender	Educational Qualification	Teaching Experience before Displacement	Total Teaching Experience (Years)	Region
Teacher 1	27	Female	B.A. (English)	None	3 (started in an IDP camp)	Sagaing
Teacher 2	36	Female	Diploma in Teacher Education (DTEd)	Yes – Primary level	13	Sagaing
Teacher 3	31	Male	B.E. (Engineering)	None	5 (since relocation to a camp)	Karenni
Teacher 4	42	Female	B.A. (History)	Yes – Secondary level	15	Karenni
Teacher 5	29	Male	B.Sc. (Chemistry)	None	4 (volunteer teacher in a camp)	Karenni
Teacher 6	34	Male	B.Sc. (Math)	Yes – Tutoring/private teaching (freelance)	8	Karenni
Teacher 7	40	Female	B.Ed. (Education)	Yes – Middle school	12	Sagaing

Data were collected through semi-structured interviews with the seven volunteer teachers. These volunteer teachers are all working in IDP camps in the Sagaing and Karenni Regions. Both areas are highly affected by armed conflict and have ongoing insecurity, including military threats and aerial attacks. Moreover, the teachers and students in these areas are facing the high challenges of educational barriers such as insufficient infrastructure, lack of electricity, and unstable internet access.

It is risky and challenging to visit these areas in person; researchers conducted all interviews remotely via the Zoom platform. The whole interview conversation was held in Burmese, so that the participants could talk more freely and comfortably. Each interview lasted about 30 minutes and was audio-recorded with the participants' consent. A self-developed semi-structured interview guide based on the SDT framework was used. In the interview process, open-ended questions were used to explore the three main dimensions of motivation under the SDT framework- autonomy, competence, and relatedness. Interviews took place between May and June 2025, were transcribed in Burmese, and then translated into English for analysis.

Data Analysis Procedures

Thematic analysis following a deductive approach informed by Self Determination Theory SDT (Deci & Ryan, 1985) was used to interpret the data. Under the framework of the SDT, the three psychological needs of autonomy, competence, and relatedness are formed in the initial coding categories. In the analysis process, there were two main coding circles. The first-cycle coding was Initial coding. In this process, interview transcripts were read fully to gain familiarity with the data. Sentences related to each theme of SDT were highlighted and assigned descriptive codes. Second-cycle coding was Axial coding. In this stage, initial codes were refined, grouped, and compared across all participants. Relationships between sub-themes were examined to understand how different motivational elements emerged in the context of teachers in selected areas. Coding was conducted manually using Excel to organize interview quotes, codes, sub-themes, and interpretations. This approach allowed the researchers to keep the analysis grounded in Self-Determination Theory and the specific features of teacher motivation that emerged in the crisis context.

Ethical Considerations

This study has received formal approval from the Research Ethics Committee of Eötvös Loránd University, Budapest, Hungary, on 8 May 2025. The ethical approval reference number is 2024/390. Before the interview process began, researchers explained the purpose and process of the research to participants and obtained verbal consent. To protect data security, all steps in the interview process were taken with high confidentiality. During the transcription stage, researchers removed participants' personal details, such as names and identifying information. All interview records and transcription files were stored safely for academic use only.

As the research took place in a sensitive context of conflict and displacement, the researchers took special care to reduce emotional strain. When participants shared painful or difficult experiences in the interview, the researchers listened to them with empathy, acknowledged their feelings, and offered reassurance. These practices reflected a strong commitment to safeguarding the dignity, safety, and well-being of all individuals concerned in the study.

Research Questions

- How do volunteer teachers in IDP camps experience and express autonomy in their teaching practices?
- In what ways do teachers in displacement contexts perceive their own competence, and how do they pursue professional growth?
- How does a sense of relatedness shape teacher motivation and resilience?

Findings and Discussion

Autonomy

This section answers RQ 1: *How do volunteer teachers in IDP camps experience and express autonomy in their teaching practices?* Two major sub-themes emerged under the central theme of "Autonomy": (1) flexibility in adjusting lessons based on learners' physical and emotional states, and (2) negotiation of teaching schedules with students in line with their on-the-ground conditions in crisis zones.

Flexibility in Adjusting Lessons based on Learners' Physical and Emotional States

It is noted that volunteer teachers in the present research context need to be flexible enough in dealing with the lessons. Regarding this aspect, Teacher 2 and Teacher 5 expressed their experiences as follows: *"We adjust the lessons when we notice that our students are tired or hungry. Sometimes, we skip writing tasks." (Teacher 2, a 36-year-old female teacher from Sagaing Region)*

"We adjust the topics depending on how the children feel. Sometimes they are too tired or sad, so we talk about their feelings before we continue with the lesson." (Teacher 5, a 29-year-old male teacher from Karenni Region)

These excerpts illustrate that teachers have complete autonomy in decision-making when it comes to their students' well-being in war-affected educational areas. In other words, they prioritize their learners' physical and mental states over fixed lesson plans, which is one of the essential practices in unstable or traumatic settings. Similar findings can be found in Wang et al.'s (2024) study, which suggests that teachers' ability to adjust lesson topics and address their students' feelings reflects their autonomy in planning lessons and managing classrooms. This autonomy is closely related to teachers' intrinsic motivation. This finding was also supported by some recent studies (see e.g., Beltman & Poulton, 2025; Ma, 2021; Valente et al., 2022) that teachers were intrinsically motivated if they had the right to adapt the lesson contents according to their students' physical and/or emotional conditions.

Negotiation of Teaching Schedules with Students in line with their on-the-ground Conditions in Crisis Zones

In accordance with the findings of this study, volunteer teachers in conflict zones need to negotiate teaching timetables with their students. To put it another way, they have the right to adjust class schedules to accommodate their students' everyday circumstances. In relation to this, the experiences of Teacher 1 and Teacher 3 can be seen in the following excerpts:

- *"We don't follow the exact schedule like formal schools, but I know what my students are dealing with – I teach accordingly." (Teacher 1, a 27-year-old female teacher from Sagaing Region),*
- *"Our schedule is not fixed like in the towns (formal schools). We discuss with students, and sometimes we have to cancel or reschedule due to the weather or security concerns." (Teacher 3, a 31-year-old male teacher from Karenni Region).*

These findings proved that volunteer teachers' intrinsic motivation derived from their autonomy in flexibility in scheduling teaching time because of the external factors such as weather conditions and security concerns in crisis settings. These findings resonate with a qualitative study of IDPs in Northern Nigeria, which reported that camp leaders and teachers likewise abandoned fixed routines in favor of flexible, adaptive management practices that reflected residents' needs (Ekezie et al., 2022). Nigerian IDPs reshaped schedules and daily activities around community challenges such as health concerns, security issues, and emotional well-being. The study concluded that autonomy-driven adjustments were central to fostering resilience, noting that *"IDPs can be active actors in their change and development if basic and essential management support is provided"* (Ekezie et al., 2022, p. 1). It reflects how volunteer teachers in the Sagaing and Karenni Regions in Myanmar engage their students in negotiating teaching schedules and respond quickly to contextual disruptions. Taking these findings into consideration, it can be assumed that having authority to reschedule teaching timetables based on the situations (e.g., weather conditions and security concerns, as can be seen in the above interview excerpts) leads to their intrinsic motivation.

Competence

This section answers RQ 2: *In what ways do teachers in displacement contexts perceive their own competence, and how do they pursue professional growth?* Three main sub-themes emerged under the central theme of "Competence": (1) building professional knowledge and skills, (2) sustaining learning environments with limited resources, and (3) conducting classes in harsh environments.

Building Professional Knowledge and Skills

In the context of this study, volunteer teachers build their professional knowledge and skills not through formal training but through collaboration among colleagues and the use of social media like Facebook, despite not having stable internet access. In this regard, Teacher 6, a 34-year-old male teacher from Karenni Region, explained, *"We learn from each other. Some use Facebook to find new ideas for teaching, and we share during Sunday meetings."* This excerpt highlighted that building their professional knowledge and skills in these ways fulfils their *personal efficacy* (Dörnyei & Ushioda, 2011), one of the dimensions of basic psychological need "competence". From the point of view of SDT, such a need is crucial for enhancing teachers' intrinsic motivation even in conflict zones where formal support is scarce. Similar findings have been reported in Belay & Melesse's (2024) study from the Ethiopian context, which suggests that the intrinsic motivation of teachers from Ethiopia's crisis-affected schools can be fostered through Continuous Professional Development (CPD) and participation in learning communities.

Sustaining Learning Environments with Limited Resources

In the targeted contexts, an extreme shortage of educational resources is one of the main challenges faced by volunteer teachers. Despite these constraints, they usually find ways to solve this problem and

make sure that their students have continuous support from them. In the following interview excerpt, a 42-year-old female teacher from Karenni Region shared her experience regarding how she adapted her teaching practices in the case of limited resources:

- *"We do not have enough books or copies. We always ask students to share, or sometimes I rewrite lessons on the blackboard many times for different groups." (Teacher 4)* As can be seen in the above interview excerpt, volunteer teachers in crisis zones coped with limited resources by enhancing student collaboration and adapting their teaching methods, e.g., teachers' willingness to rewrite lessons on the blackboard many times, which could be regarded as teachers' intrinsically motivated behaviors. In other words, the teachers' act of rewriting lessons for different groups of students does not come from external rewards, but from their genuine enjoyment. Interestingly, a similar finding can be found in a study conducted by No (2024) in the Karenni and Pekon Regions, which are conflict-affected areas in Myanmar. The key findings of his research highlighted that "teachers are driven by empathy and a sense of duty, facing significant obstacles such as insecurity and resource scarcity" (No, 2024, p. 18). Studies of refugee and IDP education have consistently shown that resource constraints force teachers to be innovative and creative by sharing materials among students and rewriting the same lessons for different learner groups. Such practices not only guarantee access to learning but also build professional competence through adaptive problem-solving and reinforce relatedness by creating a collective culture of sharing (Mendenhall et al., 2018).

Conducting Classes in a Tough Environment

Since the present research context was conflict zones having inadequate infrastructure, this forced teachers to find possible learning spaces for their students. Extreme weather conditions could also be additional challenges for them in sustaining their students' learning process. A 40-year-old female teacher from Sagaing Region described her experience in this regard as follows:

- *"We try to continue lessons even in the rain, under a tree or in a small hut. We don't want to stop teaching because of the weather." (Teacher 7)*

This interview excerpt illustrated that teachers' intrinsic motivation and resilience in war zones could be demonstrated by their determination to maintain learning routines in informal and weather-exposed environments. That is to say, their willingness to teach their students despite the rain, by finding possible locations (e.g., under a tree or in a small hut), showed their intrinsically motivated behaviors. Recent research conducted by OECD (2022) and Wang et al. (2024) also reported similar findings that continuing lessons under any available conditions demonstrates competence not only as mastery of teaching skills but also as persistence and adaptability in sustaining Education despite adversity.

Relatedness

This section answers RQ 3: *How does a sense of relatedness shape teacher motivation and resilience?* Three main sub-themes emerged under the central theme of "Relatedness": (1) sharing teaching materials and teaching tips among colleagues, (2) receiving appreciation and emotional support from others, and (3) having social connections with students' parents.

Sharing Teaching Materials and Teaching Tips among Colleagues

Volunteer teachers in this research context worked with limited resources and had no formal teacher training for their professional development. In this regard, they shared teaching materials and teaching tips with their colleagues, believing that this kind of collaboration could strengthen their sense of relatedness. A 36-year-old female teacher from Sagaing Region shared her experience regarding this aspect, saying that: *"We share materials and ideas during weekends. Sometimes one of us brings teaching aids from the nearby town, and we all use them." (Teacher 2)*

The above excerpt highlights the importance of social connections among colleagues and collegial support that fosters relatedness – one of the primary psychological needs in the SDT framework. To put

it another way, teachers are intrinsically motivated when experiencing a sense of belonging within a group. Similar research findings have been reported in Mass et al.'s (2022) study, stating that teachers' sense of relatedness was met through supportive relationships with peers, enabling them to sustain their intrinsic motivation even in low-resource and unsafe settings (i.e., conflict zones). Kolleck's (2019) systematic reviews also showed that working collaboratively and sharing pedagogical knowledge and resources can enhance teachers' motivation and commitment. Comparable findings in U.S. rural schools and low-income Indian schools reinforced that peer-driven resource sharing fosters both professional growth and emotional resilience (Brill et al., 2025; Vashistha et al., 2021). Such practices illustrated how relatedness fulfils a psychological need under SDT, reducing stress while enhancing a collective identity as educators working "together" rather than in isolation.

Receiving Appreciation and Emotional Support from Others

In this study context, volunteer teachers often depend on emotional and social support from others to foster a sense of relatedness. This fundamental human need is closely tied to intrinsic motivation. Teacher 1, a 27-year-old female teacher from Sagaing Region, shared her experience that *"I feel proud when parents tell me their children want to come to school every day – even when it is raining or difficult to walk."* This interview excerpt demonstrated how relatedness strengthens teachers' intrinsic motivation in conflict-affected areas. That is, receiving recognition and appreciation from their students' parents reassures them that their efforts are meaningful despite adverse conditions. Since relatedness in the SDT framework refers to feeling connected to others, having positive relationships among teachers, students, and their parents plays a vital role in sustaining teachers' intrinsic motivation and resilience. Similar findings were reported in Belay and Melesse's (2024) study, which found that positive recognition from their students' parents enhances Ethiopian teachers' intrinsic motivation as well as their professional development, despite political instability. Therefore, teacher relatedness extends beyond their professional networks to encompass relational bonds with their students and parents, which reinforces their motivation (Robinson, 2022).

According to the findings of this study, the intrinsic motivation of volunteer teachers in displacement contexts heavily depends on emotional support and encouragement from their colleagues. A 31-year-old male teacher from Karenni Region described his experience as follows:

- *"When I feel too down, my co-teacher encourages me. We talk about our feelings together." (Teacher 3)*

The above excerpt demonstrated that receiving encouragement from their colleagues and having trusting relationships are important in sustaining their sense of belonging and relatedness. Such peer support strengthens their intrinsically motivated behavior in coping with the adverse conditions. These findings resonate with research from the Philippines (Gonzales et al., 2020), which discussed that teacher motivation and mental health conditions in crisis zones depend primarily on support from their colleagues, emphasizing how such supportive relationships boost their intrinsic motivation.

Having Social Connection with Students' Parents

In this study context, volunteer teachers often depend on emotional and social support from others to foster a sense of relatedness. This fundamental human need is closely tied to intrinsic motivation. Teacher 1. The involvement of students' parents has become an important source of encouragement for volunteer teachers in the present study context. From the point of view of SDT, relatedness is also sustained through connection with students' parents. Regarding this aspect, a 34-year-old male teacher from Karenni Region explained, *"When the parents join meetings or help in school events, I feel we are not alone."* Such a social connection has become crucial in conflict areas where teachers often feel isolated. Interestingly, similar findings can be found in No's (2024) study, which suggests that high levels of parental cooperation are vital for teacher motivation and resilience in war-torn zones in Myanmar.

Implications for Practice and Policy

Findings from this study show that supporting teachers' psychological needs is essential in crisis settings, and this requires approaches that go beyond the provision of books or supplies. In practice, training programs should be flexible and modular so they can be delivered even in insecure or resource-poor environments. Portable toolkits and mobile training packages, which have been used effectively in other refugee education contexts, could be adapted to Myanmar's IDP camps. These trainings can provide not only pedagogical guidance but also psychosocial strategies that teachers specifically need (UNESCO Teacher Task Force, 2020). In addition to training, organizing teacher networks is a practical way to maintain competence and resilience. These networks can take the form of weekly or monthly peer-learning circles, where teachers can exchange lesson plans and teaching strategies, and receive suggestions on their lessons. In the areas where in-person meetings are not possible under different conditions, virtual platforms such as Telegram groups can be used.

Experiences from South Africa and India show that such teacher learning communities, including digital platforms, help strengthen professional identity, build resilience, and reduce isolation (Oduro, Ngwenya, & Bhengu, 2024; Vashistha et al., 2021).

Another important implication is providing teaching resources. Providing adaptable and low-cost materials, such as community libraries or solar-powered devices, helps teachers adjust their lessons in flexible ways. In the research targeted regions, teachers already rely on sharing inadequate textbooks and rewriting lessons on blackboards for different groups; these problems could be addressed and scaled through structured resource-sharing systems (OECD, 2022). At the same time, recognition of teachers' contributions is vital. Community-based education committees or parents' groups could formally acknowledge teachers' efforts through certificates, symbolic stipends, or community appreciation events. Research evidence from Russel 2024 shows that recognition from parents and peers reinforces teachers' sense of relatedness, which sustains motivation even when financial incentives are limited (Russell et al., 2024; UNESCO Teacher Task Force, 2025).

At the policy level, a significant implication is to integrate volunteer teachers into broader education networks. Provisional accreditation for these volunteer teachers or their inclusion in Humanitarian teacher databases would increase visibility, enabling them to access training, professional development, and financial support (UNICEF, 2024a; INEE, 2024). Another priority policy is to create conditions that protect teacher autonomy. Flexible guidelines according to location and conditions of the regions should allow teachers to adjust schedules and lesson content based on children's emotional state, fatigue, or security concerns. Many studies have shown that autonomy-supportive practices, such as participatory decision-making with students, can enhance both teachers' resilience and motivation (Ryan & Deci, 2017; Wang & Sun, 2025). Strengthening competence also requires structured pathways for professional development. Partnerships with universities that offer distance learning courses and mentoring programs are also possible ways to enhance the competence of teachers (Kisaakye et al., 2024; UNESCO Teacher Task Force, 2025).

Finally, relatedness can also be supported through policy by involving parents and communities more in school decision-making. In Myanmar, in some IDP camps, parents and the community already contribute by providing materials and helping to organize school events, as seen in other crisis contexts (Morales & Walker, 2023). By implementing these practices, policymakers and practitioners can create conditions that not only sustain teacher motivation but also ensure continuity of learning for displaced students in Myanmar.

Conclusion

This study demonstrates teachers' motivation in a challenging environment under the theoretical lens of Self-Determination Theory. From the interviews, the data show that teachers' autonomy grows when they are involved in decision-making and when they can keep their teaching flexible. Moreover, when teachers receive peer support or professional development and can share teaching resources with

others, their sense of competence is enhanced. The data also show that when communities engage with them and recognize their contributions, teachers' relatedness to their students becomes stronger. These factors collectively support teachers in maintaining their motivation. Moreover, these factors can also enable teachers to continue their role in sustaining Education for displaced children. Such measures are important because they can improve teacher retention and morale.

There are some limitations to this study. The sample size was small and focused only on two geographic areas. Therefore, the findings should not be extended to all contexts in Myanmar. Despite the limitations, the in-depth approach of the study still provides meaningful insights into teacher intrinsic motivation in crisis settings. Future research could explore this topic in other areas. While crisis conditions are often assumed to weaken motivation, the findings of this study show that teachers adapt and develop strategies to meet their psychological needs. Moreover, they use the practical, relational, and often improvised strategies in their teaching. By using these approaches, they provide not only academic lessons but also emotional support and stability for their students. In this way, they offer children hope for a brighter future and highlight the vital role of teachers in sustaining education during times of crisis.

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Appendix A: Interview Questions

Autonomy

- How do you decide what and how to teach within the constraints of the camp?
- How can you express your teaching style and methods within the camp setting?
- What challenges do you face that affect your teaching style and methods?
- How could changes to these spaces enhance your autonomy, mastery, or sense of purpose as a teacher?
- What strategies would you like to see implemented that could help you and your colleagues feel more autonomous, skilled, and purposeful in your roles?

Competence

- How do these challenges impact your sense of competence and satisfaction in your teaching role?
- What strategies have been most effective in enhancing your motivation and ability to teach effectively in the camp?
- Are there any resources or types of support you think would make a significant difference in your teaching effectiveness?
- Can you share any experiences where these barriers directly impacted a lesson or educational outcome?
- How do these support mechanisms help you in your day-to-day teaching tasks?

Relatedness

- Can you give an example of how mentorship or community support has helped you overcome a teaching challenge?
- How do you envision the learning environment within the camp?
- How do you think the community can play a larger role in the Education of children in the camp?
- What are your long-term aspirations as a teacher in this setting?

Algerim SATUBALDINA

An Examination of Blended Learning in the Context of Higher Education

Challenges, Adaptive Strategies, and Institutional Support

Introduction

Background of blended learning in higher education

Blended learning combines traditional (face-to-face) teaching with online learning using digital platforms. (Dziuban et al., 2004). This methodology is well regarded in higher education and can be more efficient because it offers greater flexibility and more interactive teaching than the classroom model. According to Tong et al. (2022), combining the two learning models, the result is students with higher levels of engagement and autonomy. Another study in this area shows that information and communication technologies, when used in education, have led to an increase in hybrid teaching (Bizami et al., 2022). Therefore, it is important to recognize the challenges faced by students using this blended learning method, as this type of higher education has increased. Identifying these barriers will optimize learning outcomes for students, faculty, and the institution making the learning experience more comprehensive and enhancing student performance. This is a bibliographic study on the challenges faced by students in higher education who use blended learning. The article will investigate the actions academics take to address these challenges and provide relevant suggestions for overcoming them. The objective of the study is to understand the greatest challenge students face when using blended learning and address the issues they face so that these difficulties can be resolved, offering better results from blended learning. In addition, this analysis will provide a theoretical analysis of the problems in hybrid teaching, and thus evaluate its alignment with a selected possibility, which is the main focus of this work. The purpose of this comprehensive investigation is to provide educators, institutions, and policymakers with a useful resource that will help them effectively address and overcome these difficulties.

Significance of studying challenges and barriers in blended learning

Conducting a thorough analysis of the challenges students face when entering the blended learning model is crucial. When a broad understanding of the challenges faced by students, educational institutions, and educators is gained, proactive strategies emerge to address discrepancies such as lack of engagement and learning. As educators gain experience in improving teaching techniques and support systems, they maximize the benefits of blended learning. Another important factor in helping to amplify the effectiveness of blended learning programs is that universities must ensure that course design, delivery, and technology are tailored to the challenges students face. As a means of improvement, implementing pedagogical strategies and techniques based on empirical research improves the organization of the learning process. In order to create supportive learning athmosphere and to increase educational equality, it is extremely important to analyze the challenges that hinder the wider implementation of hybrid teaching. Analyzing academic research in this area, it can be concluded that there was a gap between student populations in terms of technological accessibility, digital skills proficiency, and availability of support services. Consequently, addressing the challenges and barriers to blended learning and potential improvements in system efficiency results in benefits such as improved teaching practices, better student outcomes, a more equitable and inclusive education system, advances in teaching and learning research, and informed policy decisions. This ensures that the learning environment strengthens students' intellectual and psychological well-being.

What challenges do students face while studying in blended learning?

The following questions will be raised to implement an investigation into this fundamental issue:

- RQ1: What challenges do students face while studying in blended learning?

- RQ2: How do students react to those challenges? What do they do to manage those challenges?

Therefore, the study might be valuable for educators, teachers, or those simply from university administrators to understand the challenges and to find the ways how to make university or study experience for students more fruitful, resulting in a more practical and efficient experience for students.

Research Methodology

Through documentary research, this study analyzes hybrid learning in higher education, with the emphasize of challenges identification faced by this form of teaching and learning. The methodology section consists of a literature review, a theoretical framework, and the results of previous research, with the aim of providing practical recommendations.

For the analysis, research was conducted in conference proceedings, articles, specialized journals, and reports from academic institutions. With the use of the key words "blended learning", "higher education", "challenges", "coping strategies", "institutional support" publications relevant for this research were identified (Tong et al., 2022). By applying previously established theoretical frameworks, the research demonstrates a solid conceptual foundation for understanding the challenges of blended learning. Therefore, the research frameworks selected were Ecological Systems Theory, Social Presence Theory, Self-Determination Theory (SDT), the Community of Inquiry (CoI) Framework, Cleveland-Innes & Wilton (2018), and the Technology Acceptance Model (TAM).

The literature review for this study was carried out using a documentary research approach,the search conducted using Scopus, Web of Science, ERIC, and Google Scholar, employing combinations of keywords such as "blended learning", "higher education", "challenges", "coping strategies", and "institutional support".

To ensure methodological transparency, specific inclusion and exclusion criteria were applied. As for inclusion criteria: (1) peer-reviewed journal articles published between 2004 and 2023; (2) studies written in English; and (3) research focused on higher education contexts that explicitly discussed blended learning challenges, coping mechanisms, or forms of institutional support. Exclusion criteria included: (1) studies focusing solely on primary or secondary education; (2) non-English publications; and (3) articles unrelated to the research questions.

The search strategy of relevant articles included the identification, screening, evaluation of eligibility and final inclusion, as of the PRISMA framework. In total, 312 matches were found and 18 matches from the alternative sources as reflected in Appendix X. The duplicates were removed and with 260 articles have been processed for screening stage, where 182 were considered as improper. Also, 36 out of 78 records didn't meet the inclusion criteria as for full-text evaluation. At the final stage, 42 studies were used for further consideration.

Regarding the dynamics of blended learning, the following references provide notable insights: Ettekal & Mahoney (2017); Kreijns et al. (2021); Niemiec & Ryan (2009); Cleveland-Innes & Wilton (2018); Sweller et al. (2019); and Granić & Marangunić (2019).

Consequently, relevant academic articles were used to obtain data and create a synthesis. These researchers used thematic analysis to identify recurring themes related to the challenges of blended learning and their coping mechanisms. Regarding the integrity and reliability of the research results, greater understanding was achieved through the analysis of qualitative and quantitative data.

Theoretical Framework

Theories relevant to blended learning challenges and barriers

Understanding the theoretical foundations of barriers in blended learning is vital to effectively addressing them. A range of relevant theories apply in this context, such as the Technology Acceptance Model (TAM), which explores consumer technology use, giving a prominece to perceived usefulness,

ease of use, and attitudes toward technology. These are essential aspects for determining technology acceptability in blended learning (Granić & Marangunić, 2019). Another theory is Social Presence Theory, which investigates how the lack of physical presence in blended learning can impact students' sense of social presence, participation, and coping strategies, showing up the importance of sociability and connectivity (Kreijns et al., 2021). Similarly, Self-Determination Theory (SDT) addresses the internal motivation of people and their psychological needs, such as autonomy, competencies, and relatedness, as playing a key role in influencing student engagement and coping mechanisms in blended learning environments (Niemiec & Ryan, 2009). The Community of Inquiry (CoI) presents how cognitive, social and teaching presences can influence engagement and knowledge building. (Cleveland-Innes & Wilton, 2018). Further, Cognitive Load Theory (CLT) investigates the cognitive load on students during the learning period and examines how course design and structuring in this type of learning influence cognitive load, information processing, and student coping mechanisms (Sweller et al., 2019). As such, Ecological Systems Theory can offer insights into the interactions between humans and environments.

In conclusion, the theories, taken together, provide a complete framework for understanding how hybrid learning impacts students and the challenges they face. These theoretical analyses provide relevant knowledge for proposing useful interventions.

Challenges and Barriers in Blended Learning

Overview of challenges and barriers faced by students

Understanding the barriers encountered by teachers in a hybrid teaching environment is of paramount importance so that both educators and institutions can offer effective support.

The barriers for users of this form of education are extensive, one of which is access to technology and reliable internet connectivity, which can represent a significant obstacle, as there are gaps in the availability of devices and internet access, hindering student participation and learning outcomes. (Asio et al., 2021; Cullinan et al., 2021). In addition, inadequate technical assistance and training accentuate technological challenges, causing learners to become frustrated and unable to make effective use of hybrid learning (Barrot et al., 2021). In addition, a lack of digital skills can make it difficult to engage with digital resources. (Coman et al., 2020; Chaw & Tang, 2023). Self-discipline and a high level of time management are of paramount importance for studying under hybrid learning mode, a lack of these qualities in students may lead to increased procrastination and negatively affect their overall academic performance.(Cobo-Rendón et al., 2022; Eggers et al., 2021). In terms of face-to-face interaction, hybrid environments also present emotional and social challenges, leading to lower motivation and well-being among students (Li, 2022; Zhao & Song, 2022). Precel et al. (2009), Serrano et al. (2019), and Namyssova et al. (2019) argue that when teaching materials are poorly designed and lack structure, this can lead to reduced comprehension on the part of the reader and consequently decrease their engagement with the teaching. When it comes to assessment and feedback in hybrid teaching, approaches need to be addressed in a way that finds solutions to ensure fairness and effectiveness (Gikandi et al., 2011). According to Hattie and Timperley (2007), traditional evaluation methodologies need to be developed to allow for greater adaptability so that there are different modes of active participation.

In conclusion, addressing such challenges may require competent decisions that leverage technological innovation and pedagogical expertise, making performance and behavior assessment efficient (López-Pellisa et al., 2020). Therefore, by identifying and addressing these challenges, both institutions and educators have the opportunity to improve the teaching environment and pave the way for greater holistic educational enrichment, always seeking new opportunities for efficiency and optimization. Such challenges will depend on the educational environment, student demographics, and course design, with a focus on placing efforts on the need for personalized approaches for students to achieve academic success.

Challenges specific to higher education

When discussing hybrid teaching in higher education, the challenges that this type of teaching presents require close examination. Firstly, digital exclusion can be a factor of great concern, as the number of students who do not have access to technology, or even a reliable connection, is considerable. (Rahiem, 2020). This isolation results in significant discrepancies between students, causing obstacles to accessing course materials and engaging fully in blended learning activities. (Asio et al., 2021; Cullinan et al., 2021). When it comes to the lack of accessible assistance and comprehensive training, according to Chervonyi et al. (2021) and Su et al. (2023), this gap leaves students poorly educated in the use of digital tools.

In addition, many students still have limited digital literacy skills, which can hinder their efficient navigation of hybrid learning environments – especially in cases where digital technologies play an important role in education (Tang & Chaw, 2016). Students who are not sufficiently proficient in using digital tools find their ability to access course materials and participate in online activities impaired. (Chaw & Tang, 2023; Coman et al., 2020). Another important point is that students who are enrolled in hybrid education, in order to make good use of it, must have greater autonomy and self-discipline so that they can manage their own time for those who already face difficulties in organization and self-management (McHone, 2020).

In the social and emotional realm, the decrease in face-to-face encounters can generate feelings of isolation and distance, problems that are exacerbated by the absence of the more subtle emotional cues inherent in face-to-face interaction (Eslit, 2023; Li, 2022; Zhao & Song, 2022). From a pedagogical point of view, designing courses that adequately balance the use of digital resources with different learning styles and promote engagement in all formats remains a significant challenge, as does ensuring fair assessments and providing consistent feedback in both the virtual and face-to-face parts of courses (Namyssova et al., 2019; Serrano et al., 2019; Ice et al., 2007; Hattie & Timperley, 2007).

One way to resolve these issues efficiently is for institutions to adopt a broad approach that provides fair access to technology, technical support, and even digital empowerment programs. In addition, the success of hybrid learning environments in higher education depends on careful course planning, organizational structure, and well-defined assessment strategies.

Addressing Challenges in Higher Education Blended Learning

In short, addressing the specific challenges of higher education in a hybrid environment may require a holistic strategy. To address these issues in an effective and functional manner, educational organizations should consider the following measures: First, it is important to ensure equitable access to technology and internet connectivity, which can include efforts such as providing loaner devices, subsidies for internet access, or even partnerships with established local service providers. (Asio et al., 2021; Cullinan et al., 2021; Rahiem, 2020). According to Chervonyi et al. (2021), Su et al. (2023), and Sankar et al. (2022), it is important to equip students with ubiquitous technical support possibilities as well as continuous training for improving students' experiences with online learning platforms. Keeping a high level of students' digital competence including confident use of digital environment can be supported with the help of continuous training. (Tang & Chaw, 2016; Chaw & Tang, 2023; Coman et al., 2020). To achieve efficient management with minimal losses, it is necessary to offer workshops and resources on management so that the target audience can gain mastery (McHone, 2020; Eggers et al., 2021; Cobo-Rendón et al., 2022).

At the same time, it is necessary to encourage the formation of virtual support networks and communities and promote initiatives to leverage emotional well-being in order to combat social and emotional challenges (Eslit, 2023; Li, 2022; Zhao & Song, 2022). In order to provide resources and training that are cohesive and able to maintain engagement in different modalities, educators need to adapt their teaching methods so that learning can progress (Namyssova et al., 2019; Serrano et al., 2019; Jeffrey et al., 2014; Bakhati, 2022). In terms of pioneering forms of assessment, investment in plausible and

useful feedback mechanisms is required to ensure greater accuracy in assessing student performance (Ice et al., 2007; Gikandi et al., 2011; Hattie & Timperley, 2007).

Finally, the improvement of clear guidelines is essential to maintain the integrity of collaborative assessments (López-Pellisa et al., 2020). Therefore, such barriers require proactive and varied conduct, in which institutions are able to invest in technologies, training, and support systems so that students gain useful skills.

Institutional Support and Resources

Educational institutions must not only be aware of and address the inherent obstacles blended learning but also work to play a decisive role in providing support systems and resources to improve student performance. First, it is of utmost importance that assistance and support services be offered in an amplified and easily accessible manner, with technical support teams and academic advisors dedicated to guiding students through their journey in hybrid learning. (Raphael, 2016). For Rashid (2023), investment in learning platforms that are accessible and easy to use, ensuring fluidity, good organisation of materials and integration of tools.

Similarly, it is important to offer workshops on a regular basis that teach how to conduct effective online research and show how to critically evaluate digital sources (Martínez-Alcalá et al., 2018). The higher education institutions are reponsible for supporting students' well-being and health by arranging students counselling services, educating them on stress-reduction and mental wellness programs (Mali et al., 2023). Flexibility in this type of education is of paramount importance, as it recognises the different schedules and commitments of students who have chosen to study in this type of education (Wilson, 2021).

In short, establishing tutoring and mentoring programmes between the parties can foster a sense of community and greater support among students, enabling more experienced colleagues to help newcomers face the challenges of this type of education (Vaughan et al., 2016). This dynamic strengthens bonds, contributes to learning and helps to overcome obstacles collectively.

Conclusion

Through this research, it is possible to confirm that higher education based on hybrid models deals with problems that are real and that have great importance and diverse characteristics. The difficulties are not only access to devices and connection, but also time management and emotional balance (Asio et al., 2021; Su et al., 2023).

The main points highlighted show that overcoming these obstacles requires attitudes and solutions on the part of institutions, namely the inclusion of the promotion of digital equity, the strengthening of support networks, and the expansion of pedagogical policies that are aligned with current demands. Furthermore, as indicated by Martínez-Alcalá et al. (2018) and Mougiakou et al. (2022), adaptation over time is essential to ensure a functional and stimulating learning experience.

The change that these initiatives can bring about is far-reaching. This is especially true when it comes to institutional restructuring to respond to such demands, which not only increases the number of opportunities to acquire knowledge, but also ensures that universities are seen as spaces that promote greater social inclusion and innovation. However, it is recognised that this article has certain limitations, such as the generalised nature of the analysis and the absence of empirical data representing local realities and diverse contexts.

For future research, it is recommended that a study be produced that has empirical characteristics and focuses on certain types of audiences and different contexts, in order to deepen the perception of tactics that are more effective in supporting students. It is also important to emphasise how valuable it is to investigate the role of teachers and managers in implementing these new practices. In general,

responding critically and with a model of excellence is vital for educational institutions to remain relevant in the digital age.

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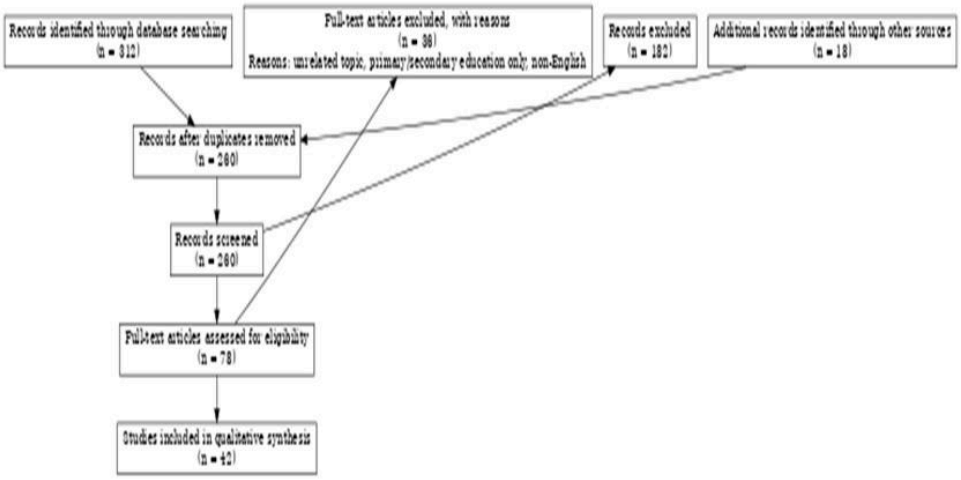
Appendix A: PRISMA Flow Diagram of the Literature Selection Process

The figure below illustrates the PRISMA flow of information through the different phases of the literature selection process, including identification, screening, eligibility, and inclusion.

Figure 1 — PRISMA flow



HOFFMANN, Maria Rita & FLAMICH, Maria Magdolna & BERZSENYI, Emese & GOMBÁS, Judit

Experiencing and Interpreting Disability (Studies) in the Post-Socialist Era

Hungarian scholars in international disability (studies) discourses

Introduction

Although the powerful slogan "Nothing About Us Without Us!" originates from Central-Eastern Europe (Charlton, 2000), most scholars in the area arrived significantly later in the international disability studies arena. Despite some exceptions (see Prof. Dr. György Könczei, n.d.), scholars first entered the international disability studies discourse around the beginning of the 2000s. Nowadays, numerous resources provide several reasons for the delay, for example, Petri & Hruskó (2024), Hoffmann & Flamich (2024), Mladenov & Petri (2019), and Hoffmann & Flamich (2015). This paper is not intended to be one of them. In this paper, rather than seeking further explanations, we highlight aspects and ideas that Hungarian scholars have contributed to the theories and practices of multifaceted disability studies.

This article features scholars who represented Hungary at the 13th ALTER conference, held at the University of Innsbruck from July 8 to 10, 2025. However, before getting acquainted with the scholars and their talks, we take a closer look at ALTER, its brief history, aims, and philosophy.

ALTER: What is it? Who are they?

ALTER, the European Society for Disability Research, is a scholarly network that promotes research on disability in the social sciences and humanities. It welcomes contributions from the scientific community across the globe" (ALTER Conference, 2025). The history of the community dates back to the human rights revolutions of the 1960s and '70s. The movements not only encouraged but also empowered people with disabilities to initiate and carry out activism in academia. Henri-Jacques Stiker, the acknowledged disability historian and co-founder of ALTER (European Journal of Disability Research), recalls how it all started:

"1. I do not start by defining Alter as a word, because the polysemy of this Latin term, deliberately chosen during free discussions in the period between 1987-1988 […]: it [the term] implied the connotation of other, otherness, alteration, handicap, infirmity, marginality, etcetera.

2. Were we a band of indecisive, unable to decide on a concept? Were we, in addition, a heterogeneous group of researchers who did not know what disciplines they belonged to? Indeed, next to Alter, we ended up putting 'International Association for the History of …'. The 'for' voluntarily left the door open to all those, whether sociologists, anthropologists, psychologists, lawyers, or professionals, who thought they could not do without historical depth, without being historians. History was like a connective tissue, but it did not impose a discipline, as Michel Foucault had taught us to be way of" (Stiker, n.d.).

As the name ALTER implies, the devoted scientific community provokes critical thinking of disability, and instead of considering it a taboo engraved in most cultures, the international network seeks answers to extremely sensitive questions, such as

- Disability, an operator to question norms? ALTER Conference, 2021)
- Protection, autonomy, emancipation: a(n)(im)possible alliance? (ALTER Conference, 2023).

Consulting the ALTER website, we can see that the questions always focus on themes that are often considered sensitive or taboo topics even today. For example: normalcy (ALTER Conference, 2021) or "Inclusion, Participation, and Human Rights Disability Research (ALTER Conference, 2016)

Presentations by Hungarian researchers at previous ALTER conferences

As 'Nothing About Us Without Us' implies, the concept of disability is strongly connected to various factors of human nature, cultural contexts, knowledge, religion, philosophy, and human rights. Like it or not, we must admit that the human rights approach enjoys priority. In contrast, the others are often

ignored or forgotten when disability-related issues, such as inclusion, come into the picture. Inclusion can be regarded as a one-word version of the slogan and therefore implies numerous questions. The fact was recognized by the organizers of the 2016 ALTER Conference, who chose the theme of inclusion and participation in the context of human rights. The theme resonated with two Hungarian scholars, Anikó Sándor and Péter Horváth, from the Bárczi Gusztáv Faculty of Special Needs Education at Eötvös Loránd University (ELTE) in Budapest. Sándor and Horváth approached the theme from a rarely discussed, constantly relevant aspect: the adoption of children with disabilities in Hungary. The scholars introduced their mixed-method study where they aimed to reveal "the characteristics of the families that deliberately adopt children with disabilities [in order to] better recognize the needs of families, their pleasures and difficulties after the adoption [The outcomes of their study] can help to establish adequate supports in the everyday lives [of the families concerned]" (Sándor & Horváth, 2016, p. 95). The two scholars concluded that the "empirical evidence can also lead to a legislation reform, and more children with disabilities can live in families" (Sándor & Horváth, 2016, p. 95). This novel aspect could not only contribute to a better understanding of disabilities in legal, pedagogical, cultural, and social contexts, even in those cultures where disability is still a stigma, but also in countries where disability is considered a special way of perceiving the world.

Admittedly, since the disability human rights movements empowered disabled scholars, their activism has changed or transformed thinking and acting about disability all over the world. These changes can be both positive and negative; moreover, in most cases, they challenge societies of all kinds. The Janus-faced transformation explains why the 2025 ALTER conference reflected critically on these changes and challenges.

The 2025 ALTER Conference

Why "transformations"? What does the term "transformation" cover in theory, and what in practice in disability studies context? Since the "Nothing About Us Without Us" movement empowered various groups that felt segregated, the world has been exploring ways of transformation regarding the concepts and practices of inclusion and exclusion. That might be one of the reasons why the 2025 ALTER Conference focused on "Transformations" and invited scholars, activists, professionals, and people with lived experience to analyze the changing dynamics in disability rights and disability research. The "underpinning question [was] whether change in the various social, cultural, economic and political systems shaping the lives of persons with disabilities reduced inequalities or lead to more pessimistic conclusions about increasing exclusion and precarity including the research arena" (ALTER Conference, 2025). The relevant question again crossed over disciplines and addressed people interested in the fields of "policy and societal contexts of disability rights, activism and campaigning, culture, history and disability archives, disability knowledge and disability research, disability futures (ALTER Conference, 2025).

The keynote speakers explored transformations of disability from cultural, legal, and social perspectives. The cultural one aimed to highlight the various ways of perceiving the world and their significance to any individual, while the legal one aimed to guarantee the rights to perceive the world in different ways, live in it, and act within it. The social one aimed to address the benefits of various perspectives on the world while criticizing current practices. The triad of approaches aimed to form a holistic picture of disability and to empower those who feel lost in the transformation process.

Cordula Thym and Eva Egermann, professors at the University of Vienna, introduced C-TV, a film that uses satire to critique ableist and heteronormative dynamics in society. It depicts a fictional television station and its interviews with people with disabilities about their daily lives and their artistic and political work. The authors […] "portray a world in which participation, inclusion, agency and visibility are realized far more strongly than in our current world" (ALTER Conference, 2025).

The legal aspect of changes was highlighted in Justin J. W. Powell's keynote talk, Transformation(s)? Deinstitutionalization Dynamics in Disability Rights, Representations, and Research. Professor Powell

from the University of Luxembourg examined the dynamics of change. He theorized "(de-)institutionalization dynamics in ideas, norms, and policies. Case studies of disability rights, representations of disability and accessibility [Professor Powell stated that] disability studies exemplify the complexities, paradoxes and potentials involved in (attempting to) transform societies to be more inclusive" (ALTER Conference, 2025).

The third keynote speaker, Katerina Kolarova from Charles University of Prague, focused on otherness and social attitudes towards "disability, mechanisms of exclusion, feminism and queer/LGBT identities" (ALTER Conference, 2025). The three keynote talks paint an overall picture of the changes and transformations that have happened so far in thinking about disabilities; however, they still failed to answer the questions of the Conference. The panels, however, offer some answers and alternatives to make societies as inclusive as possible.

To highlight the transdisciplinary nature of disability studies, the panels of the ALTER Conference 2025 in Innsbruck address a wide range of interrelated themes. Central attention is given to disability histories and memories, as well as the roles of policy and practice in education, employment, social services, and health care. Discussions explore identity, self-representation, and cultural narratives, while also engaging with pressing issues of accessibility, digital transformation, universal design, and inclusive pedagogies. Further focal points include the rights and lived experiences of persons with disabilities in contexts of migration, family, sexuality, and everyday life, as well as questions of empowerment, autonomy, and deinstitutionalization. Methodological and theoretical innovations are foregrounded, with attention to multi-perspective approaches, relational aspects of rights, and activist strategies for social change. Complementing the panels, workshops offer more focused explorations, including the history of disability rights movements in Austria, the representation of Nazi "euthanasia" in literature and film, participatory research and filmmaking, innovative uses of PhotoVoice, and ethical frameworks for co-constructing knowledge in Deaf and Disability Studies.

Taking a look at the list of topics, we can conclude that disability as a concept has constantly been transforming, and as lived experience changes every aspect of life from birth to death. Disability is universal and therefore moves far beyond the stereotypes most cultures have universally formed about it since disabled human beings first appeared on earth. Till disability-related stereotypes are with us, we cannot ignore them. Understanding and challenging them, however, can be a significant step towards inclusion.

Hungarian scholars at ALTER 2025

What can ALTER learn about Hungary's alternatives to transformation?

The 2025 ALTER Conference is expected to welcome several Hungarian scholars. That activism may be attributed to the fact that Innsbruck is closer to Hungary than Stockholm. However, supposedly, this is not the only reason. Another possibility is that the number of scholars interested in disability studies has been increasing since 2010, when Professor György Könczei, an acknowledged Fulbright scholar, established the Disability Studies Doctoral Workshop at the Institute for Disability and Social Participation, part of the Bárczi Gusztáv Faculty of Special Needs Education at ELTE.

Most of the Hungarian scholars presenting at the 2025 Conference are affiliated with the Workshop. The work of the scholarly community can be discovered in their approaches to disability (studies)-related issues. Their topics and talks unwielded, they approach disability (studies) from numerous aspects, and to a great extent, rely on "Nothing About Us Without Us".

Anikó Bernát, Gábor Petri, and Ágnes Turnpenny, through a survey, provocatively asked and answered the question whether "public attitudes support intellectual disability and autism rights and inclusion" (Bernát, Petri, and Turnpenny, 2025, n.p.).

The authors state that their purpose was to "explore social attitudes toward disabled people and their human rights." Within the scope of the study, Bernát, Petri, and Turnpenny analyze how social attitudes change toward specific groups of persons with disabilities.

The authors describe "promising" findings to some extent when they reveal that "the majority of respondents supported full inclusion of people with sensory or mobility limitations signalling a broad social consensus. [While] acceptance of autistic people and people with an intellectual disability was significantly lower for both adults and children." In general, attitudes towards children were less harmful than those towards adults. The authors point out that "respondents were less likely to approve certain rights of autistic people and people with an intellectual disability, including the right to vote, to marry, to raise children, to work in the open labour market and to go to school with others."

Negative attitudes can be rooted in past beliefs and depictions (Hoffmann & Flamich, 2015). Emese Berzsenyi & Laura Husvéth (2025) examined depictions of Down Syndrome and other disabilities in the Middle Ages. The researchers pose the question of whether angelic or sinful creatures are those with disabilities. Berzsenyi (2025) relates that "In the socialization of any community value selection serves as a powerful determinant of behaviour. In the Middle Ages the interplay between health, religiosity, economic factors and societal factors was far more intricate than it is today. Christian sensibilities reinterpreted the ancient Greek concept of kalokhagathia, linking visible beauty to virtue through religious devotion" (Berzsenyi & Husvéth, 2025; Berzsenyi, 2024).

Their research is based on disability history and content analysis to introduce how disability is represented in medieval iconography.

Emese Berzsenyi spoke about another interesting and relatively rarely discussed topic: Religious Interpretations of Disability. She introduced representations of disability in the Sacred Texts of Judaism, Christianity, and Islam. The author pointed out that the term disability is much younger than the examined texts; therefore, her "study required careful contextualization in the alignment of relevant concepts." In her paper, she focuses on questions such as "How do the Hebrew Bible, the New Testament and the Qur'an address disability and disabled individuals?" (Berzsenyi, 2025; Berzsenyi, 2020).

Staying with the historic aspect, an often-mystified theme, blindness came into focus.

Maria Flamich, the leader of the Legato Choir at the School for the Blind, moved beyond the metaphorical interpretations of blindness and stepped towards practical issues. She discussed the strong and everlasting connection between blindness and music. One of the reasons why the author chose the theme is to examine realities and mysteries behind the ancient stereotype according to which blind people are compensated with exceptional musical talent for the loss of their sight, and to what extent blind people's outstanding knowledge of and connection to sounds help them navigate successfully in the world. In her study, Flamich addresses the questions by examining the 200-year history of music education for people with visual impairments in Hungary. Due to blind people's special relationship with sounds and voices, Maria Flamich believes that music is one of the most inclusive ways for blind people to become responsible citizens.

In her presentation, "Sounds of Becoming: Two hundred years of teaching music to the blind in Hungary," Flamich relates past and present practices and proposes future perspectives. She aims to "initiate thinking over what role music education has been playing in becoming and belonging in blind people's lives" and to what extent music helps blind students to establish and accept their blind identity (Flamich, 2025, n. p.).

Her historical overview and the semi-structured interviews she conducted with blind choir members demonstrate the empowering role of playing music, even in cases where blind individuals lack exceptional musical talent. Her study suggests rethinking and reforming music education for students who are blind.

As the historic aspects illustrate, understanding disability requires knowledge about human differences. Historical, cultural, and political contexts, as well as the contexts of power, often shape the knowledge that determines the lives of people with disabilities.

Although the role of political power can be considered universal in shaping knowledge about disability, two Hungarian scholars examine its role in these transformations.

In his study Gábor Petri from the Central-European University introduced to the audience, he explores how disability rights movements advocate for human rights in changing and eroding democracies for Central and Eastern Europe" (Petri, 2025, n. p.). He refers to data collected in Bulgaria, Hungary, Romania and Serbia. First, he describes disability movements in the four countries "with the data about their mobilisation resources and positions in policymaking. Second, a closer analysis examines the situation in Hungary, often regarded as a 'poster child' of illiberalism (Petri, 2025, n.p.). The author finds it of significant importance to underline that, according to the results of his study, 'the space of disability rights movements is shrinking in eroding democracies.' Opportunities to influence and monitor public policymaking have been diminishing where de-democratisation is stronger. Due to fear of representations, some disability movement actors employ self-censorship when talking publicly. […] De-democratisation affects disability movement organisations diversely, making it difficult for movement actors to form coalitions internally.

Or externally with other social or political movements. National disability movements can, and often become fractured" (Petri, 2025, n. p.) After reviewing human rights-related policies and practices regarding the advocacy of persons with disabilities in the recently democratizing countries of Central Europe, Hungary comes into focus from a rather unusual perspective.

Katalin Gyöngyösi's presentation highlights an often-neglected issue: the intersection of disability and homelessness in historical, cultural, and political contexts, spanning from the recent past to the present. To help understand the significance of knowledge shaped by the political context, the author finds it essential to provide background information. She points out that the collapse of the communist regimes in Central and Eastern Europe has resulted in significant changes and challenges in disabled people's lives. "New institutions were put in place, legislation was brought in line with international standards, and EU support was used for development. Despite the progress achieved, fundamental challenges remain, including the lack of sufficient guarantees to exercise basic rights, a scarcity of inclusive educational and employment opportunities, low levels of accessibility, misalignment of user needs and social service supply, restricted legal decision-making capacity for many, and a lack of affordable housing (UN, 2020; Kozma, Petri and Bernát, 2020; Petri, Turnpenny and Bernát, 2023 cites Gyöngyösi, 2025, n. p.).

Out of the challenges listed above, the connection between disability and homelessness falls within the scope of Gyöngyösi's research. Observing the tendencies, policies the regime changes have brought, Gyöngyösi concludes that disabled persons have been overrepresented amongst homeless people since the regime collapsed. Gyöngyösi underlines an unexpected fact of her research:

"A rather surprising and finding is that a high number of homeless clients reported to have attended special education in childhood, and those with such education history are more likely to identify as Roma, and to have been raised in foster care" (Gyöngyösi, 2025, n. p.). Families and disabilities can be analysed from numerous aspects. In her study, Judit Gombás, for example, focuses on parenting with visual impairment. She examines social attitudes toward parents who are blind or visually impaired. Gombás highlights that although Article 23 of the United Nation's Convention on the Rights of Persons with Disabilities (UN CRPD) states the right of individuals with disabilities to found a family and highlights the significance of providing them to all the necessary information so that they could make freely their own decision about parenting, blind and visually impaired parents all over the world experience "discrimination in pregnancy and child birth related health settings" (Frederick, 2015 cites Gombás,

2025, n. p.). The author even points out that most societies question their ability to give proper care for their children.

Gombás introduced the results of two different qualitative research projects. One study investigated the experiences of Hungarian Blind and visually impaired fathers in rearing their children, while the other focused on the viewpoints and practices of Hungarian mothers. Semi-structured interviews were conducted to gather the respondents' attitudes. In both research projects, the results reflected worries from the families of most respondents. Moreover, they reported that even medical staff questioned blind and visually impaired people's ability to be responsible and caring parents. Gombás (2025) pointed out that in one case, "a blind mother was suggested an abortion by her gynaecologist upon detection of the pregnancy."

The talks we have investigated so far, to a great extent, rely on inherited preconceptions. Most cultures, societies, and political regimes associate disability with extremities. Some still suggest that it is either the result of sinful behavior (see Berzsenyi & Husvéth, 2025) or the presence of angelic creatures with extra abilities (see Berzsenyi, 2025; Flamich, 2025). Due to the power human beings attribute to themselves, their reaction to extremes is to mystify the gifted ones and rule over, or disable, segregate, or marginalize the weak ones (see Petri, 2025). Those who are disabled or segregated tend to blame society's attitude for their disability.

Attitude is a key concept in disability-related transformations. Attitude, both individual and social, reflects the level of knowledge about the various abilities that people with disabilities possess.

Carmen Svastics, Sára Csillag, and Zsuzsanna Győri examined how digitalization influences the attitudes of disabled entrepreneurs towards both disabled and mainstream societies regarding opportunities for inclusion. The authors state "since they [disabled entrepreneurs] occupy a special place in the community of people with disabilities through their self-realization and the many benefits and resources (personal assistance, relational capital freedom) arising from their business, digitalization may mean not only difficulties but also greater flexibility and autonomy to them" (Pichault & McKeown, 2019 cites Svastics, Csillag & Győri, 2025).

The three scholars employed qualitative research to examine how digitalization has transformed businesses for individuals with disabilities. According to Svastics, Csillag, and Győri (2025), "the results revealed four distinct strategies […] [and concluded that] overall, entrepreneurs accept the digital imperative, see digital solutions as opportunities to bridge the so-called digital disability gap (Dobransky & Hargitai, 2016 cites Svastics, Csillag & Győri, 2025), at the same time believe that digital equality for people with disabilities […] has yet to be achieved" (Svastics, Csillag and Győri, 2025).

As all the talks suggest, the attitude towards people with disabilities is a key factor. It has been observed, examined, and depicted since the emergence of disability as a phenomenon on the planet. Admittedly, knowledge gained through dialogues may generate a positive attitude, without which inclusion is impossible. Generating special knowledge to affect attitude was the purpose of Maria Rita Hoffmann's talk: Concepts, Contents, Realities: What a course on inclusion teaches us about us.

The author aimed to provide an example of how disability-related narratives can contribute to inclusive teacher education, in general, and specifically to English as a foreign language (EFL) education.

Hofmann points out that inherited beliefs and prejudices, as they have been with us for thousands of years, influence our attitude towards disabled people. We need time to eliminate them. We need time to learn about our own abilities, disabilities, and prejudices. Cultural representations of disability prove a helpful mirror to be critical regarding prejudices, and to recognize skills and disabilities. The author goes even further and proposes cultural disability studies as an element of teacher education. Based on students' feedback, Hoffmann concludes that critical thinking about prejudices and special knowledge about disabilities promotes inclusion.

The course she described exemplifies the significant importance of lived-experience-based narratives in generating knowledge about disability and the experiences of persons with disabilities.

Conclusion

This paper describes what Hungarian scholars think of the theme of transformations. ALTER proposed to discuss at its 13th conference in Innsbruck this year. To understand the significance of the Hungarian contribution, Hoffmann, Flamich, Berzsenyi, and Gombás introduced ALTER: the international community of disability researchers. They provided a brief description of its history and highlighted the topics that the academic community addresses.

Over the years, the topics have addressed several sensitive issues, such as inclusion and participation. This year, the topic focused on transformations, and the question was whether change in the various social, cultural, economic, and political systems shaping the lives of persons with disabilities reduced inequalities or led to more pessimistic conclusions about increasing exclusion and precarity, including the research arena" (ALTER Conference, 2025).

In this paper, Hoffmann, Flamich, Berzsenyi, and Gombás situate both the topic and the question within the context of "Nothing About Us Without Us," due to its Eastern European origin. The once empowering has undergone a radical transformation since it was first recorded in 1993 (Charlton, 2000). These transformations were addressed, discussed, but never questioned at the Innsbruck conference.

Scholars from around the world presented a comprehensive picture of their disability culture. Hungary's past and present disability culture was also introduced from several viewpoints. The scholars talked about historical, political, legal, social, and cultural aspects. They even pointed out attempts disabled and non-disabled people make to understand better, interpret disability, and accept and respect the people who perceive or navigate the world differently. The holistic picture of the Hungarian disability culture is a direct, both theoretically and practically supported answer to the Conference's question. The delay that characterized Hungarian scholars' arrival at the international disability studies arena can no longer be discovered in their scholarly work. They bravely highlight points, such as the significance of attitude, to consider if the disabled community wants steps towards inclusion and belonging.We observed that the talks revealed the significance of attitude, which appears in each presentation of the conference, encompassing historical, political, legal, social, and, of course, cultural contexts. Thus, we Hungarians proposed ways to transform a negative attitude into a positive one.

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Erzsébet GULYÁS

The Shape of Things Unseen: A New Science of Imagination by Adam Zeman (Bloomsbury Publishing, 2025)

Adam Zeman's book [URL1], *The Shape of Things Unseen: A New Science of Imagination* [URL2] summarizes current scientific research on imagination, tracing its development throughout history and in individual life, and its relationship with creativity. Professor Zeman [URL3], a cognitive and behavioural neurologist at the University of Exeter, together with his colleagues, coined the term *aphantasia* to describe the absence of a 'mind's eye' (p. 13). The considerable public interest generated by his research has drawn attention to the difference between imagination and imagery. Imagination, and our ability to share it with others, is what makes us uniquely human and shapes our culture.

With the help of ever-evolving methods of studying imagination, we are learning more about the vital role it plays in our lives. Some of the themes discussed in Zeman's book also appear in earlier works, such as Agustín Fuentes's *The Creative Spark. How Imagination Made Humans Exceptional* [URL4] (2017), and Oliver Sacks's *The Mind's Eye* [URL5] (2010) – Sacks himself had aphantasia (p. 302) – and also in works that included studies related to imagination, such as *The Cambridge Handbook of the Imagination* [URL6] (edited by Anna Abraham, 2020). Zeman's book, structured into three parts and twelve chapters, reviews the functioning and significance of imagination, presenting the most recent scientific findings in a captivating and accessible style, regardless of the reader's background. The book's cover introduces its theme – the close relationship between imagining and perceiving – through a visual metaphor.

Introduction

The Introduction opens with an exercise that illustrates the diversity of imagination (p. 1): *'Imagine: An apple. The sound of thunder. A dinosaur. The look of your kitchen. The map of France. The scent of thyme. Your mother's eyes. Your first kiss. The touch of velvet. Your plans for your next vacation. Winning the lottery. The interior of an atom. The interior of the Earth.'* The timeliness of the subject is underscored by recent research showing that imagination is not only employed in solving creative tasks, but we also immerse ourselves in our thoughts while doing things. That perception can be understood

as *'controlled hallucination'* (p. 2), shaped by our knowledge and predictions. Research enables us to better understand how our imagination works and control it more effectively. Importantly, imagination is not only private but, because we evolved into social beings, also shared.

First part

The first part of the book explores the scope of imagination, examining its everyday, creative, and social aspects. Humans spend approximately half of their awake time engaged in an imaginative activity, occasionally using special strategies to connect with the present '*for a while'* (p. 17). The biblical story of Adam and Eve's eating from the tree of knowledge, Zeman argues, *'symbolizes the alienation that flows from our detachment of the epistemic innocence of the here and now'* (p. 15). While imagination removes us from the present, sharing imaginative experiences enables us to connect with others. Adam and Eve's act of naming *' all cattle, and … the fowl of the air, and … every beast on the field'* (p. 45) reflects the need to communicate their imaginative representations. Though imagination can be mistaken for reality, perception itself is not without imaginative processes; it is based on predictions and internal models. Vision, for example, is generative and sometimes leads to false conclusions.

The creative use of imagination carries responsibility. Zeman illustrates this with the example of cosmologist Martin Rees, who, while studying the *'multiverse',* realized that artificial intelligence might evolve in directions independent of human interests. This recognition led him to found the *Centre for Existential Risk*, years before widespread public interest in AI (p. 41). As Martin Luther King Jr. demonstrates, Rees also exemplifies the *'unreasonable man … who persist in trying to adapt the world to himself'* (p. 63), on whom social progress depends.

Visionary leaders, often artists, must make decisions in the face of crises, such as climate change or pandemic management, decisions that depend heavily on how they imagine the future. Communication and information transfer using language relies on our '*truth-default' or 'truth-bias'* (p. 55). However, we already live in a *'post-truth society'* (p. 62), where, according to research, neither the presidents of great world powers nor the shared news on social platforms can be trusted as reliable. To shape our path to the future, though, imagination must be grounded correctly, for '*truth is not the enemy of imagination: it is its fuel'* (p. 67).

Second part

The second part describes the science of imagination, its reproductive and productive aspects, its neural correlates, its evolution in human history, and its development in the individual lifespan.

The components of human imagination can be classified in multiple ways: they may be voluntary, involuntary, or fall somewhere in between, as in the case of reading a novel. Imagination enables us to evoke absent emotions and sensory experiences, to engage in purposeful mental activity or problem-solving during dreams, and to generate phenomena such as illusions and hallucinations. Visual imagery is the most studied domain.

Until recently, imagery was assessed primarily through questionnaires. Over the past decade, however, several objective methods have been developed to measure visual imagery, and parallel approaches are emerging for auditory and olfactory imagery. For instance, pupil dilation reflects the vividness with which light and dark objects are imagined, while galvanic skin responses indicate physiological arousal during the mental visualization of frightening narratives. In binocular rivalry experiments, where each eye is presented with a different image, visually imagining one of the stimuli can bias perception toward it. Individuals with stronger imagery tend to exhibit greater susceptibility to such perceptual misinterpretations.

The 'imagery debate', lasting nearly half a century, arose partly because *'people who lack a form of imagery are prone to deny its existence'* (p. 91). One of the memorable anecdotes in the book – especially for readers with aphantasia, such as myself – comes from Stephen Kosslyn's early experiments. When asked to evaluate the statement *'A flea can bite,'* two participants judged it false. Asked to explain, *'the*

first answered 'I looked for a mouth, but I couldn't find one.', the second: 'I looked but I couldn't see any teeth'" (p. 82). Though in their case, visual thinking was not the well-chosen method leading to a goal, Einstein described his own imaginative process as grounded not in words but in voluntary manipulation of images: *'the words of the language, as they are written or spoken, do not seem to play any part in my mechanism of thought. The physical elements which seem to serve as elements in thought are certain signs and more or less clear images which can be voluntarily 'reproduced' or combined* (p. 93). With this form of thought, Einstein imagined that for somebody travelling on a beam of light, time would stand still (p. 107).

Both science and art rely on imagination – science to describe what is, and art to express what is felt. As Mihály Csíkszentmihályi observed, *'to be human is to be creative'* (p. 102). Research shows that in the case of our everyday creative activity, '*external reward reduces both enjoyment and creative output'* (p. 113) – a point that, in my opinion, raises questions about educational practices such as grading in elementary school.

Neuroimaging methods, including EEG, fMRI, and MEG, reveal that the brain is often more active during rest than during externally directed tasks. The resting state, 'default mode network', is relevant to the imagination; it is active when our mind can wander, visit memories, and plans. During creative processes, it interacts with the 'executive, task-control network' and with the 'salience network'. Arthur Koestler, the Hungarian-British thinker's theory of *'bisociation'* (p. 103) – the connection of *'self-consistent but habitually incompatible frames of reference'* (p. 135) – in the creative process is supported by these findings.

The evolution of imagination paralleled the evolution of the human brain. Homo sapiens has the highest encephalization quotient, the relatively largest extra brain area for cognitive purposes. Other species with high encephalization quotients also tend to be long-lived, reach sexual maturity slowly, live in social groups, and, in some cases, use tools and attribute mental states to others. Chimpanzees, for example, are capable of mental simulation and hypothesis testing. Archaeological evidence – such as cave paintings, tools, and carvings – indicates that our ancestors' consciousness was comparable to ours. Their minds were not unreflectively self-centred but reflectively social. While apes exhibit limited forms of shared cognition, humans are *'ultrasocial'* and have a *'deep social mind'* (p. 163).

Tool use and tool making, together with remembering the locations of raw materials and the methods for transforming them, as well as the need to symbolize absent objects, required the emergence of language – most likely beginning with gestures, which we still employ today. Mime serves as an iconic form of representation, in contrast to most words. Nevertheless, in many languages, we use back vowels for terms describing *round* or *huge* objects, or *those that* are *far*, and front vowels for *spiky*, *teeny* objects, or for *this* one *near here,* a phenomenon known as the 'kiki-bouba effect' (p. 169). Language functions both to share knowledge and ideas with others and to structure thought within the self, and it can be used to inform as well as to deceive. Human bodies and brains evolved for language and culture. *'We have evolved to share what we imagine'* (p. 180).

Imagination is not *'primitive, solitary, driven by wish-fulfilment, distorting of reality'* (p. 200), as Freud and Piaget proposed, but rather social and sophisticated, enabling us to understand, control, and shape reality. Infants develop 'cultural intelligence' (p. 195) by learning the art of imagination from their caregivers: first by describing, then by misdescribing, by pretending, and ultimately by internalizing their cultural environment. The capacity for imagination is genetically grounded, but its development depends on critical time windows for acquiring specific skills. Just as animals raised in enriched environments develop more interconnected brains than their peers, children raised in emotionally neglectful environments tend to exhibit reduced neural connectivity, smaller brain volume, and lower cognitive capacity. As Zeman observes, *'Childhood adversity shrinks possibility – in part by stealing the tools of imagination'* (p. 205).

Third part

The third part addresses the *'maladies, remedies and extremes of imagination'* (p. 6). The author frequently emphasizes that perception is a form of 'controlled hallucination': what we see, hear, and sense depends on internal models constructed from our prior experiences of the world. When this regulatory process is disrupted, or under conditions of sensory deprivation – such as flotation chambers or even being blindfolded for an hour – hallucinations may arise. In the absence of external input, the brain's intrinsic activity intensifies, and its internal models generate creative predictions. Emotions, sleep, drugs, or other factors may also trigger hallucinations.

Another way in which imagination can blur reality is through delusions – false beliefs that arise when the ability to evaluate possibility is impaired. The brain is constantly generating and testing hypotheses by constructing internal models, and these predictions (imaginative processes) shape perception. Functional illnesses may result from imaginative mechanisms operating outside of conscious awareness. As Reynolds observed in 1869, *'an idea … takes possession of the mind and leads to its own fulfilment'* (p. 258). While delusions may sometimes be linked to underlying emotional factors, this is not always the case. Sometimes we mistake the imagined for the real, which is why, in exceptional cases, we ask ourselves whether something actually happened. The frontal pole of the prefrontal cortex, with its especially dense connections to other brain regions, plays a decisive role in this evaluative process.

In contrast to its potentially disruptive forms, imagination can also support learning, healing, and problem-solving. Mental practice – whether during wakefulness or sleep – can enhance performance in different skill domains, enabling musicians to refine their playing, surgeons to rehearse procedures, gymnasts to perfect movements, or chess players to plan moves. Both pain and pain relief can be simulated through imagination. Placebo effects, mediated by the exact neural mechanisms as pharmacological treatments, have been shown to alleviate not only pain but also depression and anxiety. In Parkinson's disease, they can reduce immobility and tremor by triggering dopamine release.

Imagination can act as a powerful remedy, but also as a potent curse (p. 276). Because visual imagery intensifies emotions, post-traumatic stress disorder can be reduced by weakening the association between imagery and memory – for example, through tasks such as playing Tetris. Similarly, cravings and symptoms of bipolar disorder may be relieved by engaging competing imagery.

Remarkably, about one-fifth of individuals once believed to be in a vegetative state can communicate through mental imagery. Their responses can be detected with brain imaging techniques such as fMRI or EEG: imagining playing tennis can signal 'yes,' while imagining walking around one's home can signal 'no' (p. 282). This form of communication is enabled by our fundamentally social nature, which relies on language to externalize and share imagination.

The imaginative visions of novelists can at times prove prophetic, as exemplified by works such as *Around the World in Eighty Days* or *Nineteen Eighty-Four*.

The closing section of the chapter may prompt readers to reconsider the imagery exercise presented in the Introduction. It emphasizes that both extreme responses are possible, equally normal, and imperceptible to others. The section concludes with interviews featuring hyperphantastic and aphantastic artists. Ed Catmull, the recently retired president of Pixar, Disney, and Turing Prize recipient, who described his role as '*protecting the new*' (p. 118), recounted to Zeman a revealing conversation with Glen Keane, one of the most excellent living animators. To Catmull's surprise, Keane disclosed that he has never been able to visualize mental images. He even recalled arguing with a senior colleague who found it inconceivable that an animator could work without 'seeing' images in advance. Keane explained that while he held something in his mind, it was not a picture – he had to interact with the paper to externalize it. Catmull noted that he experienced the same: he too had mental content, but no imagery (p. 296).

The epilogue discusses the role of human imagination in individual lives and society.

Both imagination and perception are shaped by conscious and unconscious imaginative processes, which refine the brain's internal models. Uniquely in humans, imagination can be influenced by the imaginations of others through the use of symbols, such as language, art, music, mime, algebra, or computer code. The book demonstrates how this capacity for sharing and regulating imagination emerged over millions of years of evolution and through individual developmental processes in childhood.

Zeman achieves his stated goal of making '*the insights into our nature accessible to you, whatever your background*' (p. 2) by including a two-page overview of the **brain regions** discussed, a forty-two-page **bibliography**, and sixteen **color pages** of illustrations ranging from prehistoric to modern art, and from Cajal's neuron sketches to contemporary neuroimaging.

The author introduces us to scientists and artists, individuals who experience hallucinations or delusions, those with imagery as vivid as perception, and those without any sensory imagery, presenting them in a way that allows readers to connect with his subjects, gain insight into how their brains function, understand their thought processes - imaginations, and appreciate what occupies their minds. This approach helps us understand and accept the origins of unusual thoughts *and* imaginations in ourselves and others, potentially serving as a starting point for personal or social improvement.

In a presentation[URL7] the author discusses the topic of his book more engagingly and in greater depth than I can convey in this review. Even though he does not refer to it, for me – perhaps because I have aphantasia – the title suggests that even without sensory imagery, one can still comprehend the shape of objects; spatial imagery can be, and often is, highly developed even in the absence of object imagery. As the author notes, Aristotle was incorrect in claiming that *'the soul never thinks without a/an image/ phantasma'* (pp. 71, 93, 297). However, he was right in asserting that *'humans are deeply "mimetic beings": we have a strong urge to represent our experience of ourselves, of one another, and of the world, and to share those representations'* (p. 37).

Links:

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- URL2 - https://www.bloomsbury.com/uk/shape-of-things-unseen-9781526609779/
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