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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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