

Non-government organisations as a basis for sustainable development of education

Kateryna V. Vlasenko^{1,2,*}, Iryna V. Sitak^{3,**}, Iryna V. Lovianova^{4,***}, Vitaliy V. Achkan^{5,****}, and Tetiana S. Armash^{4,†}

¹National University of “Kyiv Mohyla Academy”, 2 G. Skovoroda Str., Kyiv, 04070, Ukraine

²Limited Liability Company Technical University “Metinvest Polytechnic”, 71A Sechenov Str., Mariupol, 87524, Ukraine

³Volodymyr Dahl East Ukrainian National University, 59 A Tsentralnyi Pr., Severodonetsk, 93400, Ukraine

⁴Kryvyi Rih State Pedagogical University, 54 Gagarin Ave., Kryvyi Rih, 50086, Ukraine

⁵Berdiansk State Pedagogical University, 4 Schmidta St., Berdiansk, Zaporizhzhia oblast, 71100, Ukraine

Abstract. The article examines the experience of team work of scientists-members of a non-government organisation (NGO) “Smart Math”. The analysis of the advantages of scientists’ collaboration and communication are offered in the current research. The paper presents the findings of scientific collaboration and cooperation of researchers, whose activity is represented on the open educational platform “Higher School Mathematics Teachers”. The areas of activity of a team of researchers, which brings together teaching staff of Ukrainian universities, and tackling the issue of developing on-line courses are described in the present article. The outcome of such collaboration of the members of “Smart Math” in 2020 is the increase by 4,7 in the average citation index in scientometrical databases publications.

1 Problem statement

Developing a successful country and a constitutional state is impossible without developing public awareness. Non-government organisations (NGOs), which are one of the key social institutes of a person’s development and social integration, play a key role in this process. For a scientific community, participation in a professional NGO is an opportunity to fruitfully communicate with like-minded people from different cities and institutions, to implement joint projects, to raise funding for research and publication, etc. Moreover, creating NGOs in a social sphere, in science, culture and education, in innovations and technological development, provides for a development model for civilisation, based on innovations. This way the basic needs of the present generation, along with preserving the environment, strengthening personal and societal health – all the factors, defining sustainable development of the society are met.

2 Analysis of the recent research papers and publications

Among the key skills for the future, scientists single out 4 core ones, the so called “Four Cs” – Creativity, Critical Thinking, Communication, and Collaboration. Collaboration and team work play an important role for teaching

staff and scientists. Team work for Ukrainian scientists is usually implemented through team projects and scientific research on-the-job, but such collaboration in our opinion does not give an opportunity to realise a scientist’s full potential. A solution to this problem is establishing professional non-government organisations, which contributes to strengthening partnership and collaboration among teaching staff; gives them opportunities to work on scientific projects in teams; allows to p scientific, social and other interests. Moreover, Para. 19 of Art. 38 in “Licensing Terms for Educational Service Provision” [1] contains a requirement concerning “activity in accordance to the speciality in a form of participating in professional and/or civic associations”, which gave rise to founding professional civic associations in Ukrainian educational sphere. Thus, an all-Ukrainian NGO “Civic Council of Educators and Researchers of Ukraine” (CCERU) [2] is aimed at contributing to renaissance of a high social profile and a status of an educator and a researcher; to strengthening the role of education and science in economic, moral, cultural development of the society, the state, the citizens and a personality, as well as protecting the joint interests of its members. Non-government organisation “PROSTIR Foundation” [3] was established by students, teaching staff and alumni of East-Ukrainian National University named after Volodymyr Dahl in order to improve the standards of living of the residents of Luhansk region through social partnership, development of leadership in communities, promotion of sustainable development as a lifestyle, support for innovations. Non-government organisation “Educational Era” [4] created one of the most popular domestic educational platforms – a studio of on-line education Ed-

* e-mail: vlasenkov@ukr.net

** e-mail: sitakirina@gmail.com

*** e-mail: liriha22@gmail.com

**** e-mail: vachkan@ukr.net

† e-mail: Armash@i.ua

Era. The participants thereof aim at making on-line education in Ukraine accessible and of high quality. The team creates on-line courses, special projects, interactive books and educational blogs. “Kharkiv Mathematics Society” [5] is a local NGO, which brings together on a voluntary and equal rights basis its members – citizens, who do fundamental and applied research in Mathematics, and /or teach the subject. Non-government organisation “Education of the 21-th century”, based in Kharkiv [6], runs advanced training courses for teachers of project classes; implements the project “Intelligence of Ukraine”; arranges trainings for trainers to work in the project with primary school students. The above mentioned proves that the social movement of establishing non-government organisations is becoming more active among teachers and scientists in Ukraine.

International experience of NGOs’ work in educational domain is much vaster, than it is in Ukraine. Thus, The American Association of University Professors (AAUP) [7], which was founded back in 1915, contributes to shaping the American higher education, designing standards and procedures, which maintain the quality of education and academic freedom in colleges and universities. Members of the organisation identify fundamental professional values and standards for higher education, advocate for the rights of scientists, for instance, academic freedom and joint management, as well as contribute to the interests of teaching and research in higher education. The National Education Association (NEA) [8] brings together more than 3 million people – educators, students, activists, employees, parents, neighbours, friends, who advocate for equal opportunities for all the students and help create a more fair and inclusive society. The American Association of State Colleges and Universities (AASCU) [9] is a collective voice of about 400 public colleges, universities and systems, which unite the student community. The Association works on increasing students’ access to new opportunities; contributes to teaching career development on the international level; supports field studies and the provision of services, that facilitate sustainable development and improvement of the living standards in communities all over the country.

The objective of this paper is to examine the experience of team work of researchers-members of the NGO “Smart Math”; to show how joint effort of educators results in creativity, critical thinking, communication and collaboration.

3 Methods

The analysis of the international communication experience of scientists, the synthesis of such analysis and own experience resulted in a decision to bring together experts, working in Mathematics and teaching methods. Upon stating its objective, the NGO “Smart Math” was founded and registered on September 27, 2019 (registration number in the Unified Register of Organisations 1503698 [10]) by Professor Kateryna Vlasenko and Associate Professor Iryna Sitak. Currently the organisation consists of 16

members, scientists from technical and pedagogical universities of the centre, east and south of Ukraine.

According to the articles of association of the NGO “Smart Math” [11], its “... main purpose is to meet the social, economic, cultural, ecological and other needs of the Organisation, teaching staff and student community; to facilitate exercising rights and freedoms, collaboration and partnership (on the international level including), in developing mathematical education and culture through efficient implementation of social initiatives”.

The key areas of interest for the Organisation are: “Impact on the development processes in mathematical education through collaboration of experienced university teaching staff, whose joint effort will facilitate tackling the issue of engaging wider audience into developing and promoting Mathematics; efficient usage of internal potential of educational institutions; introduction and protection of intellectual property of the members of the teaching community; bringing together communities, public for-profit and non-for profit organisations in the domain of education and culture; support for state and local authorities in dealing with issues that relate to the rights and legitimate interests of the Organisation’s members; contribution to shaping the societal awareness of the priority of the educational culture units development and drawing attention of the society to their problems; participation in designing and implementing local education and culture development programs; comprehensive support for educators through providing informational, methodological and organisational assistance, engaging them into the work of the Organisation; raising awareness of the society of the problems in education and culture, developing solutions to those problems; representation of the Organisation’s members in their relationships with enterprises, institutions and organisations of different form of ownership; promotion of the mathematical education development, including extra-curricular activities; popularisation of the mathematical education attractiveness; creating and supporting educational on-line platforms for Mathematics teachers, which will facilitate exchanging and sharing international experience within the life-long learning framework; arrangement of study visits in order to learn about specificities of teaching Mathematics in different regions of Ukraine and around the world; foundation and popularisation of Mathematics clubs or societies in educational establishments of different levels of accreditation; implementation of mathematical projects; contribution to developing standards and increasing quality of education and culture; fostering and engagement in international collaboration in the domain of education and culture, arranging and holding non-for profit educational events, courses, on-line courses, congresses, workshops, festivals, seminars, lectures, round tables, exhibitions, forums, other social and cultural public events, involving national and international experts and specialists, members of the public, state and local authorities, representatives of educational establishments; contribution to enhancing the legal awareness of both – the Organisation’s members and members of general public; advocating for rights to safe and healthy natural environment and comprehensive fostering of safeguarding flora

and fauna; promotion of healthy lifestyle; arrangement of printing activities for the sake of pursuing the purposes, stated in the articles of association, and facilitation of publishing and disseminating printed, audio, video products, photos, related to the Organisation’s purposes; foundation of mass media in pursuit of the Organisation’s purposes and objectives, stated in the articles of association; co-ordination of the activities of its members for the sake of achieving the Organisation’s purposes and objectives; participation in implementing international, all-state, regional, local and own development programs in the domain of education and culture; engagement in the work of associations and other voluntary unions, which facilitate achieving the Organisation’s goals, stated in the articles of association, including international partnerships; participation in the work of advisory and other subsidiary bodies, established by the state and local authorities in order to hold consultations with public associations and draft guidance on issues, related to their sphere of interest”.

4 Findings

Upon establishing the NGO “Smart Math” in September 2019, several teams were built, each of them focussing on doing research in the following domains: development of on-line courses, project work, cloud computing, etc. An open educational platform “Higher School Mathematics Teacher” was also developed [12]. Content on the platform is placed in two languages – Ukrainian and English in order to attract international partners. Target audience of the platform are undergraduate students and teaching staff of pedagogical universities. The platform helps each of them to solve one of the most complicated tasks – how to teach a student majoring in engineering to learn Mathematics. The platform became a venue for scientists, who are willing to share their practical skills in teaching Mathematics. As of June 01, 2021 the following educational and methodological courses were published on the platform – “Methods for Teaching Mathematics to Students in Technical Universities” [13], “Project method in Teaching Higher Mathematics” [14], “Differential Equations” [15]; work on such courses as “Personal e-Learning Environment of the Maths Teacher” [16], “Creative Thinking Through Learning Elementary Maths” [17], “Operations Research Oriented to Cloud Computing in the System Co-Calc” [18] is ongoing. The researchers described their experience of developing such courses in their papers [19–21].

Scientific communication and collaboration resulted in the research works, which were published, are included into the scientometrical databases Scopus and Web of Science, as well as into reviewed specialised domestic journals. The number of citing of publications by scientists-members of NGO in the the scientometrical database Scopus (table 2) in 2020, compared to 2019, increased by 4,6 times (figure 1), namely in Google Scholar – an increase by 2,7 times (figure 2), in Scopus by 44,4 times (figure 3) and in scientometrical database Google Scholar (table 1). In 2021 this movement towards the increase in the number

of citing and Hirsch index for teaching staff is on the rise as well.

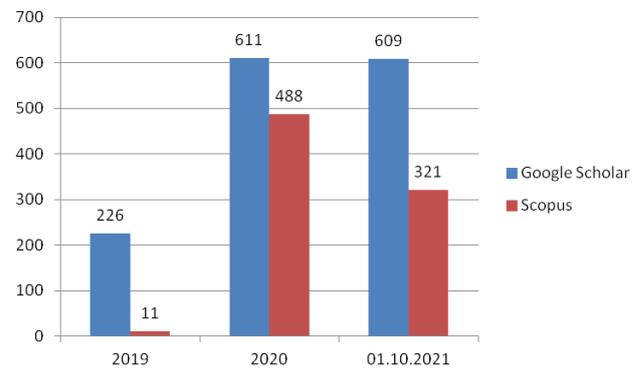


Figure 1. The total number of the publications by members of the NGO “Smart Math”.

The outcome of the collaboration of scientists within the NGO was discussed at the 7th Workshop on Cloud Technologies in Education (CTE 2019) [19], XII International Conference on Mathematics, Science and Technology Education (ICon-MaSTEd 2020) [20], XIII International Conference on Mathematics, Science and Technology Education (ICon-MaSTEd 2021) [21] and others.

5 Discussion

The number of non-government professional associations is growing in Ukraine and worldwide, societal interest, which the scientific community takes in participating in such associations, is on the increase. Thus, a scientific research by Volkova [22], dedicated to a comprehensive analysis of the current situation and prospects for harmonizing the Ukrainian constitutional legislation on non-government organisations with the European standards for non-government organisations. Kobziev [23] and Bezverkha [24] put consideration into the role, which NGOs play in scientific and professional training of students. McGinn [25] examines the experience of supranational organisations in decentralisation and privatisation of education, an opportunity for non-government or-

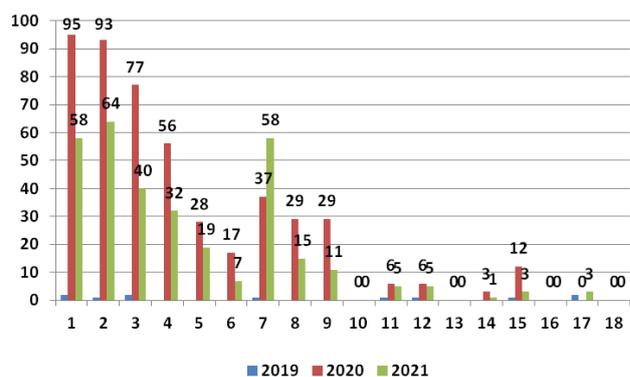


Figure 2. The number of citing of the publications by members of the NGO “Smart Math” in Scopus.

Table 1. The number of citing of the publications by members of the NGO “Smart Math” in the scientometrical database Google Scholar.

Scientists	Scientific title	Total	2019	2020	2021.10.01	h-index
Vlasenko K.	Doctor of Education	577	45	125	127	13
Lovianova I.	Doctor of Education	465	34	125	129	12
Chumak O.	PhD in Education	195	16	83	85	8
Sitak I.	PhD in Education	190	20	68	53	8
Kondratyeva O.	PhD in Education	31	5	1	1	1
Achkan V.	Doctor of Education	94	13	21	5	5
Bobyliiev D.	PhD in Education	95	3	34	49	4
Volkov S.		57	1	27	24	5
Kovalenko D.		53	0	28	25	3
Beskorsa O.	PhD in Education	28	6	5	7	3
Havriloiva L.	Doctor of Education	254	47	70	61	7
Ishutina O.	PhD in Education	39	3	13	16	3
Oriekhova V.		4	0	2	1	1
Khizhniak I.	PhD in Education	58	19	5	15	4
Armash T.	PhD in Education	12	3	4	1	2
Dziuba M.	PhD in Physics and Mathematics	6	5	0	1	1
Khilkova L.	PhD in Physics and Mathematics	23	6	0	8	3
Kaluhin R.		1	0	0	1	1

Table 2. The number of citing of the publications by members of the NGO “Smart Math” in the scientometrical database Scopus.

Scientists	Scientific Title	Total	2019	2020	2021.10.01	h-index
Vlasenko K.	Doctor of Education	160	2	95	58	8
Lovianova I.	Doctor of Education	163	1	93	64	7
Chumak O.	PhD in Education	120	2	77	40	7
Sitak I.	PhD in Education	90	0	56	32	6
Kondratyeva O.	PhD in Education	47	0	28	19	5
Achkan V.	Doctor of Education	40	0	17	7	4
Bobyliiev D.	PhD in Education	66	1	37	58	4
Volkov S.		44	0	29	14	4
Kovalenko D.		42	0	29	11	3
Beskorsa O.	PhD in Education	1	0	0	0	0
Havriloiva L.	Doctor of Education	12	1	6	5	1
Ishutina O.	PhD in Education	12	1	6	5	1
Oriekhova V.		0	0	0	0	0
Khizhniak I.	PhD in Education	4	0	3	1	2
Armash T.	PhD in Education	16	1	12	3	2
Dziuba M.	PhD in Physics and Mathematics	0	0	0	0	0
Khilkova L.	PhD in Physics and Mathematics	7	2	0	3	2
Kaluhin R.		0	0	0	0	0

ganisations to compete with the national ones for control over public education. Rowan [26] studied specific features of political control over education, educational non-government organisations, team work of scientists. Lai et al. [27], Nganga [28], Happ [29] state that persons with highly developed collaboration skills and team work achieve better results in studying and more recognition from employers.

Highlighting the importance of establishing non-government organisations by university teaching staff, we determine their special application effect as collaboration

practices and claim, that core skills of the 21st century, such as communication, collaboration, critical thinking, and creativity, are considered central for achieving success in the modern world in general, and in the context of key subject areas, contributing to sustainable development of the society. Focussing attention on the non-government organisation “Smart Math”, there is ground to believe, that communication gives teachers an opportunity to promptly obtain new information, findings of research work and educational experiments; collaboration contributes to the increase in the scope of research and the speed of processing

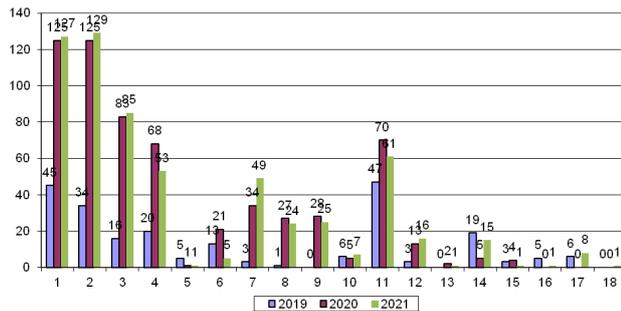


Figure 3. The number of citing of the publications by members of the NGO “Smart Math” in Google Scholar.

thereof, which in turn increases the number of scientific publications; critical thinking helps to objectively analyse each proposal and scientific hypothesis, allows to “sift through” the ideas before bringing them into the open; creativity makes the results of joint work more unconventional and varied. Hence, continuous development of scientific communication within a non-government organisation affects positively the sustainability of the development of scientific environment and society.

6 Conclusion

Hence, organisation of teachers into a non-government organisation is an important means to develop a fundamentally new attitude to a teacher-researcher – for one thing, as to a subject of social and scientific system, for another – as to a main goal of the development. Systemic character of such an activity is a prerequisite for a sustainable development of the society. Participating in the work of the non-government organisation “Smart Math”, scientists get an opportunity to communicate internationally, to receive funding for their research work, to upgrade their skills. It also creates absolutely new networks of social and scientific relationships, which is proved by the number of international conferences, in which the members non-government “Smart Math” participated. A non-government organisation helps researchers to share internationally their scientific achievements; to put into practice promising findings; to establish international collaboration with scientific and educational institutions, organisations and associations through publishing materials on an open educational platform “Higher School Mathematics Teacher”.

The non-government organisation “Smart Math” plans to develop new on-line courses, to implement a project in promoting mathematical education, to engage foreign colleagues into participation in the Organisation.

References

[1] *Licensing Terms for Educational Services Provision* (2105), <https://zakon.rada.gov.ua/laws/show/1187-2015-%D0%BF#n12>

[2] *All-Ukrainian non-government organisation “Civic Council of Educators and Researchers of Ukraine” (CCERU)* (2021), <https://ring.org.ua/edr/uk/company/33551138>

[3] *Non-government organisation “Prostir” Foundation* (2022), https://snu.edu.ua/?page_id=161

[4] *EdEra – studiia onlain-osvity* (2022), <https://www.ed-era.com/courses/>

[5] *Non-government organisation “Kharkiv Mathematical Society”* (2013), <http://kms.univer.kharkov.ua/ustav.pdf>

[6] *Non-government organisation “Education of the XXI-th century”* (2022), <https://osvitaxxi.org.ua/>

[7] *AAUP: American Association of University Professors* (2022), <https://www.aaup.org/>

[8] *The National Education Association | NEA* (2022), <https://www.nea.org/>

[9] *American Association of State Colleges and Universities* (2022), <https://www.aascu.org>

[10] *Registry of non-government organisation* (2021), <https://rgo.minjust.gov.ua/>

[11] *Non-government organisation “Smart Math”* (2022), <http://formathematics.com/uk/pro-platformu/>

[12] *Open educational platform “Higher School Mathematics Teacher”* (2022), <http://formathematics.com/>

[13] *On-line course “Methods for Teaching Mathematics to Students in Technical Universities”* (2022), <http://formathematics.com/courses/imt/mnmtzvo>

[14] *On-line course “Project method in Teaching Higher Mathematics”* (2022), <http://formathematics.com/courses/imt/pmthm>

[15] *On-line course “Differential Equations”* (2022), <http://formathematics.com/courses/mathematics-courses/differential-equations/>

[16] *On-line course “Personal e-Learning Environment of the Maths Teacher”* (2022), <https://cutt.ly/9KVedt6>

[17] *On-line course “Creative Thinking Through Learning Elementary Maths”* (2022), <https://cutt.ly/XKVexKs>

[18] *On-line course “Operations Research Oriented to Cloud Computing in the System Co-Calc”* (2022), <http://formathematics.com/courses/mathematics-courses/operations-research-with-cocalc/>

[19] K.V. Vlasenko, S.V. Volkov, D.A. Kovalenko, I.V. Sitak, O.O. Chumak, A.A. Kostikov, *Web-based online course training higher school mathematics teachers*, in *Proceedings of the 7th Workshop on Cloud Technologies in Education (CTE 2019), Kryvyi Rih, Ukraine, December 20, 2019*, edited by A.E. Kiv, M.P. Shyshkina (CEUR-WS.org, 2019), Vol. 2643 of *CEUR Workshop Proceedings*, pp. 648–

- 661, <http://ceur-ws.org/Vol-2643/paper38.pdf>
- [20] K.V. Vlasenko, I.V. Lovianova, O.O. Chumak, I.V. Sitak, V.V. Achkan, *Journal of Physics: Conference Series* **1840**, 012007 (2020), <https://doi.org/10.1088/1742-6596/1840/1/012007>
- [21] K.V. Vlasenko, I.V. Lovianova, T.S. Armash, I.V. Sitak, D.A. Kovalenko, *Journal of Physics: Conference Series* **1946**, 012003 (2021), <https://doi.org/10.1088/1742-6596/1946/1/012003>
- [22] D.E. Volkova, The thesis for a candidate of Law Degree in the Specialty 12.00.02 – Constitutional Law, National University “Odessa Law Academy”, Odessa (2015), <https://nrat.ukrintei.ua/searchdoc/0415U002884/>
- [23] V. Kobzev, I. Kobzeva, in *Science And Education In A Transformation Period Of The Society* (Kyiv National University Of Technology And Design, Kyiv, 2017), pp. 18–19
- [24] I. Bezverkha, Ph.D. thesis, Kyiv National University of Technology and Design, Kyiv (2017)
- [25] N.F. McGinn, *International Journal of Educational Development* **14**, 289 (1994), [https://doi.org/10.1016/0738-0593\(94\)90042-6](https://doi.org/10.1016/0738-0593(94)90042-6)
- [26] B. Rowan, in *The New Institutionalism in Education*, edited by H. Meyer, B. Rowan (State University of New York Press, Albany, 2006), pp. 15–32, <https://cutt.ly/uKViUdV>
- [27] E. Lai, K. DiCerbo, P. Foltz, *Skills for Today: What We Know about Teaching and Assessing Collaboration* (Pearson, New Jersey, USA, 2017), <https://www.pearson.com/content/dam/one-dot-com/one-dot-com/global/Files/efficacy-and-research/skills-for-today/Collaboration-FullReport.pdf>
- [28] L. Nganga, *Journal of Social Studies Education Research* **10**, 26 (2019), <https://jsser.org/index.php/jsser/article/view/1262>
- [29] D.W. Happ, Ph.D. thesis, American International University, Springfield, MA, USA (2013), <https://www.proquest.com/openview/0253863c2340bf4090ab849e13e5094f/1?pq-origsite=gscholar&cbl=18750>