

Institutions of the Academy of Sciences as Centers for Science Popularization in Russia

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Abstract: Scientific knowledge is increasingly needed in more and more areas of life. Various industries, economics, and even politics cannot be truly effective without close interaction with science. This is especially important for planning and making long-term decisions. A person who lacks basic scientific knowledge cannot be involved in modern industries, but also loses the chance to make reasonable choices. Instead, he is extremely vulnerable to manipulations and thus cannot consciously influence his own life and the life of future generations. World level of scientific education remains extremely low, including developed countries. The modern society realizes this problem and there is a great demand on improving common scientific education and accessibility of reliable scientific information. However, the popularization of sciences not very effective today for a number of reasons. Using the Russian Academy of Science as an example, current article discusses these reasons with a special emphasis on the problems arising in the transmission of scientific knowledge. Then, the paper proposes a number of detailed algorithms for the popularization of science and raising the level of scientific education in society.

1. Introduction

Public understanding of science aspects is important in decision making for the evolution of mankind. For example, society has to make a choice on its further course direction. Would it be a more affordable public transportation, fully computerised surgery or NON-GMO dairy products? By reasoning their choices, people start to understand what politicians to vote for: for those who stand for cutting down fuel costs or for those, who lobby against the risks of medical equipment or vote for referendum to limit agricultural biotechnology [1].

In 1985 at the Royal Society Committee devoted to the problems of the public's poor understanding of science, Walter Bodmer linked the connection between the potential deceleration of the country's economic growth and reduction of staff positions in science and technology fields; in addition, incapacity of staff with poor science knowledge competently exert in development of scientific field.

As a result, the committee COPUS (Committee on the Public Understanding of Science) has been founded [2].

All facts, given above, point out the importance of public understanding of science as a major tool in rational collective decision making. At the age of rapid science progress, public literacy is foremost current. The issue is highly influenced by the following factors:

- Ability to solve science-technical problems, to achieve greater results in research performance, - all of that can only be possible by having sufficient numbers of educated specialists. Encouraging young people to choose professions, science-related, increases chances of positive growth in this particular field [3].
- Older generation's ability to adapt to a rapidly changing world.
- Continuing education of scientists in other science - related areas.
- Implementing solid correlation between relation to science and general knowledge of scientific facts [4].
- Public participation in open research, oriented towards science education and healthcare. An example could be a mobile game focusing on dementia research [5].
- Emerging amount of pseudoscientific information and scientists-impostors, as well as incompetent mass media representatives.

Recently, the image of classical science has been substituted by the image of Fan-Science, the line between scientific and anti-scientific knowledge has been blurred out; in pursuit of "wow-effect" the scientific component is neglected for the sake of entertainment [2]. Some of the famous talk show hosts and journalists, lacking any form of expertise, impose their subjective opinions on the public, pointing out what problems to focus on, what experts to be trusted or not. Moreover, the global network is overloaded with tons of information, so practically, every person can find "undeniable proof" of his point of view, no matter if it comes from a non-scientifically proven point of view.

The research by Frolov and Suvorov indicates that 40% of published texts do not have any proper references set up redirecting to the original sources [6]. Making it even more paradoxical considering the fact that science popularization in Russia is mainly focused on people who are already interested or even involved in science [7].

2. Specifics of Communication Between Scientists, Media and Public

A scientist is constantly immersed into his discovery process, analysis of scientific texts and his own research data. He has profound knowledge that, probably, can easily be shared with the public, but in reality, that is not always the case. The reasons might be a lack of time, energy, communication skills or inability to provide complex information in simple words. In 1997 American scientists and journalists Harts and Chapepell conducted research about the connection between science and journalism, resulting in the conclusion that scientists and journalists don't understand each other's language simply because they think differently. The authors made a big announcement that 'the gap between science and journalism is a threat to the future of America' [8]. Another research showed that representatives of liberal and social fields generally interact more frequently with mass media rather than representatives of the Science and Technology field [9]. Nevertheless, some science individuals, in contrast, have become more motivated to interact with journalists [10]. The held research indicates that scientists mostly choose communication methods oriented towards defending science against disinformation and educating the public [11].

An important connecting link in communication between scientists and journalists is press representation of the department where a scientist works. This could provide an effective communication between researchers and the press. This collaboration provides an image of the science and research department, increasing scientists' recognition, and also advancement of

researching itself that leads to future financing of studied topics. These facts popularise science by bringing attention to organisations and individuals. The writers of the article in the given research of media activity of Siberian branch of the Russian Academy of Sciences revealed a positive correlation between the numbers of mass media publications and a presence of press-departments in science institutes [12].

The Russian Academy consists of about 400 institutes. In the research of Kosyakov, Yudin, Vahrameev the point is being made that only a few institutions have their own PR services. A positive drift in media activity can be already spotted. Unfortunately, the actual presence of press services does not guarantee its effectiveness. The content analysis brought out the absence of hyperlinks to organisations sites and personal web profiles of the researchers in most of the cases. But there has been a positive point. In comparison to 2016, in 2018 a link to a source did exist in the majority of published texts [13].

Press services' ineffectiveness and poor popularization of science in general brought some attention to the problem. In 2018 there was a meeting between representatives of science popularization and the president of the Russian Academy of Sciences. Faint educational activity was detected among members of the Academy, so it was decided to emerge it into official duties of the members [14]. Similar suggestion was made in the works of Hans Peters, where the author considered that a collaboration between the mass media and a scientist has to become a relevant concept in modern society [15].

In 2018 The Ministry of Economic Development of the Russian Federation together with the Ministry of Education and Science of the Russian Federation and a few other ministries, developed the program of popularization of scientific, science and technology and innovative activities that comes to operation within 2019 - 2024. In 2019 the Committee of the Russian Academy of Sciences has started its work for popularisation of science. The main goal of this committee is to spread scientific knowledge, increasing the ratings of science and achievements in science and technology [16].

Such programs focus on developing scientific journalism, quality analysis of separate communicators and press services, reports, such as, "Annual project research "Communicative Laboratory" [17]. Awards are also given in the science popularization field [18, 19, 20].

3. Potential Development Options in Communicative Strategy for Its Successful Implementation on the Example of the Russian Academy of Sciences

3.1. Foundation for Science Communication Centre

An effective algorithm of intercommunion among scientists, journalists and the public requires a profound and detailed elaboration of such a comprehensive issue from all the angles of scientific knowledge. In May 2012 the colloquium "The science of science communication" organized by Arthur M. Sakler calls on to unite the scientists of different scientific fields to work out the most effective and scientifically proved methods of communication. This event inspired Baruch Fischhoff to polish up the communicative sciences and their role in development of such programs, and also pick out the key specialists to solve those tasks [1].

The proposed list of key specialists is in line with our vision for the program development of communication between scientists and the public.

Thereby, here is the highlighted list of the specialists:

- An analysts, who will determine the basic knowledge level that modern society should possess for rational decision making; already obtained knowledge, and tracking of the dynamics, risks' prediction;
- Communication Specialists to establish trustworthy communicative channels;

- Researchers in the field of social and behavioral sciences, whose duties would include correction of existing communicative programs, evaluation of their effectiveness, analysis of the degree of public allegiance towards gaining new knowledge;
- Reduction of physical and emotional load on a scientist and ensuring high-quality methodical approach towards lecture preparation;
- Tracking the effectiveness of communicative events;
- Defined response in case if problem rises during knowledge distribution.

3.2. Development of Specialised Courses and Programs for Raising a Level of Skills in Science Communication

An individual plays an important role in science popularization. For the majority of people, a scientist is an embodiment of science, thus an approach to science can be influenced by the impression that scientist evokes and his ability to communicate with his audience. A scientist, that achieved many results, can be a great example of a pleasing image of Science itself - as one of the most interesting types of vocation. He is capable of breaking down a specific event providing his audience with facts based on scientific knowledge in an accessible manner [21].

To provide high-quality communicative interaction between scientists and the public - one of the main objectives that could be achieved is implementing valuable skills by scientists. For this purpose, a number of courses could be developed:

- A course for undergraduate students of the Academy of Sciences and its institutes might be offered. Some world known universities provide a program, after which completion, a student receives two diplomas: one in natural science and another one in journalism [22].
- For postgraduates a course of science communication should be mandatory, following up with the exam.
- For young scientists, and also interested ones in developing effective methods of public speaking, this course could be offered as a part of continuing education.
- All interested individuals can regularly continue working on skills, attend master classes of famous journalists, public speakers and teachers of public speaking. For example, in Great Britain some science figures practice internships in media, where they learn from journalists how to write about science in an approachable and engaging way [23]. In present, in Russia there is a professional training program for young science popularizers "Innovative Studios", founded by Rosnano Foundation [3].

Gathering a successful conversation between scientists and the public, raising a level of science education, critical thinking in natural science is obviously a great benefit, especially when implemented after a long time after graduation. Such practice can be witnessed on the examples of The Next Generation Science Standards (NGSS) in USA [24] or KMK in Germany [25]

3.3. Definition of the Problem During Science Knowledge Transmission for Its Successful Solution

- For a scientist, it's not only important to speak to but also to listen to his audience, to understand the problems, to demonstrate his own involvement in solving them from a scientific point of view. All this helps to build trust between him and his audience.
- A scientist can't rely on his audience to figure out new parallels based on given statistics. Most of the time it leads to erroneous results.
- Popularization of science knowledge has to be selective, choosing only scientific facts that absolutely everyone needs to know.[1]

- During the question-answer series it's encouraged to allow the audience to ask questions online anonymously. Some people shy away from public speaking.
- After a lecture an anonymous test can be held with the following analysis. This way the lecturer can clarify some questions and thus, navigate himself better in planning the future events keeping those points in mind.

The advice to enhance the communication skills is frequently met in literature [26,27,28].

3.4. Providing Internet Activity

Scientometric research shows that the citation index of Russian scientists is lower than the average in the world. This relates to low integration rate between Russian and international science, and also to ineffective results of scientific research activity in global network [29].

- Registration of scientists in scientific social sites such as ResearchGate.

Based on the research, 9 out of 10 outstanding Russian scientists do not have an English version of their website page. In addition, there are no reference links to full texts of their own work [29].

- Research mainstreaming on institutions' sites, building of laboratories' personal pages and employees' profiles via CRIS-system.

In fact, more than half of outstanding Russian scientists - members of the Russian Academy of Sciences, don't own personal websites. This problem can be a part of technical difficulties that a scientist can face and lack of skills in this field [29].

Press services need to pay close attention to this problem. For regular information outflow in laboratory websites or personal profiles of employees, it's advised to select an employee among young scientists, post-graduates or students who will be given the duties of monitoring site updates or passing updated information to press services. These duties have to be awarded though. For example, salary bonus for internet activity.

- Invention and support of aggregators of scientific information.

Aggregators of science news is a relatively new wave of science popularization, rapidly gaining its popularity. Such platforms are created to display and successfully push information of scientific news and press-releases in mass media. Among the biggest international aggregators there is EurekAlert!2 founded in 1996 (under the management of American Association for the Advancement Of Science(AAAS)) and AlphasGalileo (founded in 1998 under initiation of State Foundation of Great Britain "Particle Physics and Astronomy Research Council" (PPARC) and British Association for the Advancement of Science (BAAS)). Out of Russian aggregators we can spotlight "Open Science", a working tool among many science communicators and journalists. Since 2018 it's being managed by the Association Of Communicators in sphere of Education & Science (ACSON)[30]

I'd like to point out relevant, constantly updated list of upcoming events on the main site of the Academy that includes information of all branches, e.g. "Interactive Calendar of Events".

3.5. Effectiveness Improving Events

- Organisation of weekly journalism clubs within institutes. Such activities can increase collaboration rates.
- Regular press services updates on upcoming articles.

The content of release, as any interview, has to be run by the author before publication. Recently, it was brought out that Mass Media shows growing interest in news about published scientific articles. The average number of re-publishing of such articles is clearly higher [13].

- "Open Doors" event for press representatives to introduce them to new aspects of culture in the science world.

- Live reports from laboratories for citizens who can't be present in person or due to safety protocol that doesn't allow people in the laboratory.

Such live shows could bring science closer to common people. To implement this idea, The Academy could create an online channel with live shows from different laboratories. Moreover, such a project could have an educational purpose. Students and postgraduates doing their DNA routine, e.g., could comment on their actions while demonstrating chemical agents and explaining the purpose of each and one of them.

4. Conclusion

A level of basic scientific education will greatly influence a course of individual life, different industries, economics, politics and humanity in general. The urgent need for science popularization is generally recognized by common people, in social science and politicians. The low effectiveness of current programs for science popularization accompanied by the abundance of pseudoscientific information is likely to result from a poor communication between society and a real scientist. It could be partly explained by the peculiarities of a scientist personality, which is obviously cannot be changed. What we can change are the methods for such communication. An effective method is proposed to be developed by bring together scientists from different fields of knowledge, including social, behavioral and educational areas, in a specific communication center. The collaboration should result both in developing scientifically based communication programs and preparation of the new specialists in this area. Under and postgraduate students, young scientist and other people can be trained in scientific journalism which is the main and such a needful mediator between science and society. On the other hand, it's important to motivate scientists for communication, for instance, through the internet activities, and develop a measurable criterion for its effectiveness. Summarizing, such a complex goal as a radical improvement in basic scientific knowledge, its accessibility and visibility, we expect to achieve by intense interdisciplinary collaboration, specially focused on the main aspects of science popularization. Bringing together such a number of a specialist from various aeras is not a simple mission that obviously needs a governmental support.

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