Public understanding of and participation in ethical events relating to science and technology: Comparing China with other countries

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Abstract
With the rapid development of science and technology (S&T), which has a profound impact on human society and the environment, the tension between S&T and ethics has attracted increasing attention. Ethical events occur from time to time in S&T domains, and related issues have aroused heated discussion. In China, the participants in S&T ethical events are mainly professionals in their respective fields. By comparing China with other countries, we can see that public understanding of and participation in S&T ethical events in China still need to be strengthened. This can be accomplished from two perspectives: the promotion of ethical consciousness and the popularization of science.

Keywords
Public understanding of science, science and technology ethics, scientific quality

Since ancient times, the issue of ethics has always played a part in the development of science and technology (S&T), though to varying degrees. For example, the Hippocratic Oath in ancient Greece set out the ethical guidelines for medical practitioners in the West; and Chinese medical books – such as Shang Han Za Bing Lun (Treatise on Cold Pathogenic and Miscellaneous Diseases) and Qian Jin Yao Fang (Essential Prescriptions Worth a Thousand Pieces of Gold) – also discussed ethics. Those views about ethics apply primarily to S&T workers to ensure that their professional behaviours are consistent with people’s ethical expectations.

Rapid advances in S&T have caused wide-ranging, drastic and far-reaching impacts on society and changed the course of social progress. Today, the impact of S&T has deeply penetrated into all aspects of people’s lives. The exploration and application of S&T have touched the bottom line of people’s understanding of their nature as well as their rights and resulted in a conflict of values at the ethical level.

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For example, the ‘genetically edited baby’ and ‘human–monkey chimera’ incidents in recent years caused great controversies in S&T ethics and triggered widespread interest and discussion in the scientific community and even in wider society.

The public is no longer passively affected by issues related to S&T ethics but also takes an active interest in and offers opinions on those issues. Some people are even participants in S&T ethical events. Therefore, the public’s understanding of and participation in S&T ethical events has also become an important factor that must be weighed in the governance of S&T ethics.

1. Source data: Scientific literacy survey

According to the Report of the Scientific Literacy of Chinese Citizens (4th edition) (Zhang et al., 2018), more than half of Chinese citizens are concerned about public S&T affairs, but their participation in those affairs is still limited. The statistics show that 54.1% of citizens often, sometimes or seldom ‘read articles about science in newspapers, books, or on the internet’, while 41.0% do not; 62.8% of citizens often, sometimes or seldom ‘discuss science and technology with relatives, friends, or both’ and 33.7% have never discussed this topic. Only 15.6% of citizens often, sometimes or seldom ‘participate in activities about atomic energy, biotechnology or the environment’, while more than 70% of citizens have never participated and another 12.8% do not know whether they have participated. Concerning ethical issues related to S&T, such as climate change, nuclear energy and genetic modification, Chinese citizens are now more willing to participate, but still lack concrete actions (Zhao and Liao, 2017).

Surveys show that people in developed countries are more sensitive to issues concerning scientific ethics and also have a stronger awareness of participation, but they also do not have sufficient motivation to actually participate. For example, according to the results of the Public Attitudes to Science 2011 survey in the UK (Ipsos MORI Social Research Institute, 2011), 82% of respondents agreed that ‘science is such a big part of our lives that we should all take an interest’ and 68% thought that ‘it is important to know about science in our daily lives’. To the question ‘How well informed do you feel, if at all, about science and scientific research’, 44% of respondents answered ‘very well informed’ or ‘fairly well informed’, 44% chose ‘not very well informed’ and 13% answered ‘not at all informed’. These survey data suggest that the UK has achieved better results than China in terms of science communication and public understanding of science. On issues related to S&T ethics, such as ‘Scientists seem to be trying new things without stopping to think about the consequences’, 33% of respondents chose ‘agree’, 7% said they ‘strongly agree’, 26% said they ‘disagree’ and 4% chose ‘strongly disagree’. This shows the sensitivity of the British public to the issue of S&T ethics. However, following up on this question, 69% of respondents said they ‘trust scientists all the same’, 14% said they ‘trust scientists a little more’, 4% said they ‘trust scientists much more’ and only 10% said they ‘trust scientists less’. This shows that, despite their trust in scientists, the British public is still reflecting on scientific work.

Public participation is an important indicator in the survey of public attitudes towards science in the UK. To the statement ‘The government should act in accordance with public concerns about science and technology’, 18% of respondents chose ‘strongly agree’, 55% chose ‘agree’ and 16% chose ‘neither/nor’. As for the benefits of public participation in science, the top four answers were that public participation ‘enables the public to make informed decisions about their lives’, ‘enables the public to judge scientific issues for themselves’, ‘enables better decision-making’ and ‘promotes interest in/understanding of science’. Of course, there are also some problems with the British public’s participation in scientific issues. For example, 50% of respondents chose ‘I hope the public could participate in scientific issues, but not myself’; and most of the respondents thought that public opinion does not have much influence on the government’s S&T decisions.

2. The subjectivity of public participation

By comparing the similarities and differences between citizens in China and other countries on
issues related to S&T ethics, we can gauge the subjectivity of the Chinese public’s participation in such issues and, on that basis, locate problems concerning that subjectivity.

2.1. Public participation: A dimension of S&T ethics that needs to be strengthened in China

Public participation has a significant impact on the construction of scientific culture. The value preferences, actual needs and consumption trends of the public can have a considerable impact on the development of S&T and the prosperity of the S&T industry. The public’s opinions and preferences may influence the attitudes and decisions of policymakers, business managers and even the scientific community.

Similarly, public opinion is an important influencing factor for decision-makers and executors of S&T ethics. Public opinion plays an important role in the construction of ethical principles of S&T, and public understanding and support are also needed in the implementation of S&T ethics (Yin and Liu, 2017). Therefore, public participation is an important part of S&T ethics. However, there is still a lack of such participation in China.

First, the scientific literacy of the public is still a bottleneck for their participation in S&T ethics (He et al., 2018). Over many years, the Chinese Association for Science and Technology (CAST) has conducted several surveys on public scientific literacy in China using internationally accepted indicators and methods. The results show that, in terms of the three indicators (‘basic understanding of scientific knowledge’, ‘basic understanding of scientific research processes and methods’ and ‘basic understanding of the impact of S&T on society and individuals’), the scientific literacy of the Chinese public is gradually improving. However, it is still relatively low compared with scientific literacy in developed countries, and there are notable differences among genders, age groups, educational backgrounds, occupations, urban and rural areas and levels of regional economic development. According to the results of the 10th sample survey on the scientific literacy of Chinese citizens in 2018, the proportion of the population that was scientifically literate had reached 8.47% (an increase of 2.27% points from 6.20% in the ninth survey in 2015) and in some regions the proportion exceeded 10%. However, the overall level of public scientific literacy is still low. This makes it difficult for the public to truly understand issues related to S&T ethics and cannot provide a positive social environment for the construction and implementation of S&T ethics.

Second, the public’s participation in the construction and implementation of S&T ethics is low (Ren et al., 2019). Members of the public are not fully involved in discussions on S&T ethics, do not have knowledge of related issues and lack influence in the discussions. Issues concerning S&T ethics involve all aspects of society. They are simply too important to be left entirely to a small number of professionals. However, due to the public’s limited awareness and participation, the power to make decisions regarding S&T ethics has naturally fallen into the hands of a few elite practitioners. For example, most of the public declarations on the ethics of artificial intelligence have been promoted by technology companies and, although a few elite people have deep knowledge of the theories and issues concerning S&T ethics, it is almost impossible to avoid conflicts of interest. The public should be more capable and more widely involved in the discussion of issues related to S&T ethics, and there is much room for improvement in the existing context.

2.2. Differences in terms of governance

In addition to the need for improvement in public awareness of and participation in S&T ethics, another problem in the practice of S&T ethics concerns the supervision and review of such practices. There are differences between China and other countries in the authorities that conduct supervision and reviews.

In some countries, the supervision and review of S&T ethics are conducted by mature third-party institutions. For example, in Australia, the Australian Research Council and the National Health and Medical Research Council have both prepared a formatted funding agreement for research projects
under their funding programmes, which serves as the basis for the reasonable management of the participating organizations. The agreements all include clear provisions on the ethical norms to be followed by the organizations. In Canada, the three major science funders (the Natural Sciences and Engineering Research Council of Canada, the Canadian Institutes of Health Research and the Social Sciences and Humanities Research Council) jointly monitor S&T ethics in research projects and share necessary information while dealing with relevant violations. If the funding agencies find that such violations are occurring, they can request the funded organizations to implement corrective measures.

In China, however, there is a lack of third-party certification mechanisms (An, 2019). According to the Certification and Accreditation Regulations of the People’s Republic of China, ‘certification refers to the qualification review conducted by the certification agency to prove that the product, service and management system conform to the relevant technical rules and the mandatory requirements or standards under the technical rules’. The government leverages third-party agencies to meet growing regulatory demands and achieve the goals of supervision and review. Improving the ethics committee system requires the engagement of diversified systems. In addition to supervision by government departments and self-regulation by academic communities, an objective and independent third-party evaluation system is also indispensable.

Professional consultation and assessment conducted by agencies independent from government departments and academic institutions on issues related to S&T ethics can play a key role in promoting information disclosure, avoiding conflicts of interest and lowering regulatory costs. In recent years, although the review of S&T ethics has gradually improved in China, the lack of a third-party certification mechanism has impeded the construction of an effective system of S&T ethics. Some institutions have to seek ethical review services from foreign certification organizations such as AAHRPP (Association for the Accreditation of Human Research Protection Programs), CAP (College of American Pathologists) and SIDCER (Strategic Initiative for Developing Capacity in Ethical Review). If this continues, the establishment of a localized certification system based on an ethics committee that fits China’s actual situation will be delayed. Moreover, relying on foreign organizations to provide certification labels for the construction of S&T ethics in China also entails risks in terms of law and public opinion.

Therefore, promoting third-party participation is an issue calling for attention in the construction of China’s S&T ethics system. It is necessary to encourage the in-depth participation of non-government actors in building the system.

3. Analysis: What makes public participation possible?

Through international comparative analysis, it can be shown that the possibility of public participation in China on issues concerning S&T ethics may be weakened by the lower level of scientific literacy of the population, the surrounding environment and the progress of technology.

3.1. The public: Strengthening the foundation for public participation in S&T ethics

Professionals’ knowledge of S&T ethics needs to be converted by science popularization workers into popular content for communication. The public’s lack of knowledge about S&T ethics is an important factor that makes real public participation difficult to achieve. In the social sphere, it is necessary to disseminate knowledge of S&T ethics to the public through multiple ways so as to bring the attention of society to the ethical issues related to S&T. In the case of major ethical events, communication through media, professionals and commercially run social media is not enough. Members of the public also need to be able to express their views about the issues and offer their opinions in a more timely, quantitative and intuitive manner. The opinions of professionals must be combined with the views of the public to inspire lively and professional discussions, promote healthy public participation in S&T ethics and improve the construction of an S&T ethics system and its supervision (Gao and Guo, 2020).
3.2. Academia: Strengthening education on S&T ethics and accepting public participation

The academic community itself should strengthen its knowledge of S&T ethics. It is necessary to strengthen the awareness of S&T ethics within the academic community and to popularize and deepen the education of S&T ethics in universities and research institutions. According to a survey published by CAST in 2020 on S&T workers’ attitudes towards and evaluation of academic integrity, 29.0% of respondents said they had little or practically no knowledge about academic norms such as research ethics and academic integrity. This shows that ethical awareness among S&T workers is yet to be strengthened.

The willingness of scientific researchers to reflect on their work should also be encouraged to promote their acceptance of public participation. Their reflections on the risks of S&T and the responsibilities of scientists can both increase their support for public participation in science (Lu and Zhao, 2020). Reflective scientists are more likely to support the ‘retrospective’ public participation advocated by responsible research and innovation. Therefore, acceptance of public participation is more likely to occur when scientific researchers are reinforced in their awareness of the risks of S&T and their responsibilities as scientists.

3.3. Government: Strengthening supervision and the timeliness of constructing an S&T ethics system

Innovation in S&T is an important driving force for social progress. The Chinese Government encourages innovation to promote the development of S&T. However, a precautionary approach is also needed in this process, such as being mindful of possible ethical issues and paying attention to the importance of supervision mechanisms. China’s efforts in this area remain lacking. For example, the survey published by CAST in 2020 shows that the proportion of Chinese S&T workers who do not approve of the effectiveness of the supervision mechanism of academic integrity is still quite high (21.1%), and many S&T workers (42.9%) believe that the measures taken in response to ethical misconduct in scientific research (such as the genetic editing of human embryos) are not strong enough.

The construction of a regulatory system for S&T ethics is an ongoing process and involves many aspects of society. No individual department or institution can do it alone, and the whole of society must get involved. Discussions of the issues need the participation of the public, and the supervision and review of S&T ethics also need the participation of public institutions.

The regulatory system for S&T ethics is time sensitive (Zhang, 2019). With the progress of S&T, the relationship between human beings and S&T has become closer and more delicate, posing new challenges for the management and supervision of S&T (Liu, 2019). For example, with the development of genetic engineering technology, its influence has been extended to plants, animals and even human beings, and the old regulatory mechanism for S&T ethics might not be able to govern those new problems. Moreover, the advance of artificial intelligence technology has also caused ethical controversies in certain applications. The discovery and discussion of such new issues inevitably require the participation of the public.

The participation of the public is increasingly vital when there are more and more new communication channels. With the rise of online media and social media, awareness of S&T ethics, which used to be ‘monopolized’ by the intellectual elite, has grown into a public awareness shared by diverse groups. To be successful in the popularization and dissemination of S&T ethics, the power of social media should never be underestimated (Xu et al., 2017).

4. Conclusion

Compared to other factors, the public’s knowledge of S&T ethics is a prerequisite for its interest and participation in S&T ethical issues. The public’s awareness of S&T ethics can be strengthened mainly through education, publicity and public opinion guidance. To promote S&T ethics in society, a bottom-up approach is needed to establish a systematic
framework of publicity and education. In the meantime, given the features of public information communication, it is also necessary to make effective use of public channels to seek better communication results. The dissemination of S&T ethics should be done along the following lines.

4.1. Promoting education and raising awareness

First, we should build an official discourse system for S&T ethics. For example, we could establish the basic principles of S&T ethics, clearly convey our position and voice to the public in a concise, widely understood and accepted way, and inform the public about the issues and knowledge of S&T ethics with a clear and firm articulation of our position using popular means of communication. In addition, we should strengthen the development and implementation of relevant policies, plans and on-the-ground systems. The introduction and effective implementation of the regulatory system for S&T ethics will be accompanied by the official interpretation of the relevant regulations and policies and the public’s reading of the policies. Thus, a comprehensive and responsive governance system for S&T ethics could be established. In this sense, making and implementing sound policies and measures serves the purpose of public education.

Second, as General Secretary Xi Jinping has pointed out, S&T innovation and science popularization are the two wings of innovative development. Science popularization should be given the same importance as S&T innovation. Science communicators should strengthen their ethical awareness and follow relevant ethical guidelines when communicating science to the public, so that S&T ethics and science popularization ethics can be turned into day-to-day norms that are willingly accepted and followed by people.

4.2. Keeping up with the times in science popularization

With the rapid progress of S&T, the form of human society and the way it functions are going through rapid changes. The channels, content and means of information communication, as well as people’s choice of information, have also changed. Therefore, it is necessary to promote the dissemination of scientific knowledge and scientific culture in a way that keeps pace with the times.

In addition to stepping up official publicity and adding the content of S&T ethics in museums, science centres and other educational facilities when conducting science education, it is also important to fully motivate the people and encourage them to engage in further discussions on issues related to S&T ethics, thus increasing the public’s interest and participation in and understanding of the relevant issues. We should promote the development of the science popularization industry (Ren et al., 2011) and harness the power of education to encourage the expression of opinions and actions by the public, so that people can understand S&T better and know more about S&T ethics while willingly participating in discussions and better contributing to the relevant issues.

4.3. Building platforms for public participation and promoting positive interactions

We should build channels and platforms for public participation in the issues of S&T ethics, improve the participation system and form a virtuous cycle of knowledge and action in the participation process. For example, we could use the China Science Communication portal launched by CAST and other platforms to create venues for public discussion about S&T ethical events and enable the full expression of public views in a quantitative and intuitive form. Moreover, we should encourage direct and healthy interactions between S&T workers and the public to promote the public’s understanding of and participation in the development of S&T ethics while explaining and spreading knowledge to the public.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.
Funding
The authors received no financial support for the research, authorship, and/or publication of this article.

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