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Recommendations for Enhancing Algorithm Recommendation Technology to Improve the Precision of Science Popularization

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Abstract: Algorithm-based recommendations for precision science communication aim to address the challenge of accurately, swiftly, and efficiently extracting science information, categorizing it, and delivering targeted content in the information-saturated digital age. Intelligent algorithms rely on massive datasets for information mining, integration, and distribution. By analyzing users' information reception patterns, they enable precise, efficient, and rapid personalized recommendations. The powerful computational capabilities and information dissemination speed of big data algorithms have triggered a "technological tsunami" gradually emerging as a new variable in science popularization for grassroots communities. The era of artificial intelligence centered on big data algorithms has arrived. China's science popularization initiatives have flourished, continuously building and establishing a modern science museum system. This system, anchored by physical science museums and supported by mobile science museums, science outreach vans, and digital science museums, has become a project that benefits the people. Public science popularization services have become more balanced and effective.

Keywords: Algorithm-based Recommendations, Rural Areas, Science Popularization.

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1 PROPOSING THE PROBLEM

In this era of information explosion, science communication faces a core dilemma of "mismatched supply and demand," manifested in three key challenges. The application of algorithmic recommendation technology directly addresses these issues. First, science information online exhibits characteristics of "massive volume and fragmentation," spanning fields like healthcare, agricultural technology, scientific theories, and cultural knowledge. However, the quality of this information varies widely, and its presentation is often disorganized. Ordinary citizens, particularly those in rural areas, struggle to quickly filter relevant content from this overwhelming volume, resulting in inefficient dissemination and the drowning of valuable resources in the information flood. [1] Second, traditional science communication often relies on a "one-size-fits-all" approach—such as standardized offline lectures or generic pamphlets—ignoring the diverse needs of different groups. Rural residents may prioritize agricultural cultivation techniques or rural pension policies, while urban youth show greater interest in cutting-edge technologies and space exploration. This one-size-fits-all approach fails to precisely match individual needs, diminishing the appeal of science content and hindering its integration into daily life across diverse communities. Third, rural and remote areas suffer from pronounced "information islands" due to geographical constraints and inadequate information infrastructure. On one hand, high-quality science resources struggle to penetrate regional boundaries and reach grassroots communities. On the other, science content targeting rural populations—especially ethnic minority groups—often faces language barriers and rigid expressions. For instance, content promoting a shared sense of community among the Chinese nation frequently fails to resonate due to its "preachy" tone, further exacerbating the challenge of reaching grassroots audiences.

2 THE SIGNIFICANT VALUE OF ALGORITHM RECOMMENDATION TECHNOLOGY IN SCIENCE POPULARIZATION

The technological logic of algorithmic recommendation in science popularization relies on analyzing vast user data to accurately identify potential issues faced by target audiences. It proactively anticipates user needs, infers search intent and

interests, and delivers tailored science content—thus injecting new vitality into the field's development.

2.1 Enabling Precise Science Communication to Bridge the "Last Mile"

Rural areas have long faced challenges in disseminating science popularization resources due to their dispersed geographical distribution, uneven development of information infrastructure, and diverse population structures. These factors have led to difficulties in reaching underserved communities, weak alignment between supply and demand, and low dissemination efficiency. The “last-mile” bottleneck has become the core obstacle hindering the development of science popularization in rural areas. [2] Algorithm-based recommendation technology, leveraging data-driven precision and technological flexibility, offers a novel solution to this challenge. Rural areas can harness algorithmic recommendation to break down information silos and regional barriers, reaching deeper into communities. By using data to precisely identify individual needs, anchoring these needs to relevant science content, and creatively adapting to modern societal demands, rural regions can utilize cloud servers and immersive digital spaces to identify gaps in science outreach. and efficiently deliver targeted content on healthcare, agriculture, technology, and culture. This approach precisely guides residents in deepening their understanding of modern theories, making science more accessible and engaging. Consequently, science education becomes integrated into daily life, bridging the “last mile” gap and providing robust support for the flourishing development of science outreach in rural areas.

In breaking down information barriers, algorithmic recommendation technology has fundamentally transformed the traditional “one-way output” model of science popularization. Rural areas, historically constrained by transportation and media access, saw high-quality science resources concentrated in cities or core regions, creating distinct “information silos” Farmers struggled to quickly access cutting-edge pest control techniques, elderly villagers had limited understanding of pension insurance and medical reimbursement policies, and women lacked scientific knowledge on childcare and health care. Algorithmic recommendation integrates vast amounts of science popularization data stored in cloud servers and combines it with visualization technologies like panoramic digital spaces. This enables the transcendence of geographical boundaries such as mountains and villages, transforming scattered science resources into instantly accessible digital content. For instance, villagers in remote mountainous areas can now receive agricultural planting tutorials recorded by experts and common disease prevention guides interpreted by clinic doctors—all via smartphone. This eliminates the constraints of physical lecture venues and schedules, truly achieving “on-demand access to science resources.” In practical terms, algorithmic recommendation technology injects sustained momentum into rural science outreach. Grassroots science communicators can leverage algorithm-driven data to clearly identify popular topics and underserved areas within their jurisdictions, enabling more efficient resource allocation and program implementation. This technology-enabled precision outreach effectively bridges the “last mile” gap in delivering science resources to rural communities. It empowers scientific knowledge to become a vital force in boosting rural industries, enhancing villagers' quality of life, and driving rural revitalization, laying a solid foundation for the flourishing development of science communication in rural areas.

2.2 Diversifying Science Communication Channels to Strengthen the Sense of Community for the Chinese Nation

Science popularization efforts to forge a strong sense of community for the Chinese nation require not only conveying profound theoretical concepts but also building bridges of shared understanding across ethnic groups. Traditional science popularization models, however, are constrained by offline settings, single-channel delivery, and homogeneous content. [3] They struggle to overcome geographical, linguistic, and cultural barriers, often resulting in limited reach, low acceptance rates, and weak influence. Algorithm-based recommendation technology, leveraging personalized dissemination logic and digital platform advantages, has not only significantly expanded science communication channels but also transformed the transmission of the Chinese national community consciousness from one-way indoctrination to two-way integration, injecting fresh energy into the interaction, exchange, and integration among ethnic groups.

In terms of channel innovation, algorithmic recommendations have broken free from traditional science communication's reliance on single formats like offline lectures and printed materials, constructing a digital dissemination matrix characterized by “multiple platforms, all-scenario coverage, and broad reach.” Under traditional models, science popularization for fostering the Chinese national community consciousness was largely confined to fixed settings like school classrooms and community lectures, with content primarily consisting of theoretical articles and policy interpretations. This made it difficult to reach groups such as ethnic minorities in remote areas and migrant workers. Algorithmic recommendations, however, leverage diverse digital platforms like smartphones, short-video platforms, and social apps to achieve “seamless penetration” of science popularization channels. From a practical perspective, algorithmic recommendations have become a vital technological bridge for strengthening the sense of community for the Chinese nation. Not only does it broaden outreach through channel innovation, but it also transforms content into precise, engaging, and emotionally resonant formats, ensuring the theoretical essence of community

consciousness truly takes root in people's hearts. This represents both an inevitable choice in the information age and a key measure to enhance the effectiveness of ethnic work. As algorithmic technology continues to evolve, it will further dismantle information barriers and cultural divides between ethnic groups. This will enable the consciousness of the Chinese national community to be continuously transmitted and deepened within the digital space, providing a solid ideological foundation and communication support for all ethnic groups to unite as tightly as pomegranate seeds.

2.3 Precision in Science Popularization Efforts Advances Modern Civilization in Rural Areas

Science popularization comprehensively supports the rural revitalization initiative. Rural areas leverage platforms such as science museums, museums, agricultural science and technology industrial parks, rural centers for new era civilization practice (institutes and stations), science popularization demonstration bases, and science courtyards to accelerate agricultural and rural modernization through lectures, science outreach activities, technical training, and guidance.

Science popularization serves as both a vital force driving social prosperity in rural regions and an invaluable asset for fostering modern civilized living locally. On one hand, by disseminating scientific knowledge, promoting the scientific spirit, and enhancing public scientific literacy, it significantly propels social progress and holistic human development. This is particularly crucial given the lagging development of modern civilization in rural areas. Science popularization enables rural communities to gain deeper insights into modern scientific knowledge, embrace atheistic thinking, and adopt advanced production and lifestyle practices, thereby improving quality of life and social engagement.[4] On the other hand, it provides developmental opportunities to advance rural modernization and holistic human development. By disseminating scientific knowledge, science popularization elevates the technological literacy and innovation capabilities of all ethnic groups in rural areas, offering more and better development opportunities. This plays a vital supporting role in enhancing mutual understanding and trust among ethnic groups and promoting harmony and stability in rural regions. For instance, initiatives such as bringing science education to schools and communities, conducting ethnic unity education activities, and promoting the fine traditional culture of the Chinese nation bring scientific knowledge closer to people's daily lives. These efforts enhance the scientific literacy of rural grassroots communities, cultivate a scientific spirit, and help people consciously resist the infiltration and influence of religious extremist ideologies.

3 Challenges in Achieving Precision in Science Popularization through Algorithm Recommendation Technology

While algorithmic recommendation technology offers significant advantages for science popularization, its practical implementation faces multiple risks and challenges due to technical characteristics and regulatory mechanisms, hindering the effective realization of its value.

3.1 Distorted Focus: Shifting Objectives Under Algorithm Dominance

In the information age, algorithmic recommendation technology has become deeply integrated into the entire process of science popularization work, leveraging its efficient user profiling capabilities and precise content distribution. Its original intent was to break down barriers between science supply and demand through technological empowerment, enabling scientific knowledge to reach the public more effectively. However, under the dominant influence of algorithms, the core objectives of science communication activities have gradually deviated from their essential purpose of disseminating scientific knowledge and enhancing public scientific literacy. Instead, they have fallen into the utilitarian trap of “traffic supremacy and interest prioritization,” posing significant challenges to the healthy development of science communication.

The core logic of algorithmic recommendation is "maximizing user interest. " Without effective guidance, this can easily lead science communication into the trap of "traffic supremacy. " Some science communicators, seeking to cater to algorithmic preferences and boost visibility, may deliberately oversimplify scientific knowledge, exaggerate content effects, or even disseminate one-sided, sensationalized information—neglecting the fundamental scientific rigor and accuracy of science communication. [5] This phenomenon of "algorithms hijacking content" shifts the focus from "disseminating scientific knowledge" to "chasing traffic metrics," undermining the credibility of science communication.

In a market-driven environment, most science communication platforms rely on advertising and traffic revenue sharing to generate profits, with traffic directly linked to earnings. Algorithms cannot effectively discern the scientific accuracy or authority of content, instead promoting material based solely on viral popularity. This allows erroneous science content produced by non-experts to proliferate. Content creators — particularly self-media accounts and commercial entities—inevitably prioritize catering to algorithms' traffic logic to meet profit targets.

Compared to rigorous science content that demands significant time and effort, entertaining and sensationalized content boasts shorter production cycles and stronger dissemination effects, delivering quick returns. This utilitarian focus on cost and benefit shifts content production from pursuing quality to pursuing efficiency, directly driving a deviation from the core objectives of science communication.

3.2 Group Divisions: Algorithm-Driven Echo Chambers Exacerbate Cognitive Polarization

By continuously pushing content aligned with user interests, algorithms readily create an "algorithmic echo chamber" effect—users receive homogenized information over time, gradually reinforcing existing beliefs and limiting exposure to diverse science content. In the science communication sphere, this issue may deepen cognitive divides between groups: for instance, users skeptical of scientific topics may continually receive pseudoscientific content, further solidifying their cognitive biases; while specialized groups focused on specific fields may miss foundational science knowledge in other domains. For rural areas, if algorithms overly concentrate on localized content like agriculture and livelihood issues, it may lead to gaps in public understanding of macro-level science topics such as national development and ethnic culture, hindering the comprehensive enhancement of scientific literacy nationwide.

An “algorithmic echo chamber” simply means that algorithms constantly push content you like and are accustomed to seeing. Over time, you become trapped in a “small room” wrapped in information, making it difficult to encounter other perspectives and knowledge from the outside world. This phenomenon is particularly evident in the realm of science communication, gradually widening the cognitive gap between individuals and driving their ideas further apart. The core reason algorithmic echo chambers exacerbate cognitive fragmentation is that they transform personalization into isolation, turning “precise recommendations” into “cognitive segregation.” To break this cycle, algorithms must recommend more science content aligned with diverse user interests — such as ecological knowledge for farmers or foundational science for young people. Simultaneously, we must proactively step outside our comfort zones, deliberately seeking out science content that challenges our usual preferences. Only then can science communication truly broaden our horizons and build consensus, rather than pushing us further into our respective echo chambers.

3.3 Content Irregularities: Difficulties in Ensuring Information Authenticity and Authority

In an era where algorithmic recommendations have become deeply integrated into science communication, “content is king” should remain the unchanging core principle—the value of science information ultimately hinges on its accuracy and authenticity, as well as its authoritative backing. Yet in reality, the algorithm-driven dissemination logic coupled with lagging regulatory mechanisms has led to frequent misconduct in science content. The authenticity and authority of information struggle to be effectively safeguarded, not only misleading the public but also eroding the very foundation of science communication.

Algorithm-driven recommendations rely on massive data inputs. If data sources are flawed or lack effective oversight, it facilitates the spread of false or low-quality science content. [6] On one hand, non-professional institutions or individuals may produce science content containing factual errors—such as bogus health remedies or incorrect agricultural techniques. Algorithms that prioritize dissemination based solely on popularity may mislead or even harm users. On the other hand, for specialized scientific content such as fostering a sense of community for the Chinese nation, the absence of rigorous review mechanisms may result in misinterpretations or value distortions, undermining dissemination effectiveness. Furthermore, users in rural areas, who generally possess weaker information discernment capabilities, are more vulnerable to the harm caused by false scientific content.

Algorithmic recommendations prioritize traffic metrics as their core screening criteria, rendering them incapable of directly discerning content authenticity. This creates fertile ground for the dissemination of false and one-sided science popularization information. Such content often cloaks itself in practicality and novelty, luring clicks through exaggerated claims and scenario-based packaging while severely deviating from scientific facts. The authority of science communication primarily stems from the expertise of content producers—such as research institutions and scholars—and the reliability of sources, like academic papers and official reports. Yet under algorithmic traffic logic, authoritative content often lacks dissemination appeal due to its “rigorous expression and measured pace,” getting squeezed out by non-professional, entertainment-oriented material. This issue is most pronounced in the healthcare sector. Non-professional entities or individuals fabricate content like “dietary cures for chronic diseases” or “folk remedies for incurable ailments” to gain attention, simplifying complex medical principles into “one-trick wonders.” In agriculture, false planting techniques are commonplace—for instance, claims that “a certain fertilizer doubles wheat yield per acre” or " “No pesticides needed to control all pests and diseases.” Following such advice often leads to reduced yields or complete crop failure. These false claims leverage algorithmic precision to target vulnerable audiences, causing more direct and severe harm than ordinary rumors.

3.4 Talent Shortage: Imbalanced Allocation of Science Popularization Personnel

Science popularization professionals serve as the vital lifeblood for the high-quality development of science outreach initiatives. Interviews and data surveys reveal significant imbalances in the allocation of science popularization personnel in rural areas. Firstly, there exists an imbalance in the professional composition of science popularization talent. Currently, rural regions predominantly employ science popularization experts specializing in economic sectors such as animal husbandry and crop cultivation, while cultural science popularization practitioners remain scarce. Second, the limited number of positions available within local science associations, coupled with severe staff shortages, means that many prefectural, municipal, and county science associations operate with only 2-3 permanent staff members. This situation is exacerbated by factors such as village-based assignments and personnel being seconded to higher-level departments. The aging of the workforce is becoming increasingly evident, and science communication staff rarely have opportunities for specialized, systematic training. Consequently, there is an overall lack of capacity to conduct science communication guidance and coordination at the grassroots level in rural areas. Third, most townships lack dedicated deputy township heads for science and technology or full-time science popularization administrators. This absence of specific personnel to coordinate and implement grassroots science popularization efforts makes it extremely difficult to widely conduct science training and popularization activities at the grassroots level. Consequently, provincial and county-level associations struggle to effectively implement, deepen, and thoroughly advance their work.

4 RECOMMENDATIONS FOR ENHANCING ALGORITHM RECOMMENDATION TECHNOLOGY TO IMPROVE SCIENCE POPULARIZATION PRECISION

Algorithmic recommendations leverage big data to track users' online behaviors, infer their interests, and deliver tailored scientific content through precise point-to-point delivery based on user profiles. However, their operation faces challenges that hinder modern scientific dissemination, including subject distortion, group isolation, and content inaccuracies. [7] Standardize algorithmic dissemination channels, strengthen the integration of technological guidance with school education, and leverage algorithmic recommendations to foster a positive role in building a strong sense of community for the Chinese nation.

Table 1. Architecture for Applying Algorithmic Technologies in Science Education

Application Layer	Core Algorithm Technology	Value Realization
Content Creation and Reconstruction Layer	Natural Language Processing Artificial Intelligence Generated Content	Boost content production efficiency and achieve structured and systematic knowledge management.
Experience Interaction and Presentation Layer	Computer Vision Virtual Reality Augmented Reality 3D Modeling and Rendering	Transform passive viewing into active exploration, delivering an immersive learning experience.
Personalized Learning Layer	Recommendation System Learner Profiling Adaptive Learning Algorithm	Respect individual differences to enhance learning efficiency and motivation.
Assessment Feedback and Optimization Layer	Educational Data Mining Learning Analytics Emotional Computing	Establish a closed-loop teaching system to provide data support for measuring the effectiveness of science education and its continuous optimization.

4.1 Establish a Dissemination Matrix to Precisely Reach Diverse Audiences

Citizen scientific literacy and science education development are universal endeavors for all citizens. Rural areas, characterized by remoteness, vast territories, and an agricultural/pastoral focus, account for a significant proportion of the rural population. Therefore, the primary target for precision delivery of science popularization resources via algorithmic recommendation applications should be rural communities, with the vast majority of rural farmers as the core group. For these farmers, smartphone penetration is now extremely high, making mobile devices their primary source of information.

On one hand, applying algorithmic recommendations to science communication in rural areas enables demand-driven approaches. By analyzing villagers' interests— such as agricultural cultivation, medical knowledge, and pension insurance. By accurately grasping the individual characteristics, thought patterns, and core issues of grassroots communities, and integrating emotional appeals, science popularization content can be purposefully decomposed and restructured. This enables the delivery of information tailored to diverse personalized needs, providing targeted guidance

and assistance with progress tracking, thereby highlighting the active agency of villagers. On another front, leveraging algorithms can break down communication barriers and advance the discourse transformation for fostering a shared sense of community among the Chinese nation. Rural communities are predominantly composed of ethnic minority villagers who often lack proficiency in Mandarin and have limited understanding of Chinese historical continuity. [8] The discourse on strengthening the Chinese national community consciousness, due to its educational nature, frequently conveys a solemn, didactic, and detached impression. Therefore, algorithms must be leveraged to transform and integrate this content, precisely identifying elements that resonate with villagers' needs. Efforts to reinforce this consciousness should prioritize enhancing its appeal.

4.2 Incorporating Public Oversight Mechanisms for Precise Feedback on Algorithm Recommendations

Leveraging advanced algorithmic recommendation technology, we can deeply analyze public demand for science communication and behavioral patterns to deliver personalized, precise content recommendations. This tailored approach ensures each user receives information aligned with their interests and knowledge level, significantly boosting acceptance and dissemination efficiency. Simultaneously, encourage the public to provide valuable feedback on the content, format, and effectiveness of science communication. Collect this data and feedback, which will serve as crucial references for optimizing science communication services. Science communicators can continuously refine their work based on this feedback, enhancing the quality and appeal of science content to better align with public needs and expectations.

To this end, an interactive platform leveraging big data will be established. This platform will incorporate expert review and public oversight mechanisms to bridge the gap between the public and science communicators. Regular quality assessments of algorithmically recommended content will ensure the accuracy and authority of science information. Based on evaluation results and public feedback, the recommendation algorithms will undergo iterative adjustments to continuously refine recommendation strategies, aligning them more closely with public needs and expectations. This dual oversight mechanism ensures science communication remains on a trajectory of high-quality development. Such initiatives not only enhance the influence and credibility of science communication but also stimulate public enthusiasm and creativity, collectively advancing the field. Through information sharing on the interactive platform, the public can pose questions and share insights, while scientists and science communicators provide answers and disseminate research findings. This fosters a positive, interactive environment that brings scientific knowledge closer to the public while driving deeper development in science communication. It contributes to elevating national scientific literacy and propelling societal progress.

4.3 Utilizing Algorithms to Optimize Science Popularization Content and Methods to Meet Students' Holistic Development Needs

On one hand, science popularization content should be designed in accordance with adolescents' cognitive patterns. By researching and analyzing the physical and mental developmental characteristics of young people, and integrating teaching objectives across different educational stages with contemporary societal developments, the approach should be as follows: At the elementary school level, emphasize introductory and experiential science education. At the middle school level, focus on character development, fostering modern civilized living habits, and exploring the principles of high-tech innovations. high school should emphasize foundational knowledge and values education across politics, economics, culture, and technology, while college and vocational education should deliver systematic, logical, and standardized scientific knowledge. [9] This creates a progressive educational approach—from simple to complex, concrete to abstract, and surface phenomena to underlying principles—enhancing the coherence and continuity of content across educational stages.

On the other hand, innovate school science communication methods. Broaden school science communication pathways to foster a positive atmosphere where everyone participates in science education—including expert-led, teacher-led, peer-to-peer, and upper-grade-to-lower-grade science communication. Leverage digital and information technologies to the fullest, utilizing advanced tools like virtual reality and artificial intelligence to present natural and social science knowledge through artistic and contemporary expressions. This enhances the appeal and immersive quality of science communication, boosting student engagement and learning effectiveness across all educational levels. Fully leverage digital platforms such as WeChat Official Accounts, Weibo, Douyin short videos, Kuaishou short videos, and live streaming to distribute science popularization videos, expanding coverage among audiences across primary, secondary, and higher education levels.

4.4 Innovating Digital Presentation Forms for Grassroots Science Popularization in Rural Areas

With the continuous advancement of digital and information technologies, traditional science popularization models can no longer meet the demands of fostering a sense of the Chinese national community in the new era. We must

seize the trend toward informatization and technological advancement in science communication, continuously innovate grassroots science outreach models in rural areas, and open new avenues for enhancing the sense of community among rural residents. Accelerate the digital development of traditional Chinese culture. Leverage high-tech tools like virtual reality and artificial intelligence to achieve artistic and contemporary expressions of natural and social science knowledge. This will enhance the appeal and immersive experience of science communication, boosting rural residents' pride in the modernization of the Chinese nation. [10] Leverage modern technology, particularly multimedia, to broaden science communication channels. Fully utilize digital platforms like WeChat Official Accounts, Weibo, Douyin short videos, and live streaming to distribute science-themed short videos and expand audience reach. Integrating outstanding traditional culture with modern lifestyles, aesthetics, ideologies, and technology, we must "let cultural relics speak, let history speak, let culture speak." This involves innovatively showcasing how all ethnic groups "jointly pioneered the vast territories of our motherland, jointly forged a unified multi-ethnic nation, jointly wrote the glorious history of China, and jointly created the splendid Chinese culture." We should enrich the presentation forms of China's outstanding traditional culture, revolutionary culture, and advanced socialist culture, guiding grassroots communities in rural areas to develop a correct understanding of the Chinese nation.

4.5 Strengthen Overall Planning and Improve Policy Procedures

Contemporary education in Sweden is characterized by two parallel processes: the implementation of digital tools in the classroom, on the one hand, and an increased emphasis on brain-based learning, on the other. Develop science education plans for primary, secondary, and tertiary levels, refine the integration and continuity of science curricula across educational stages, and enhance the coherence and progression of science education. Collaborate with education, publicity, united front, and science and technology departments to establish science education objectives tailored to the cognitive development and holistic education requirements of youth at different stages, cultivating scientific literacy among students at primary, secondary, and tertiary levels through tiered, age-appropriate approaches. Reform traditional one-way school science education approaches by broadly soliciting and respecting students' science education needs across all levels. Explore new models that harmonize educational demands with science education delivery. Promote integrated science education models combining classroom learning with real-world experiences to unify scientific knowledge with practical application.

Accelerate the construction of an integrated innovation talent cultivation system and promote the sharing and exchange of teaching resources. Strengthen science education faculty in rural areas by establishing cross-disciplinary and cross-stage exchange platforms. [11] Led by university science faculty, organize themed reports, specialized lectures, and on-site sharing activities to empower primary and secondary school science teacher training. Assist schools in strengthening their science teaching teams, comprehensively enhancing their scientific literacy, and building a high-quality science education team centered on full-time teachers and integrating multidisciplinary backgrounds. Education authorities should meticulously plan and implement talent recruitment strategies, prioritizing the attraction of high-caliber professionals with educational expertise and scientific specialization to enrich and optimize science education faculty. Utilize the Western Development Program to recruit top-tier talent from inland regions, leveraging universities' strengths in key disciplines and educational resources to inject fresh blood into science education teams across primary, secondary, and tertiary institutions in rural areas.

5 CONCLUSION

Algorithm-based recommendation technology is a vital tool in the information age. With its powerful data processing and precise matching capabilities, it has brought tangible changes to science popularization efforts. To better leverage algorithmic recommendations for science outreach, it requires concerted efforts across all fronts—not merely the application of technology. We must tailor recommendations to diverse audiences like farmers and youth through tiered content delivery, ensuring material relevance. Robust oversight and feedback mechanisms must be established—leveraging expert vetting and public input to guarantee accuracy and authority. Furthermore, a collaborative framework involving governments, businesses, and social organizations is essential: governments should provide guidance, enterprises must deploy technology appropriately, and all sectors must participate while helping the public develop skills to discern misleading science information.

As long as algorithmic recommendations remain centered on the goal of "spreading science and serving the public," balancing precision with comprehensiveness, and innovating formats while upholding scientific and ethical standards, they will inevitably evolve from mere "information dissemination tools" into vital partners for enhancing national scientific literacy and conveying positive energy. Such technological empowerment will ultimately make scientific knowledge more accessible and understandable to everyone, laying a solid foundation for social development and national progress.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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REFERENCES

[1] He, S. (2024). Metaphor translation in popular science. https://doi. org/10. 4324/9781032620640

[2] Darwesh, A. Q. M. A. (2024). The theme Progression Patterns in Popular Science Book Writing: A Systemic Functional Linguistics Approach. International Journal of English Linguistics, 14(5), 35. https://doi. org/10. 5539/ijel.v14n5p35

[3] Kim, S. K., Kim, T. Y., & Kim, K. (2025). Development and effectiveness verification of AI education data sets based on constructivist learning principles for enhancing AI literacy. Scientific Reports, 15(1), 10725-10725.

[4] Jaspers, K. (1991). What is education? (J. Zou, Trans.). Shanghai SDX Joint Publishing Company. (Original work published 1991)

[5] Niu, H. Y. (2007). Qing shao nian ke pu jiao yu huo dong de shi jian yu tan suo [The practice and exploration of popular science education activities for adolescents]. Tushuguan Jianshe [Library Development], (3), 17–19.

[6] Si, L. (2010). Qian tan ke ji guan ke pu jiao yu xing shi de chuang xin [A brief discussion on the innovation of science education forms in science museums]. Kexue Zhi You [Friend of Science Amateurs], (14), 134–135.

[7] Yang, Y. (2009). Jie jian guo wai ke ji jiao yu jing yan fa zhan qing shao nian ke pu shi ye [Developing adolescent popular science by drawing on foreign experience in science and technology education]. Keji Tongbao [Bulletin of Science and Technology], *25*(4), 534–540. https://doi.org/10.3969/j.issn.1001-7119.2009.04.034

[8] Zheng, J. (2016). Qing shao nian ke pu jiao yu huo dong de shi jian yan jiu [A practical study on popular science education activities for adolescents]. Jiaoyu Jiaoxue Luntan [Education Teaching Forum], (21), 187–188.

[9] Li, C. F. (2003). Wo guo ke pu gong zuo cun zai wen ti de yuan yin fen xi ji dui ce yan jiu [An analysis of the problems in China's science popularization work and countermeasures] [Master's thesis, Wuhan University of Science and Technology].

[10] Forsler, I., & Guyard, C. (2023). Screens, teens and their brains. Discourses about digital media, learning and cognitive development in popular science neuroeducation. Learning Media and Technology, 1–14. https://doi.org/10.1080/17439884.2023.2230893

[11] Zhao, W. H., Xu, D. P., Gong, H. Y., & Li, Y. (2014). Study and practice based on network technology. Applied Mechanics and Materials, 644–650, 3195–3198. https://doi.org/10.4028/www.scientific.net/amm.644-650.3195