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Challenges and opportunities of acquiring scientific authority in medical sciences: determination of the experts' views based on qualitative content analysis

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Abstract

Introduction: Capability is built upon knowledge and wisdom, and scientific progress and development is associated with wealth production, national and international authority, and independence. To promote scientific development, as a prerequisite to the country's progress in other areas, there is a need for strategic planning and creating scientific capacities. Today's world is facing a rapid growth and development in science and technology, and universities and higher education centers have an important role in the society's development and progress in the areas of human resources training, science and technology production, and solving different problems. Considering the Iran's health scientific road map and communication of innovation and reform plans, and since universities are required to identify the areas of authority, this study was conducted to determine the challenges of scientific authority promotion and proper courses of action.

Methods: In this study, content analysis was used as a qualitative research method. The triangulation method was applied for data collection. Purposive sampling was done to select the participants for focused group discussion and data collection continued until data saturation was achieved. The participants were 19 higher education experts and MOHME policymakers. The ATLAS.ti software version 5.2 was used for analysis of data.

Results: The results of the analysis of transcripts obtained from FGD with higher education experts and MOHME policymakers showed 4 themes, 10 categories and 43 sub-categories. The resulting themes included: "Experienced perceptions of scientific authority", "Requirements of scientific authority", "Challenges of scientific authority", and "Strategies for promoting scientific authority".

Conclusion: Universities and governmental sectors do not represent all the capacities, and there are much more capacities that can be exploited with participation of different sectors and institutions, especially inter-sectoral and inter-university collaborations. Many advances in new sciences have occurred in interdisciplinary majors, and these collaborations help to take solid steps towards scientific authority.

Keywords: Scientific; Qualitative research; Medical Sciences

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Introduction

Achieving peaks of progress and excellence, preparing the grounds for forming an international community, and expanding the frontiers of science require strategic measures and mechanisms consistent with rapid changes of today's world to materialize (1). It is obvious that there is a need for strategic planning and creating scientific capacities to promote scientific development as a prerequisite to the country's progress in other areas (2). Serious attention has been paid to science and technology in the educational policy document of Iran and attempts are made to picture a favorable perspective of the future with an emphasis on the software movement and science production in the year 2025 (3). Accordingly, the governments should recognize the importance of this point and place emphasis on a software and knowledge production movement based on national and indigenous capabilities (2). In line with a systemic approach to achieving the goals of the knowledge-based economy and a national innovation system, universities and higher education centers are responsible for knowledge production, transfer, and dissemination; education; and human resource training (4). The final objective of the country's macro-policies is to transform scientific products to technology and wealth (5); in other words, scientific authority, economic effectiveness, science diplomacy, and technology production are assessed in science and technology macro-policies (6). Scientific authority and science diplomacy are the most important points in science and technology production, and the number of published articles is the simplest method used for assessment of the performance of individuals, universities, and countries in the area of science production (7). This method has been frequently used in the recent 10 years to assess the position of Iran and to evaluate the performance of different governments in science production (8). Another indicator is the H-index, which measures other scientists' use of one's scientific production (9). The journal impact factor is another indicator that is calculated by dividing the total number of citations by the total number of articles published in the two previous years (6).

The package of foresight and scientific authority is one of these packages that is defined as one of the operational projects of the country's medical universities with the aim of designing a monitoring system for moving towards scientific authority (10). Different researches have been conducted in the field of scientific authority, but they have all addressed theoretical issues and have not presented a solution. Considering Iran's health scientific road map and communication of innovation and reform plans and since universities are required to identify the areas of authority, this study was conducted to determine the challenges of scientific authority promotion and proper courses of action.

Methods

This study is qualitative research with an inductive content analysis approach that was conducted at Ministry of Health and Medical Education in 2017. The triangulation method was applied for data collection. Triangulation means using more than one method to collect data on the same topic. This is a way of assuring the validity of research through the use of a variety of methods to collect data on the same topic for the authentication of results and to reduce bias. Apart from the focus group technique to gather data, we had an additional data source, i.e. note -taking and memos to collect data. In the field of medical education as a well-established method, focus group discussion (FGD) is a very popular data collection technique in qualitative research. The focused group discussion was used to extract the challenges and strategies for scientific authority to discuss them from a broader point of view. The main advantages of focus group can be the fact that it is useful to obtain detailed information about personal and group feelings, perceptions and opinions. It can save time and money compared to individual interviews. Als, it can provide a broader range of information. The other method is memos. Memos are a specialized type of written records—those that contain the products of our analyses. Memos create an important extra level of narrative: an interface between the participant's data, the researcher's interpretation and wider theory. We conducted a FGD with higher education experts and MOHME policymakers in 2017. Inclusion criteria for participants were educational and management experiences and willingness to participate in the study and excluded those who did not suit the purpose (11). In this regard, in order to understand and describe a particular group in depth, we invited a homogenous group of participants (19 policymakers in the healthcare) to provide new insights into the topic area. The letter of invitation explaining the purpose of the study was sent through email. All participants gave written consent to participate and agreed that their comments could be recorded, transcribed and anonymized for analysis. At the beginning of the focus group, clear explanations of the purpose of the session were provided to the participants and in the case of any questions concerning the focus group and the topic under discussion, more explanation was provided by the researchers. The discussions in the focus groups were semi-structured and run by a moderator and co-moderator with the use of a topic guide.

In order to provide an additional dimension to data transcription and interpretation, the following tasks were done: interaction between participants, jotting down notes and taking into account the information being shared among the participants. The moderator of the focus group clarified and elaborated the point, as needed. We asked the participants not to be concerned about the agreement with other people in the group. We encouraged them to freely express their opinions regardless of what other attendees had expressed. The focus group discussions lasted for approximately 2.5 hours. In order to get rich and in-depth data, we used the questioning route or a discussion guide to increase the likelihood of open, interactive dialogue. To develop the questioning route, first, the importance of scientific authority was explained and then the participants' viewpoints about the challenges of scientific authority promotion and proper courses of action. Feedback was received on the structure of the questions and identified areas that needed clarification. At the time of focus group discussions, we made our participants at ease to disagree with each other (if any) and express their opinions by group discussions. Interaction between our partners contributed to reaching our goals. The research questions were as follows:

- What does scientific authority mean in the field of medicine?
- What are the dimensions and components of scientific authority in the field of medicine?
- What are the requirements of scientific authority?
- What are the challenges of scientific authority?
- What are the ways to improve scientific authority?

The interviews were transcribed immediately after the FGD for data analysis. Moreover, the researcher's observations during the interviews were recorded. Then, a list of codes was prepared. In the next stage, the codes were reviewed semantically and placed in abstract categories based on their similarities and differences, using the reduction method.

The constant comparison method was applied to produce the categories and subcategories, according to the Heidegger approach as reported by Dickelman (12). The ATLAS.ti software, version 5.2, was used for analysis (13). In this stage, 158 codes were extracted. Cuba and Lincoln's trustworthiness were used to make sure of the validity and reliability of the qualitative data (8). "Prolonged engagement" and "member check" were used to assess credibility; in many member checks, the interpretation and report (or a portion of it) were given to the members of the sample (informants) in order to check the authenticity of the work. Some parts of the interviews and the primary codes were presented to the participants to verify the investigator's emerging theories and inferences as these were formed during the dialogues. Confirmability was assessed by external auditors who were familiar with qualitative research; for this purpose, parts of the interview and the related codes and categories were presented to the auditors and their confirmation was obtained. To enhance transferability, the exact statements of the participants were quoted.

Ethical Considerations

The ethical principles of this study included obtaining verbal informed consent for participation, the confidentiality of the data, right to withdraw from the study at any time, permission for recording the interview sessions, and delivery of the results to any participant who asked for them. This study was approved by the ethics committee of virtual University of Medical Sciences.

Results

A total of 19 higher education experts and MOHME policymakers participated in 3 focus groups. The mean age of the focus group participants was 53.2. Among this batch, 15 were males and 4 females. The content analysis of the transcripts revealed an extensive list of perceptions, requirements, challenges and solutions.

The model is shown and described in Figure 1.

Based on qualitative content analysis, 4 themes, 10 main categories, and 43 sub-categories were extracted (Tables 1 and 2).

1- Experienced perceptions of scientific authority
1-1- Scientific Mastery

Expertise in science process skills is a basic and integral part of having effective science teaching skills. As Ausubel notes, practical work creates a "discovery-reception continuum" as opposed to a "meaningful rote learning" experience (14).

Participants mentioned "being a reference", "capability of answering people's questions", and "capability of producing and propagating

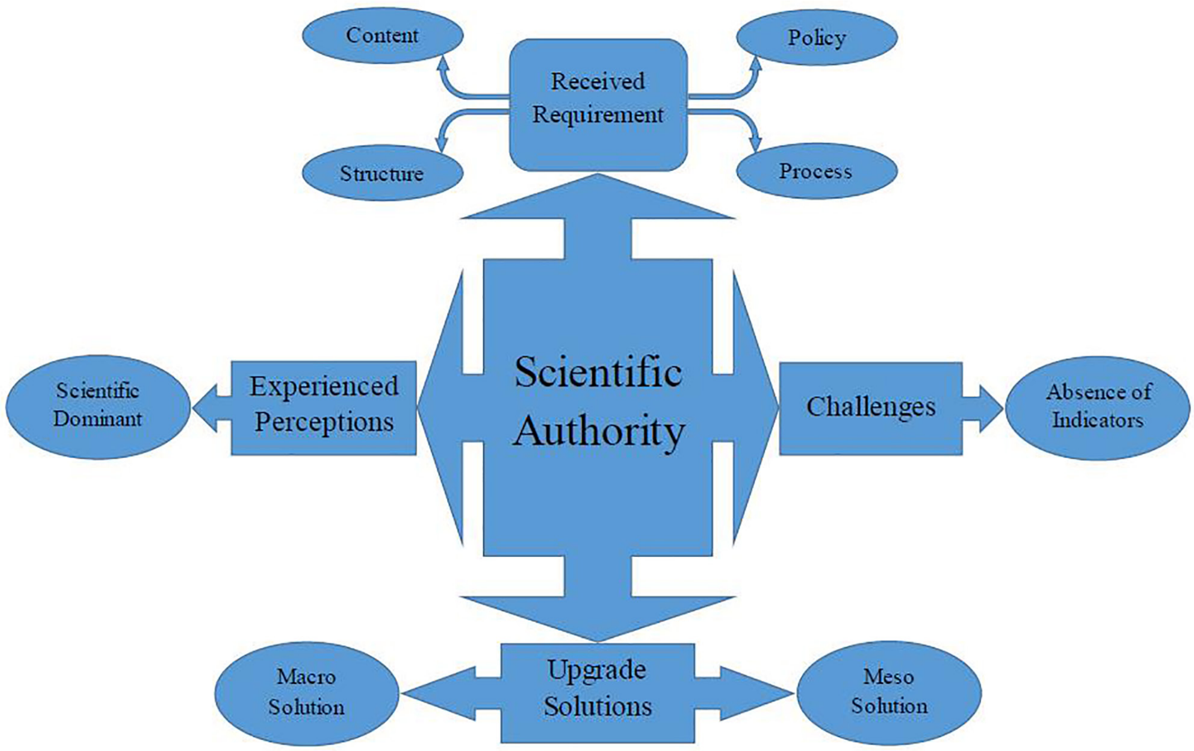

Figure 1: Challenges and opportunities of acquisition of scientific authority

Table 1: Themes and categories extracted from interviews with experts

Themes	Category
Experienced perceptions of scientific authority	Scientific Mastery Human conflict
Requirements of scientific authority	- Policymaking - Structure - Process - Content
Challenges of scientific authority	Lack of precise indicators Lack of inter professional collaboration
Strategies for promoting scientific authority	- Mid-level strategies - Upstream strategies

science" to define scientific authority. One of the participants said, "*When we talk about authority, it means being a reference for people to refer to. Therefore, it seems that it means reaching a level of knowledge to serve as a reference for others*." According to another participant (participant #13), "*A deep look into the meaning of authority suggests that there is no unique and comprehensive definition and there are various understandings of it. Therefore, the concept of authority can be defined as serving as a reference as a result of scientific mastery and capability of answering people's questions in the area of authority*." Moreover, another participant believed that capability of science production is another concept of scientific authority.

1-2- Human conflict

The subcategories of this dimension were "*Professional Satisfaction*" and "*Communication Skills*". Professional satisfaction is important for obtaining scientific authority and this is also related to the job position. Participant 1 said: "*I do not know exactly what I should do there. My duties and internship goals were not already specified, so I do not know what to do and how*." Communication skills in the international field are important in authority as well. Participant 9 said: "*The language of politics is a prerequisite for acquiring scientific identity*".

2- Requirements of scientific authority

2-1- Policymaking

Professor Ben-David of Hebrew University Pointed out that largeness does not insure scientific accomplishment nor does smallness mean that a nation's science must be poor and backward (15). Continuing scientific endeavor

Table 2: Category and subcategory extracted from interviews with experts

Category	Subcategory
Scientific mastery	- Being a reference - Capability of science production and propagation - Capability of answering people's questions
Human conflict	- Professional Satisfaction - Communication skills
Policymaking	- Institutionalizing scientist authority in our minds - Serious follow-up of the country's scientific progress and its speed - Policymaking for prevention of separate action in different sciences (stem cell, nanotechnology, biosensors, traditional medicine) - Determining a supervising institution for strategic affairs in policymaking - Policymaking for transforming the current discourse to national map
Structure	- Necessity of breaking previous structures and designing new ones - Reinforcing the structure of elites and centers of excellence - Designing a comprehensive national plan for optimal use of educational infrastructures with preservation of identity and independence
Process	- Promoting Iran's status to a medical center of excellence in South East Asia - Revising authority-making processes in science and technology - Describing current status of integrated health system and defining optimal status - Designing a process of continuous monitoring and macro observation of integrated health system - Designing a process for establishing global interactions and knowledge management
Content	- Commitment to continuous quality improvement in all activities of integrated health system - Designing a national document for reform and innovation in the integrated system - Identifying areas, challenges, crises, and serious issues - Creating a protocol in the area of health and treatment
Lack of precise indicators	Lack of indicators for input, process, output, and outcomes (like economic, knowledge, technology, political, social, and cultural indicators)
Lack of inter professional collaboration	- Poor Team working - Cultural barriers
Mid-level strategies	- Maintenance of incorporated health and medical education systems - Creating interdisciplinary majors in area of health - Promoting professionalism - Training specialized manpower - Enhancing a culture of teamwork - Strategic transformation in medical research (basic research) - Developing a healthy competitive environment - Developing interdisciplinary research projects and holding joint seminars - Auditing research activities for applicability - Identifying barriers to interdisciplinary research and addressing them - Self-confidence
Upstream strategies	- Designing a budget allocation system and increasing the share of research from GDP - Teamwork-oriented policymaking - Establishing interdisciplinary research centers - Developing a road map - Developing and expanding scientific tools - Policymaking for scientific interaction with the world - Developing an innovation system

with the aim of achieving scientific authority in the world with an emphasis on producing science, technological development and theorizing, improving the country's status in science and technology, and achieving advanced sciences and technologies are among the communicative policies for due planning in Iran (16). O'Brien conducted a study about scientific authority in policy contexts in 2013. This study, which used the data of the US General Social Survey to evaluate public support for scientists in policy contexts, showed that using the scientists' viewpoints serves the nation's best interests in each discipline (17).

Participants mentioned "*institutionalizing scientific authority in our minds*", "*serious follow-up of the country's scientific progress and its speed*", and "*policymaking for prevention of inconsistency in the progress of different sciences (stem cell, nanotechnology, biosensors, traditional medicine)*". Some other participants believed that "*determining a supervising institution for strategic affairs in policymaking*" and "*policymaking for transforming the current discourse to a national map*" were other required policies for scientific authority.

2-2- Structure

According to Iran's 20-Year Vision Plan, learned, educated, healthy, righteous people in the society and world-class renowned scientists that are capable of producing science and technology and utilizing its achievements are required for the country's development and progress (18).

Most of the participants pointed to the importance of appropriate structures, including the "necessity of breaking previous structures and designing new ones", "reinforcing the structure of the elites and centers of excellence", "designing a comprehensive national plan for optimal use of educational infrastructures with preservation of identity and independence." One of the participants said, "*For scientific authority, the cultural structure should be proportionate to important areas of scientific authority like scientific insight, national identity, the Persian language, Iranian-Islamic traditional medicine, ethics, and spirituality. Moreover, structural barriers to interaction of basic and clinical sciences should be removed*."

2-3- Process

Most participants believed that "promoting Iran's status to a renowned medical center in South East Asia", "revising authority-making processes in science and technology", and "describing current status of integrated health system and defining the optimal status" were some examples of the required processes for achieving scientific authority. One of the participants said, "*As for process requirements, the important processes that should be revised are authority-making processes in science and technology and describing the current status of the integrated health system and defining the optimal status*." Furthermore, the participants believed that "designing a process of continuous monitoring and macro- observation of the integrated health system" and "designing a process for establishing global interactions and knowledge management" were other process requirements of scientific authority.

2-4- Content

The experts believed that "commitment to continuous quality improvement in all activities of integrated health system" and "designing a national document for reform and innovation in the integrated system" were part among the content requirements of scientific authority. Quality improvement (QI) is a systematic, formal approach to the analysis of practice performance and efforts to improve performance. Continuous Quality Improvement (CQI) is a quality management process that encourages all health care team members to continuously ask the questions, "How are we doing?" and "Can we do it better?" (19). For example, participant number 12 said, "*As for content, factors like t commitment to continuous quality improvement in all activities of the integrated health system and designing a national document for reform and innovation in the integrated system help to identify new challenges and crises in the area of scientific authority.*" Furthermore, interviewees believed that "identifying areas, challenges, crises, and new issues" and "creating a protocol in the area of health and treatment" were other content requirements of scientific authority.

3- Challenges of scientific authority

3-1- Lack of precise indicators

Indicators are signs of progress. They are used to determine whether the program/intervention is on its way to achieving its objectives and goal. A number of participants mentioned lack of indicators for input, process, output and outcomes as the challenges of scientific authority. "*Scientific authority should bring about the development of input, process, output, and outcome indicators and the country's progress, and development should manifest as improved economic, scientific, technological, political, social, and cultural indicators, which is one of the objectives of scientific authority*," said one of the participants (No 3).

3-2- Lack of inter-professional collaboration

In this study, the participants paid particular attention to the "poor team working" and "cultural barriers". Participant 12: "*In our settings, each individual works on his/her own, while the scientific team should act as a single person to improve the system*."

The participants in this study believed that humans had different cultures; therefore, respect for all of them, regardless of gender and ethnicity, was necessary. Participant 1: "From the very beginning, every person must know that all human beings are respectful, and cultural differences are some part of the structure of interactions."

4- Strategies for promoting scientific authority

4-1- Mid-level strategies

According to Iran's 20-Year Vision Plan, Iran is trying to rank first in the region and then in the world. Since this objective is based on knowledge in the context of ethics and law, it will be materialized in light of the potential facilities and talents, and national resolve. In this regard, the perspective of the educational system in Iran's scientific authority is to educate and train committed and competent individuals to serve the country and produce science for all mankind. It should be noted that the educational system has a vital role in materialization of the national aspiration of achieving scientific authority in the world; therefore, constant attention should be paid to its performance (16).

Participants believed that training specialized and committed manpower to serve the country and produce science in medical universities is among the most important strategies for achieving scientific authority. Participant 15 said: *"Having healthy, educated, and righteous people trained in the school of Islam and world-class scientists is one of these factors. Considering our capabilities in science and technology production and development, if we really wish to achieve these goals in 2025 which leads to scientific authority, we should pay special attention to research and experienced, committed, and specialized manpower, which are the pillars of scientific authority. Knowledge production, knowledge translation, and knowledge application are very important in this regard.*"

4-2- Upstream strategies

According to experts, "*designing a budget allocation system and increasing the share of research from GDP*", "*teamwork-oriented policymaking*", "*establishing interdisciplinary research centers*", "*developing a road map*", "*developing and expanding scientific tools*", "*policymaking for scientific interaction with the world*", and "d*eveloping an innovation system*" are the most important upstream strategies. Participant 15 said: "*the establishment of interdisciplinary research centers and the compilation of a roadmap can show a clearer view of the authority*".

Discussion

To achieve scientific authority, according to the macro-design of Iran's education system, it is estimated that we will rank first in science in the world within 50 years, i.e. we will determine and move the boundaries of sciences (15). According to the first theme, experienced perceptions of scientific authority, this study showed scientific authority is defined as being a point of reference in scientific productions, which is consistent with the results of the studies conducted by O'Brien (20) and Villumsen Berling (16). Universities are dynamic institutions that can help with knowledge promotion through planning (17). Drucker believes that in today's world economics, knowledge, as an outcome of the process of learning, is a much more important resource than other production resources like occupation, wealth, and land (18).

According to the second theme, requirements of scientific authority, policymaking for scientific interaction with the world was a strategy mentioned by many participants. Interaction with renowned scientific centers is one of the basic needs for mastery in science. In fact, scientific collaboration is a prerequisite and a need for comprehensive progress and development; therefore, it is very important to take an active part in international scientific events through expanding international scientific collaborations with famous scientists, especially Iranian elites living and working abroad. Woods-Townsend believes that maximum scientific interaction and collaboration with the internal and external environment may create new opportunities in the area of science and knowledge production (20). Scientific interactions are the cornerstone of new sciences.

O'Brien conducted a study about scientific authority in policy contexts in 2013. This study, which used the data of the US General Social Survey to evaluate public support for scientists in policy contexts, showed that in each discipline, using the scientists' viewpoints serves the nation's best interests (17).

In a study carried out by Shin et al, expanding the university's interaction with world-class scientific centers gained the highest score among the factors associated with achieving scientific authority (13). A communication system is designed for transferring information and sharing the results of scientific activities. It presents and evaluates the results of scientific activities. An evaluation system is performed by a group of experts to assess all research activities (21).

Therefore, scientific interactions have an important role in scientific development (22). Based on the third theme, the challenges of scientific authority, scientific collaborations among faculty members are very important for educational and research organizations. In the university, local scientific societies are popular places for informal knowledge exchange through scientific chats, systematic discussion sessions, and knowledge dissemination and propagation. Scientific societies, in addition to promoting public knowledge, have an important role in preparing the grounds for recognition of scientific talents and encouraging them to participate in expanding the boundaries of science and designing national development programs (23). Therefore, scientific interactions facilitate science production, and scientific societies have an important role in this regard (24).

According to the participants, the challenges of scientific authority in Iran are the lack of precise input, process, output, and outcome indicators. In other words, economic, scientific, technological, political, social, and cultural indicators are not determined in Iran. According to researches, it is necessary to determine the required actions, the level of authority, and the target group of scientific authority (executive centers, policymaking centers, or scientific centers) (25).

If the output is not appropriate with the client, it may be too deep (knowledge and scientist) to be useful or too practical to be considered by scientific societies. Therefore, society's need should be determined and priorities should be defined accordingly because the aim of science is to satisfy the society's needs (26).

Arif believes that it is important to assess the work processes in an organization to improve its performance. This assessment shows weak points, leading to necessary interventions resulting in reinforcing the processes and increasing the efficiency of the organization. In this regard, attempts can be made to improve a system that suffers weaknesses through management of its processes. In fact, a process attitude provides a mutual goal for the organization that leads to integration and improvement of processes (27). As a result, with a systemic approach to scientific authority, the weaknesses of the processes can be identified and productivity can be achieved through the management of processes.

In the present study, establishing interdisciplinary centers, identifying barriers to interdisciplinary research and addressing them, and strategic transformation in medical research (basic research) were some proposed strategies to achieve scientific authority.

Based on the fourth theme, strategies for promoting scientific authority, supporting scientific journals, more attention to research projects and transforming them to science and technology, expanding research in practical and developmental areas, and comprehensive empowerment of faculty members were some determinants of achieving scientific authority from the viewpoints of professors, that is consistent with Gholifar 's study (28). These activities are the processes that lead to production and dissemination of scientific products in native culture. Therefore, they can be effective in enhancing science localization. However, it should be evaluated why faculty members are not interested in research activities. The reasons may be not benefiting from the research results, weak research culture, lack of facilities and equipment, extensive bureaucracy, executive managers' lack of positive attitude towards the benefits of research, busy schedule, lengthy process of publishing a paper, difficult process of receiving funds for research projects, and lack of research skills and motivation (29). Lack of motivation probably results from wrong policies, lack of financial support, mismanagement, and inappropriate environmental conditions (30).

Training specialized human resources, developing a culture of teamwork, and self-confidence were other strategies that were proposed by our participants for achieving scientific authority. According to Gholifar et al., development of a culture of self-confidence has a significant association with the achievement of advanced science and technology and scientific vitality, indicating the effect of self-confidence on acquiring advanced science and technology and scientific vitality (28).

In recent years, special attention has been paid to scientific authority in upstream documents and the health scientific road map has been designed accordingly. Iran's status in science and research and achieving scientific authority is a point of focus in the 20-Year Vision Plan. In line with a systemic approach to achieving the goals of knowledge-based economy and a national innovation system, universities and higher education centers are responsible for knowledge production, transfer, and dissemination; education; and human resource training. Today's world is facing rapid growth and development in science and technology, and universities and higher education centers have an important role in the society's development and progress in the areas of human resource training, science and technology production, and solving different problems (4). The participants in this research also mentioned "promoting Iran's status to a medical center of excellence in Southeast Asia", "revising authority-making processes in science and technology", "describing the current status of integrated health system and defining the optimal status", "designing a process of continuous monitoring and macro-observation of the integrated health system", and "designing a process for establishing global interactions and knowledge management" as the requirements of achieving scientific authority.

Limitations

The concept of scientific authority has many aspects that cannot be addressed in one study. Another limitation was lack of relevant literature that hampered interpretation of the results. It is necessary to conduct more research on scientific authority.

Conclusion

According to the participant's view, the concept of authority can be defined as serving as a reference as a result of scientific mastery and capability of answering people's questions in the area of authority, and increased international collaborations and publication of scientific papers and presentation of scientific capabilities are helpful in achieving scientific authority. All the capacities of the country should be employed to accomplish this objective. In fact, universities and governmental sectors do not represent all the capacities, and there are much more capacities that can be exploited with participation of different sectors and institutions, especially inter-sectoral and inter-university collaborations. Another important themes were scientific collaborations among faculty members, and many advances in new sciences have occurred in interdisciplinary majors, and these collaborations help to take solid steps towards scientific authority.

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References

1. Dutfield G. Intellectual property rights and the life science industries: a twentieth century history. London: Routledge; 2017.
2. Kwon KS. Are scientific capacities and industrial funding critical for universities' knowledge transfer activities? A case study of South Korea. Journal of Contemporary Eastern Asia. 2011; 10(1):15-23.
3. Torkiantabar M, Ismaeil SM, Nooshinfard F. Commercialization of the Scientific Research Results in Iran Knowledge-Based Companies. Mediterranean Journal of Social Sciences. 2016; 7(3):11.
4. Edwards T. Economic and democratic objectives of vocational education. Evaluation & Research in Education. 1998; 12(1):1-6.
5. Şener S, Sarıdoğan E. The effects of science-technology-innovation on competitiveness and economic growth. Procedia-Social and Behavioral Sciences. 2011; 24:815-28.
6. Pouris A, Pouris A. Competing in a globalising world: International ranking of South African universities. Procedia-Social and Behavioral Sciences. 2010; 2(2):515-20.
7. Vinkler P. The evaluation of research by scientometric indicators. Netherlands: Elsevier; 2010.
8. Soykan E, Uzunboylu H. New trends on mobile learning area: The review of published articles on mobile learning in science direct database. World Journal on Educational Technology. 2015; 7(1):31-41.
9. Waltman L, Van Eck NJ. The inconsistency of the h-index. Journal of the Association for Information Science and Technology. 2012; 63(2):406-15.
10. Hossienzadeh H. Scientific and technological Authority of Iran in the world in next fifty years [Cited 2010 Jun 28]; Available from: URL:http://www.bashgah.net/fa/content/show/43943.
11. Speziale HS, Streubert HJ, Carpenter DR. Qualitative research in nursing: Advancing the humanistic imperative. California: Lippincott Williams & Wilkins; 2011.
12. Denzin NK, Lincoln YS. The Sage handbook of qualitative research. California: Sage; 2011.
13. Braun V, Clarke V. Using thematic analysis in psychology. Qualitative research in psychology. 2006; 3(2):77-101.
14. Ango ML. Mastery of Science Process Skills and Their Effective Use in the Teaching of Science: An Educology of Science Education in the Nigerian Context. International Journal of Educology. 2002;16(1):11-30.
15. Ben-David J. Scientific endeavor in Israel and the United States. American Behavioral Scientist. 1962;6(4): 12-6.
16. Villumsen Berling T. Science and securitization: Objectivation, the authority of the speaker and mobilization of scientific facts. Security Dialogue. 2011; 42(4-5):385-97.
17. Marquardt MJ. Building the learning organization: Mastering the 5 elements for corporate learning. Boston: Nicholas Brealey Publishing; 2002.
18. Drucker P. Management Challenges for the 21st Century. New York: HarperBusiness; 1999.
19. Edwards PJ, Huang DT, Metcalfe LN, Sainfort F. maximizing your investment in EHR: Utilizing EHRs to inform continuous quality improvement. J Healthc Inf Manag. 2008;22(1):32-7.
20. Woods-Townsend K, Christodoulou A, Rietdijk W, Byrne J, Griffiths JB, Grace MM. Meet the scientist: the value of short interactions between scientists and students. International Journal of Science Education. 2016; 6(1):89-113.
21. Djenchuraev N. Toward a new policy for scientific and technical communication: The case of Kyrgyz Republic. Cornell University: Computers and Society; 2004.
22. Riahi A, Rod MA, Ahmadi E. Iran's Scientific Interactions and Communications with the G8 Countries. Collnet Journal of Scientometrics and Information Management. 2014; 8(2):217-25.
23. Eden S. Public participation in environmental policy: considering scientific, counter-scientific and non-scientific contributions. California: Sage; 2016.
24. Merton RK. Priorities in scientific discovery: a chapter in the sociology of science. American sociological review. 1957; 22(6):635-59.
25. Michael Z, Henri L. Global Governance as Multi-Level Governance: Handbook on Multilevel Governance.

London: Oxford University Press; 2010.
26. Newland K. The governance of international migration: Mechanisms, processes, and institutions. Global Governance. 2010; 16(3):331-43.
27. Hassan A. Human resource development and organizational values. Journal of European Industrial Training. 2007; 31(6):435-48.
28. Gholifar E, Hedjazi SY, Hoseini SM, Rezaei A. Human resource development: Faculty members' psychological empowerment in Iran's colleges. African Journal of Business Management. 2011; 5(31):12249.
29. Haynes B, Haines A. Barriers and bridges to evidence based clinical practice. BMJ. 1998; 317(7153):273-6.
30. Dundar H, Lewis DR. Determinants of research productivity in higher education. Research in higher education. 1998; 39(6):607-31.