

NORTH KOREA AND THE ROLE OF SCIENCE DIPLOMACY

Gianluca Spezza

This study analyzes education, science, and technology initiatives as a potential bridge toward peace on the Korean Peninsula by asking what the potential impact of education and science in diplomacy with North Korea is and what problems these initiatives face. Science diplomacy with North Korea has been on the rise since the country began to open itself to the international community in the mid-1990s, despite periodic tensions and sanctions limiting such activities in more recent years. This paper explores the main facets of science diplomacy (educational exchanges, knowledge transfer, information, and technology provisions) as a potential entry point, perhaps less sensitive to political vagaries, to start joint projects and foster relations between South Korea and the U.S. with North Korea.

Series on Peacebuilding on the Korean Peninsula

This essay is part of an ongoing series by ISDP's Korea Center to provide different perspectives on peacebuilding on the Korean Peninsula. In so doing, it recognizes that peacebuilding is a long-term process and involves different dimensions, from the diplomatic and military to economic and societal.

Introduction

Could science and education be conducive to fruitful dialogue and cooperation with the DPRK, and if so, under what conditions? This paper examines the development, characteristics, and challenges of science diplomacy with North Korea, understood here as the sum of educational, scientific, and technological interactions that foreign actors have with the DPRK through bilateral programs, seminars, conferences, and academic exchanges.

Although North Korea has participated in educational activities and knowledge transfer programs since

the early 1980s, with the support of UNESCO and UNDP, what is currently defined as "science diplomacy" with the DPRK began in 1995, when the country opened up to the international community in an effort to cope with its humanitarian crisis.¹ However, activities and partners have changed in nature and frequency over the last decade, as a direct and indirect result of international sanctions and tensions related to the DPRK's nuclear program.

The first section of this paper summarizes how education and science diplomacy gained a role within peace research and conflict resolution and how the notions of "education," "science," and "engagement"

gained traction during the 1980s. Subsequently, this paper attempts to discern whether the same model – successful during the latter years of the Cold War – can be applied to the DPRK, assessing the assumptions, limitations, and even risks of such. Focus is put in particular on the United States and South Korea as external actors. The conclusion then argues the need to recalibrate expectations of what science diplomacy can achieve as well as identifies potential opportunities for future educational collaboration with North Korea.

Unpacking Science Diplomacy

Science diplomacy is best understood as an effort by certain actors to engage other countries where relationships are scarce, difficult, or non-existent by dealing with non-sensitive issues, where both sides can gain something. Other terms may collectively denote similar activities: educational engagement, educational cooperation, and scientific cooperation. In addition, scholarly works draw a necessary distinction between "science in diplomacy," "diplomacy for science," and "science for diplomacy"; the latter is often referred to as "science diplomacy" and implies that scientific missions of any kind, in view of their apolitical nature, lend themselves to initiating or fostering dialogue between two states with strained or non-existing relations.³

This general understanding of science diplomacy stems from the period during and right after the end of the Cold War; namely, encompassing cooperation and assistance from the West to Eastern Bloc countries. For the Western powers, the decline (and later the collapse) of the Soviet-backed regimes throughout the Eastern Bloc seemed to validate a framework where education and science – first introduced as apolitical pathways to dialogue – could ultimately function as a discreet conveyor belt to improve understanding of these states, and to present the values associated with liberal democracies: peace, freedom, disarmament, and socioeconomic progress inclusive of human rights.

Such a framework has by no means been confined to the Cold War period. As international tensions

The Institute for Security and Development Policy is an independent, non-partisan research and policy organization based in Stockholm dedicated to expanding understanding of international affairs.

For enquiries, please contact: info@isdp.eu

No parts of this paper may be reproduced without ISDP's permission.

Disclaimer: The opinions expressed in this paper are those of the author only and do not necessarily reflect those of ISDP or its sponsors.

worldwide multiply, proponents of education and science as a vehicle for peace dialogue have expanded their reach into other areas, such as the Israel-Middle East conflicts, Indo-Chinese tensions, and of course, the conflict between the US and North Korea, as well as the two Korean states.

In the case of North Korea, both the engagement actors and the literature on their activities (reports, guidelines, agreements) use interchangeably the terms "educational exchanges," "education diplomacy," "science diplomacy," and "education and science diplomacy," referring in each instance to the use of science and education as a platform for dialogue with North Korea.

This terminology encompasses anything that goes beyond the simple introduction of foreign knowledge into North Korea, and that, at the same time, helps the North Korean government to improve the educational level of its science elites (and, to a much lesser degree, of the general population), either by participating in projects of international cooperation or by sending government officers, teachers, and students abroad to engage in learning and training.

From a more technical standpoint, these activities are often referred to as either "knowledge sharing," "knowledge import/export," or "knowledge transfer"; the nature and scope of these activities varies, but these terms are used almost interchangeably in the literature on the DPRK's foreign relations. All these definitions imply – at some level – that North Korea

acquires knowledge from external sources and that somehow the presence of North Koreans abroad and their interaction with foreign counterparts will eventually contribute to a better mutual understanding between the DPRK and any host or partner country.

The two Korean states can cooperate as they did during the sunshine policy years (1998-2007) and as they agreed to do in the two most recent inter-Korean summits.

This paper makes a few distinctions. Here, the “transfer” of knowledge relates to what is brought into North Korea from the outside; for instance, North Koreans returning home from a period of training abroad operate “knowledge transfer,” just as foreign educational institutions do by setting up programs in the DPRK. “Knowledge sharing” by contrast refers to processes that take place in North Korea or other countries, with the participation of foreign institutions or actors. Here, the term “sharing” is used because, even though the majority of knowledge still flows from the outside into North Korea, foreign actors are able to learn more about the DPRK during the process.

Finally, “knowledge export/import” broadly describes all initiatives started with the specific goal of improving North Korea’s current situation by means of training and educational programs. In this instance, the words “export” and “import” do not carry an economic connotation; most of the time, the DPRK does not contribute financially to such operations or it does so in minimal part.

The DPRK Case: Science Diplomacy's Limits

Building on these definitions, and the standard model

of education/science engagement, the central question is whether education and science diplomacy could work just as well today with Pyongyang, particularly in inter-Korean and U.S.-DPRK relations, as it did between the United States and the USSR. After all, if during the Cold War, “the USSR and USA could successfully negotiate on a mutual scientific goal (the Apollo-Soyuz project), why could South and North Korea not do the same?”⁵

The short answer would be that the two Korean states can (and should) cooperate as they did during the sunshine policy years (1998-2007) and as they agreed to do in the two most recent inter-Korean summits. The sunshine years were particularly important as South Korea expanded and systematized knowledge about education, human resources, scientific development and innovation in the DPRK, with a view to formulating policy that would sustain closer collaboration between the two states.⁶

The underlying idea was that improving cooperation in science and education was a necessary step toward the reunification process – no matter how far ahead – just as much as economic or humanitarian cooperation. Despite obvious obstacles to implementation, not least sanctions and periodically escalating military tensions, this tenet has not fundamentally changed since the years of the sunshine policy: that is, opening the DPRK up to exchanges holds the promise of gradually enmeshing and “normalizing” it.⁷

The relationship that Seoul holds with Pyongyang differs drastically, however, from that of Washington. Whereas initiatives promoted by South Korea have generally aimed at bridging the technological and economic divide between the two Korean states with a view toward eventual reunification, efforts sustained by the U.S. and other Western countries have often aimed at opening a two-way exchange of information.⁸ Under this scenario, gathering knowledge about the DPRK is deemed to be just as important as delivering foreign knowledge into the DPRK.⁹ Using education, ICT, and science as platforms for dialogue is part of a greater effort of track-II diplomacy with the DPRK, dating back to the late 1990s.¹⁰

This underlying assumption in track-II dialogues is modeled on the understanding of North Korea as a regime comparable to those in the Soviet camp. It is postulated that official relationships and the living conditions of people could both be ameliorated by the same means that helped liberal democracies make a breakthrough into the hearts and minds of people in Eastern European regimes.¹¹ However, this assessment of North Korea is far from consensual, particularly when it comes to the nature of its governance, and whether Pyongyang could be compared to other Soviet satellites.¹²

According to the actors involved in the engagement process, track-II initiatives have produced encouraging results. S. Thorson and H. J. Seo, in their 2010 report on science diplomacy activities between the United States and North Korea, describe science diplomacy as "international scientific cooperation aimed simultaneously at advancing scientific knowledge and improving and strengthening broader relations between participating countries and groups. Science diplomacy has proved to be especially helpful in engaging countries where traditional diplomatic relations have been problematic. Successful science depends on the trusted application of shared protocols and thus encourages the development of trust among participants."¹³

In so doing, the authors claim "evidence from a long-term academic science engagement between the United States and North Korea ... that (1) sustained science engagement provides a valuable context for developing trust between individuals from countries with great political differences, and (2) this trust can spill over into more traditional diplomatic engagements."¹⁴

Two major objections can be leveled at this viewpoint. One is that there is, in fact, little evidence of science engagement spillover into traditional diplomatic relations with North Korea, which remain overshadowed by nuclear/security issues. To date, one of the very few initiatives that bridged mutual understanding with the need to contain and regulate the North Korean nuclear program is the relationship that US scientist Siegfried Hecker maintained with

North Korean authorities during the 2000s.¹⁵ Though Hecker reported to the US state department, his efforts remained on a more personal level rather than being part of a global institutional effort, and were progressively curtailed as the number and scope of sanctions on the DPRK expanded.

There is, in fact, little evidence of science engagement spillover into traditional diplomatic relations with North Korea, which remain overshadowed by nuclear/security issues.

The second is a consideration rooted in the analysis of bureaucracies from the Eastern Bloc regimes and totalitarian regimes in general: the notion that the primary recipients of engagement activities (elite bureaucrats, government officials, and technocrats) may be unable (if willing) to change the status quo – or – they historically display little interest in modifying regime dynamics because they have acquired a considerable level of safety and a certain degree of power within the regime, and have no incentive to renounce such benefits.¹⁶

Over the last three decades, the sum of scientific and educational cooperation with North Korea has provided enough results and drawbacks to assess its limitations.

One set of limitations is intrinsic to the regime and the way it cooperates with foreign entities. Whenever engaging in scientific and educational cooperation, the DPRK has done so on its own request. It has therefore shown compliance exclusively within programs that match its national interests as specified in domestic propaganda. When international organizations and the government of North Korea agree to joint educational and scientific programs, they do so in order to increase North Korea's chances of compliance

with the requirements of long-term Frameworks and programs of sustainable development (Education For All, Millennium Development Goals, and the Sustainable Development Goals). In other words, North Korea joins these international frameworks of cooperation with the understanding that none of them would seek to modify the status quo on the peninsula or the nature of the regime, and that the goals of these frameworks and programs remain compatible with the overall development goals of the North Korean government.

The second set of limitations is external to North Korea and of a specifically political nature. For education and science to work meaningfully in the DPRK, both individual actors and institutions should operate with a sincere interest in delivering education as a means to reduce (and possibly end) the aid dependency, without any particular political agenda or expectations of “change” in North Korea. So far, the expectation that informal (apolitical) engagement could somehow “ignite change from within” has been disproved by facts: simple exposure to foreign culture or advanced economies does not translate into power to change things from within institutions in the DPRK. If that were the case, logic dictates that a simple look across the Yalu river should be an eye-opener for all North Koreans, enough perhaps to demand profound changes within the system.

The international community, for its part, has made it clear that as long as the regime does not change in nature – forfeiting the nuclear and ballistic programs – it will remain isolated and deprived of any possibility to pursue economic development. This is the framework within which we can observe the limits of education and scientific cooperation.

“North Korea joins these international frameworks of cooperation with the understanding that none of them would seek to modify the status quo on the peninsula or the nature of the regime.”

TABLE 001: EXAMPLES OF MAJOR INITIATIVES FOR EDUCATIONAL ENGAGEMENT WITH NORTH KOREA

Country/Organization	Program - Years Active
Australia	The International and Business Management Program at the Australian National University (1997-1998)
Canada	Visits of Academic Delegations during the 1990s (1990-1999) The Canada-DPRK Knowledge Partnership Program (KPP) at the UBC Vancouver (2010-?)
Germany	The Hanns Seidel Foundation (HSS) (2003 - ?) The Friedrich Naumann Foundation for Liberty (FNF)(2003 - ?)
Singapore	The Singapore Nanyang Technological University Program (1998) Choson Exchange (2006-present)
South Korea	Okedongmu Children's Educational Support to DPRK (1995-2005) Korean Sharing Movement's Support Activities for DPRK (est. 1996, active 2001) Good Neighbors International's Education Support Program (1995-2005)
Switzerland	The CASIN Training and Study Tour Programs (1997-1998) The Pyongyang International Business School (PBS) (2004-2011)
UK	North Koreans in the UK and the Chevening scholarship program (2011) The English Language Training Program (ELT) in Pyongyang (1997-2012) University Exchanges (1997-?)
UN	The UNCTAD Program (1998) Curriculum Development and Teacher Training in Singapore (2003) Study visit to China on computer education (2003) EMIS establishment and training (2003) National workshops on learning assessment (2005) Training and in-service teacher training using ICTs (2004-2005) Education through TV (2004-2005)
USA	DPRK officials visit to the University of Georgia The Shorenstein Asia-Pacific Research Center (APARC) at Stanford University Report on ten years of US – DPRK educational exchanges PUST (Pyongyang University of Science and Technology) – South Korea also involved (mainly through private donations).

Risks of Scientific Cooperation

Further bolstering the arguments of critics of scientific and educational cooperation with the DPRK, recent UN Security Council (UNSC) reports provide evidence of worrisome unintended consequences. In 2019, a UNSC panel investigated alleged instances of crypto-jacking, which used malware to infect a computer to exploit its resources to generate cryptocurrency illicitly. One report analyzed a piece of malware designed to mine the cryptocurrency Monero and send any mined currency to servers located at Kim Il Sung University in Pyongyang. Separately, according to another report, the Republic of Korea Financial Security Institute specifically attributed a similar crypto-jacking attack on a South Korean company's computer to DPRK hackers.¹⁷

Subsequently, in 2020 the UNSC published a new report concerning possible violations of sanctions. Three aspects of educational and scientific activities came under scrutiny: the sponsorship of invited scholars from the DPRK to educational institutions worldwide, intangible transfers of technology, and the connection between scientific research enhancement and the North Korean nuclear program.¹⁸

On the first issue, the Panel (§149) noted "several academic exchanges in 2019, including long-term exchange programs hosted by academic institutes in Canada and China. The Panel inquired about the sponsorship of the programs, especially the income earned overseas by nationals of the DPRK during the programs. In response to the Panel's inquiry, a Canadian institute responded that the Canadian authorities were being consulted. China replied that two scholars of the DPRK, newly invited to an institute, had entered for academic exchange, not for work."¹⁹

On the intangible transfer of technology (§201 to §203), the UNSC report indicates that North Korea continues to "search for technological solutions to manufacture components or overcome technical challenges inherent in the design, production and adaptation of weapon systems" by seeking to expand the knowledge and technical capability

of its technicians. According to the UNSC, the DPRK has a long-term program that "guides its strategy in prospecting for the intangible transfer of technology."²⁰

There is no doubt that the DPRK needs substantial help to advance scientifically and technologically having lagged behind the rest of the region since at least the early 1980s.

On the issue of the DPRK's nuclear program, the UNSC report paid specific attention to the production capability of Lithium-6, suggesting that "the scientific research conducted by the DPRK, which started before the UN sanctions, could have provided the DPRK with knowledge and materials for production of Lithium 6, a vital material for development of a thermonuclear device."²¹

In a more recent UNSC report from March 2021, focus was put on research advancements in the two major North Korean universities, highlighting a connection between academic research and military capabilities: "Recent publications of Kim Il Sung University and Kim Chaek University of Technology include research related to nuclear programs [...] This suggests that universities of the Democratic People's Republic of Korea continue research in academic fields which could contribute to the country's programs related to weapons of mass destruction."²² The same report also mentions again the issue of the intangible transfer of technology in relation to the activities of North Korean universities explored a year prior.²³

While these concerns do not conclusively prove that cooperation in science and education with the DPRK are fundamentally counterproductive,

they nevertheless demonstrate a need on the part of program planners to carefully monitor activities.

Conclusion: Recalibrating Expectations

There is no doubt that the DPRK needs substantial help to advance scientifically and technologically having lagged behind the rest of the region since at least the early 1980s. However, the external expectation that science diplomacy and educational exchanges can be a catalyst for socio-political change within North Korea – and thereby contribute to more peaceful relations – would seem misguided, at least in the current context for the reasons outlined earlier.

In sum, Science diplomacy offers no quick-fix panacea in changing the political nature of North Korea or spilling over to transforming deeply entrenched conflict dynamics.

Rather, in the case of North Korea, scientific and educational engagement should be understood as implementing science to benefit the socioeconomic progress of that country without necessarily having to change the political nature of the regime first. While there may be moral and political objections to such an argument, a modernized and economically viable North Korea ultimately means better chances of survival and human development for the North Korean people. Second, North Korea's growing technological, informational, and educational gap with South Korea and China, together with the heavy financial burden attached to any project of inter-Korean integration, risks leaving the country completely behind without much hope of joining the rest of the region.

Two types of efforts could bring immediate, tangible benefits to the DPRK and its regional partners, particularly South Korea, without running the risk

of contributing to its nuclear/missile programs or directly enriching the regime.

First, future initiatives ought to focus on bringing North Korean educational standards on a par with the rest of the region with the understanding that the nature of the regime will not necessarily change as a consequence. A more realistic expectation is that a modern, less dogmatic education system, as well as the development of scientific disciplines for civilian (rather than military) use could, over the long term, improve the chances of integration with neighboring economies, particularly in the hypothesis of a federal state on the Korean peninsula. At least, this has been the hope, and the purpose of studies and initiatives launched during the sunshine era (and beyond), when South Korean think tanks mapped the extent of the technology-knowledge gap with the North as an important variable within the federation/reunification scenario.²⁴

The second type of effort should aim at enhancing North Korea's statistical capability. The researcher Benjamin Silberstein convincingly argues that this would be "not only for better policy-making within the country but also toward better-informed development cooperation and aid policies."²⁵ Indeed, statistical work is the cornerstone of nearly all activities and programs led by the UN, in the DPRK as elsewhere; the progress made with the multiple cluster surveys (MICS) by UNICEF, or the population and health studies by the UNFPA and WHO in the DPRK demonstrates the need for and the importance of reliable statistical production.²⁶

In sum, science diplomacy offers no quick-fix panacea in changing the political nature of North Korea or spilling over to transforming deeply entrenched conflict dynamics. However, scientific and educational exchanges and capacity-building do have a potentially important role in contributing to North Korea's socio-economic development, without which long-term peace and stability on the Korean peninsula will remain elusive. ■

Author Bio

Dr. Gianluca Spezza is an Associated Research Fellow of ISDP's Stockholm Korea Center, and an Invited Professor at the Faculty of Economics & International Affairs, Kasetsart University, Bangkok, Thailand. Dr. Spezza earned his PhD in 2018, conducting research on the cooperation between UNICEF and the DPRK in education and childcare. He previously worked as assistant professor of international relations at KIMEP University in Almaty, Kazakhstan and senior researcher at KIMEP's DPRK Strategic Research Center. He is currently writing a monograph on education, international cooperation, and scientific development in North Korea (Palgrave 2021) and recently published a chapter in the edited volume "East–West Reflections on Demonization. North Korea Now, China Next?" by NIAS Press. Since 2012, his work on the DPRK, articles or interviews, can be found, among others, on the websites of the BBC, The Guardian, The Diplomat, IRIN-New Humanitarian, The Interpreter, NK News, DR.dk, Newsweek Korea, and El Confidential.

About ISDP Korea Center

The ISDP Korea Center seeks to promote informed understanding and constructive dialogue on issues of peace, security, and sustainable development on the Korean Peninsula. It also serves as a hub to advance knowledge, exchange, and cooperation between Korea and the Nordic region.

Endnotes

1. This paper refers to the collaboration between the DPRK and the international system, intended here to encompass Western liberal democracies in general, the NATO camp during the Cold War, and countries that were not aligned within the Soviet camp or under Chinese influence during the Cold War. Within the Eastern Bloc, or even the non-aligned movement, scientific, educational and technical cooperation was considered a “default” feature of the system.
2. Ruffini, P. B. (2017) *Science and Diplomacy. A New Dimension of International Relations*, Palgrave.
3. Ruffini, Op. Cit.; see also: Van Langenhove, L. (2017) *Global Science Diplomacy as a New Tool for Global Governance*, United Nations University Press.
4. Wertz, D., (2017) *Track II Diplomacy with Iran and North Korea. Lessons Learned from Unofficial Talks with Nuclear Outliers*, NCNK.
5. Krasnyak, O., (2017) *A new frontier? Science diplomacy with North Korea*, Asia Dialogue, June 19th, online at: shorturl.at/dqAQ6.
6. See: Shelton, R. D.; Lewison, G. (2013). *Scientific collaboration as a window and a door into North Korea*. *Scientometrics* 97 (3–11). Also: Babson, B. (2007). 'Knowledge Sharing With The DPRK, Future Possibilities and Challenges.'; Kwak, J. S. (2006). 'Promoting International Cooperation For Education Development In DPRK.' *Kedi Working Papers*; Na, H. R. (2009). 'Research And Education Network As International Development Aid to North Korea.' *International Journal Of Communications Law And Policy* 13; Park, J. and Jung, S. (2007). 'Ten Years Of Knowledge Partnership With North Korea.' *Asian Perspective* 31 (2), 75-93.
7. Hyunjin Seo & Stuart Thorson, (2010) *Academic Science Engagement with North Korea*, KEI academic paper series 3: 105-122.
8. See: Linda Staheli (n.d), *Engaging North Korea with Science Diplomacy*, USC Center on Public Diplomacy, online at: https://uscpublicdiplomacy.org/pdin_monitor_article/engaging-north-korea-science-diplomacy; Hyunjin Seo & Stuart Thorson, (2010) *Academic Science Engagement with North Korea*, KEI academic paper series 3: 105-122.
9. Park, K. A. (2001). 'The Pattern Of North Korea's Track-Two Foreign Contacts.' *North Pacific Policy Papers* No.5; Kim, Y. (2014). 'North Korea, Crisis as an Opportunity and the Unintended Consequences of Engagement.' *KSPS*; Babson, B. (n.d). 'Transformation And Modernization Of North Korea. Implications For Future Engagement Policy.' In 'Improving Regional Security and Denuclearizing the Korean Peninsula.'; Andersson, M. and Bae, J. (2015). 'Sweden's Engagement with the Democratic People's Republic of Korea.' *North Korea Review* 11 (1), 42-62; Weingartner, E. (2007). 'Towards a Liaison Unit for Knowledge Sharing in Pyongyang.'; Seliger, B. (2009). 'Engagement On The Margins. Capacity Building In North Korea.' *KEI Economic Papers* 25; Habib, B. (2013). 'A Curious Case. North Korea And The United Nations Framework Convention On Climate Change.' *Korea Studies Association of Australasia Biennial Conference*; Habib, B. (2015) *Balance of Incentives. Why North Korea Interacts with the UN Framework Convention on Climate Change*, *Pacific Affairs* 88(1): 75-97.
10. Wertz, D., (2017) *Track II Diplomacy with Iran and North Korea. Lessons Learned from Unofficial Talks with Nuclear Outliers*, NCNK.
11. Shelton, R. D.; Lewison, G. (2013). *Scientific collaboration as a window and a door into North Korea*. *Scientometrics* 97 (3–11). An example of such breakthrough could be Reagan's exhortation to “tear down the wall” during his Brandenburg gate's speech.
12. On this point, in particular, see: . Dukalskis, A., (2018) *The Authoritarian Public Sphere: Legitimation and Autocratic Power in North Korea, Burma, and China*, Routledge; Korhonen, P., Mori, T. (2019) *North Korea as a Small Great Power*, *Asia Pacific Journal (Japan in Focus)* 17-5(2), online at: <https://apjif.org/2019/05/Korhonen.html>; McEachern, P. (2010) *Inside the Red Box: North Korea's Post Totalitarian Politics*, Columbia University Press; Myers, B. R. (2011) *North Korea's State Loyalty Advantage*, *Journal of International Affairs*, 65(1): 115-129; Smith, H. (2005b) *Disintegration and reconstitution in the Democratic People's Republic of Korea*, in: Chesterman, S., Ignatieff, M., Thakur, R.C. (eds.) *Making States Work: State Failure and the Crisis of Governance*, United Nations University Press.

13. Hyunjin Seo & Stuart Thorson, (2010) Academic Science Engagement with North Korea, KEI academic paper series 3: 105-122.
14. Ibid,
15. Siegfried S. Hecker, A Return Trip to North Korea's Yongbyon Nuclear Complex, Center for International Security and Cooperation, Stanford University November 20, 2010; Siegfried S. Hecker, What I Saw in North Korea and Why it Matters, Google Tech Talks, April 6, 2011, online at: <https://www.youtube.com/watch?v=VIdRSl7Dc88>; Siegfried S. Hecker, (2012) Can the North Korean nuclear crisis be resolved? Center for International Security and Cooperation, Stanford University. Presented at the Conference on "Rethinking Nuclear Issues in Northeast Asia" Organized by the Institute for Far Eastern Studies/Kyungnam University (IFES) and the Friedrich Naumann Foundation for Freedom (FNF) in Seoul, Republic of Korea, March 21, 2012.
16. United Nations Security Council report, 4 March 2021, (§ 12 to 14), p.7.
17. See: United Nations Security Council, 30 August 2019 (§67): p. 29. The report quotes two sources: Chris Doman, "A North Korean Monero cryptocurrency miner", Alien Vault, 8 January 2018; and Sam Kim, "North Korean hackers hijack computers to mine cryptocurrencies ", Bloomberg, 1 January 2018. According to the report: "the malware is believed to have generated approximately \$25,000 worth of Monero for the hackers who deployed the malware. Given the increased anonymity of Monero, it is difficult to determine the total amount of revenue that the Democratic People's Republic of Korea may be generating from such attacks. Nevertheless, this crypto-jacking incident suggests the increasingly sophisticated use of crypto-jacking by the Democratic Republic of Korea and its willingness to use malware to generate cryptocurrency through mining for the benefit of the regime."
18. See: United Nations Security Council report, 2 March 2020, pp: 57, 72-74, and annex 57.
19. Ibid. 57.
20. 72: The panel notes that "Member States have identified needs of the Democratic People's Republic of Korea in relation to such transfer in several fields According to Member States, the DPRK continued to be interested in the behavior of advanced composite materials in special environments, and in aerospace-related technology, rocket- and missile-related technology, precision processing technology from advanced countries, and solar, wind and other clean energy technologies". The Panel investigated international scientific collaborations "involving scientists of the DPRK in particular fields of activity" on the basis of reports produced by scientific institutes and think tanks (see para. 201 and annex 67): "Furthermore, the Panel considers that, for the development of the weapons of mass destruction programme, in addition to direct blueprints or data, know-how for the operation of plants and laboratories is also important. §203. In addition to seeking inward technology transfer, the Democratic People's Republic of Korea continues to be an outward source of proliferation of technology, conventional weapons and items for supply chains related to weapons of mass destruction. It is known for transferring blueprints. A Member State reported that it remains very active in the provision of services in the field of artillery rocket system improvement. Despite the constraints on missile sales, it continues to seek opportunities for defense material sales as well as blueprints and data. For example, the wheeled and truck transporter erector launchers for two of the short-range ballistic missile systems tested in 2019 were sand or tan colored, possibly for marketing purposes.
21. See United Nations Security Council report, 2 March 2020, p. 219: (Annex 57: §1): "The Panel previously reported (S/2017/150, paras 24-25) a 2016 advertisement for sale of Lithium-6 (General Precious Metal) by a DPRK entity. A Member State recently shared its assessment, made on the basis of relevant academic publications in a science journal of Kim Il Song University since the late 1990s, that the DPRK had developed capability to produce the Lithium -6, enriched to the degree of 10.8±3%, which was advertised in 2016. Based on an open source report published in 2017, the Member State informed the Panel of the possible location of the facility in a chemical complex. [...] Furthermore, a chemical complex which is not specifically identified as a military or nuclear facility, may nevertheless be used directly for the DPRK's nuclear weapons program."
22. United Nations Security Council report, 4 March 2021, (§ 12 to 14) p.7
23. United Nations Security Council report, 4 March 2021 (§13): "Further to its previous investigation on the intangible transfer of technology the Panel is considering information from a Member State regarding 161 cases identified by the Member State as joint research or studies or jointly published papers with scholars of the Democratic People's Republic

- of Korea since 2017 on topics which may include technologies prohibited from being transferred pursuant to relevant Security Council resolutions.” - (§14): The Panel has requested information from 37 universities identified by Kim Il Sung University as “sister universities” with which it currently conducts academic exchanges or has previously done so. To date, nine universities had informed the Panel that they did not have academic exchanges or cooperation with Kim Il Sung University (see annex 9) and had identified no violation concerning the Panel’s enquiries. See also: UNSC, S/2020/151, paras. 201–203.
24. Yoon J.H., Lee D.H., Lee, S.H. (2006) *The Present And Future of the Educational Humanitarian Assistance to the DPRK*. KEDI Working Papers, Seoul: KEDI., Cho, J.A (2006). *North Korea’s Human Resource Development System*. Seoul: Korea Institute for National Unification (KINU)., Kwak, J.S. (2004). *Promoting International Cooperation for Education Development in North Korea*. Seoul: KEDI., Chung, S. (2001). 'Unification Of South And North Korean Innovation Systems.' *Technovation* 21, 99–107, Yoon, J. H., Lee, C. H., Et Al. (2007). 'Research On Methods Of Educational Cooperation Between North And South In View Of Unification Era.', Yoon, J. H., Lee, C. H., Cho, J. A. (2008). 'Educational System Change And Integration Prospect Between South And North Korea.'
 25. Silberstein, B. K. (2016). 'Development Cooperation with North Korea. Expanding the Debate Beyond the Political Horizon.' *Issues & Insights* 16 (1): 1-22
 26. Ibid. Silberstein makes an excellent case that the international community should then adopt "statistical capacity building as one of its areas within development cooperation with North Korea. This policy is relatively non-political: improved statistical capacity is of clear interest to the North Korean government and the international community alike" because it enhances capability on the part of the government to support modernization, healthcare, and education.