

Idea and Function of Science and Scientific Knowledge in a Glocalised World

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Introduction: Glocalisation of science?

Knowledge and science are goods that have a special role to play in a globalised world. The reason for this statement is simple: knowledge and science are the preconditions for allowing a common interpretation of the world and a common communication about the natural and human processes in it. On the one hand, a reliable common interpretation of the world is a prerequisite, but on the other hand, it is also an effect of globalisation. Furthermore, it is a precondition for global communication, the globalisation of technology, economics and politics. Therefore, a functioning world society will not only be a global economic community, it must be a 'global knowledge society' (Forstorp und Mellström 2018; Gleach und Darnell 2016; Pagano 2018; Wilson et al. 2013), a global community of understanding.

The precondition for this is a common setting of knowledge resources. Therefore, it is very important to deal with the idea of science and its function in a globalised world. Universities as scientific knowledge centres play a decisive role in this setting. Science in the strict or ideal sense is universal and claims reliability for everyone. The scientific community is a global community. Scientific knowledge is independent of time and space. We also believe it is global in the best sense, never local. And the question arises: Can the concept of glocalisation even be applied to the idea of science? The answer will be a decisive *yes* because the dialectic of global and local aspects plays a decisive role for the function of scientific knowledge and science.

Although scientific knowledge is always global in its claim and science can be regarded as the primordial phenomenon of globalisation (see Kühnhardt et al. 2017), the idea of a 'glocalisation' of knowledge and science is less reflected by science itself. Global university rankings are the visible effects of a global competition between higher education institutions worldwide (see Portnoi et al. 2010; Stack 2016). However, although the globalisation of higher education has been the subject of many studies (see Green und Whitsed 2015; Hall et al. 2018; Johnstone et al. 2010; Layne und Lake 2015; Mihut et al. 2017; OECD Publishing

and Centre for Educational Research and Innovation 2009; Webber und Calderon 2015; Zajda 2015; Zajda und Rust 2016), there are only a few studies which reflect the tension between global and local with a view to higher education (see Cloete et al. 2006; Chou 2014). Nevertheless, it can be assumed that 'glocalisation' plays a decisive role in the process of generating and disseminating not only of knowledge, but especially scientific knowledge. Scientific knowledge and science have always been global, because scientific findings claim to be universally valid. But the generation of knowledge is always local, as is its generation, interpretation, application, implementation and utilisation. In addition, local is necessarily the organisational form or institutionalisation of science as university, higher education institution or research institute. And real and local are the problems and challenges which science tries to resolve. That is why it must be said that in a globalised world, the function of scientific knowledge and science is well explained only by considering the dialectics of global and local aspects.

- In the following, I will briefly address the concept of glocalisation in general in a first approach by (1) explaining the common understanding of glocalisation to find to what extent one can speak of a glocalisation of knowledge and science.
- In a second section (2), I dedicate myself to the phenomenon of the natural globalisation of general knowledge based on experience. The dynamic of the globalisation of general experiential knowledge can be described as a non-linear process for which global and local, intrinsic and extrinsic factors play an important role and today allow us to speak of a 'knowledge society' that is increasingly not only national but also global. Therefore, we can speak of a future 'global knowledge society'.
- Thirdly, we must distinguish between the natural globalisation of *experiential knowledge* and the globalisation of *scientific knowledge* or *science* (3). Knowledge as scientific knowledge or science is a shortening of the complex process of normally slow globalisation of experiential knowledge. Science is, so to speak, the institutionalised form of the natural process of knowledge globalisation. This has advantages and disadvantages. The most important disadvantage is that scientific knowledge as a result is always abstract, global, homogeneous in its claims, but not concrete or local, and therefore not heterogeneous. Therefore, science must first artificially produce and simulate the natural dialectic of global and local. It must make the local to an object of reflection to produce and generate knowledge which has a local impact. The academic place of this artificial generation of the dialectic of global and local are the higher education institutions and universities.

In conclusion, I would like to show which tasks and challenges science and universities must fulfil so that we can speak of them as places of glocalisation of knowledge. I do this in form of seven short theses which I hope will be self-evident as a result of my remarks.

1. 'Glocalisation' as dialectic of homogeneity and heterogeneity

The term 'glocalisation' – a linguistic hybrid of globalisation and localisation which means the simultaneous occurrence of both universalising and particularising tendencies in contemporary social, political, and economic systems – was introduced in the second half of the 20th century in many ways (see Seibert 2017). In the English-speaking world, the sociologist Roland Robertson (Robertson 2012, 1998) was decisive, later Zygmunt Bauman (Bauman 1996, 1998) as well, in introducing the concept.

The notion of glocalisation represents a challenge to simplistic conceptions of globalisation processes as linear expansions of territorial scales. Glocalisation indicates that the growing importance of continental and global levels is occurring together with the increasing salience of local and regional levels. Tendencies toward homogeneity and centralisation appear alongside tendencies toward heterogeneity and decentralisation. But the notion of glocalisation entails an even more radical change in perspective: it points to the interconnectedness of the global and local levels. Therefore, glocalisation is a corrective term to the concept of globalisation as a kind of homogenization. 'Glocalisation' refers to the connection and coexistence of the multidimensional process of globalisation and its local and regional effects and connections, including the various feedback effects. All events at a certain point in the world are of local-regional and at the same time of global supra-regional significance because the process of globalisation becomes perceptible in one's own life and in everyday life. Therefore, glocalisation is the local impact and manifestation level of globalisation. Global and, at the same time, local networks give rise to networks that are responsible on the one hand for the formation of transnational production and marketing structures and the transnational institutionalisation of knowledge, and on the other hand for the change in the individual cultures.

Glocalisation can be observed under various aspects. Among other things, it has a cultural, economic, political and sociological dimension. But can we also speak of a glocalisation of knowledge and science? Like globalisation, glocalisation, too, does not describe a status, but a process. So, we must scrutinise the process of

glocalisation of knowledge and science. For this, we must first look at the process of the globalisation of knowledge for analysing the process of glocalisation of knowledge and science in a second step.

Basically, two forms of globalisation of knowledge can be distinguished:

- Firstly, there are natural processes of knowledge globalisation that have always taken place in history as unintended returns from other, e.g. economic or political processes as their side effect. Such natural globalisation processes of knowledge dissolve the tension of local and global by themselves in the act of their emergence and then also in the act of their reception. However: they need time, are unplanned and run in an unregulated manner.
- Secondly, there are artificial globalisation processes of knowledge in the form of scientific knowledge or science. Their advantage: they shorten the path and the time of natural globalisation processes of knowledge. Their disadvantage: They do not happen by themselves. They are planning intensive. They need their own institutions which can represent the specific type of global scientific knowledge locally without giving up global orientation. Complex political, legal and economic framework conditions and standards are the prerequisite for this: They require a differentiated education system, headed by higher education institutions and knowledge-generating research institutes. The problem here is that artificial glocalisation processes of scientific knowledge do not occur automatically. The process of implementation, inculturation, localisation, as well as the process of local knowledge generation reflected in science, must be actively shaped locally. This requires a corresponding competence profile for the scientific actors as well as for the institutions that generate, administer, disseminate and implement scientific knowledge.

2. The phenomenon of the natural globalisation of knowledge

So far there are only few historical investigations of those processes that lead to the globalisation of general knowledge (see Renn 2017). On the one hand, this is due to the extent and variety of the data required. On the other hand, there is currently no binding theoretical framework in which the diversity of types of knowledge and transfer processes can be described uniformly.

Researchers in this field understand globalisation as a process in which markets for goods, capital and labour emerge across countries and continents. At the same time, diverse knowledge is spreading around the globe – for example, in the form of new technologies or ideas. This has not only happened recently, but since time

immemorial: in the history of mankind, global exchange processes have always been accompanied by intensive knowledge transfer. Today, we regard globalisation with all its positive and negative consequences as a process that can only be controlled to a limited extent. Scientists, however, can contribute a great deal to solving this problem. By explaining the role of knowledge in historical processes, they are throwing light on a dimension that has so far been underestimated, but which could be of decisive importance for the controllability of globalisation processes.

2.1 The dynamics of globalisation

With a view to the dynamics of globalisation processes, researchers are concerned, for example, with the question of the extent to which the world's knowledge flows are dominated or limited by other processes of globalisation. The latter are undoubtedly also strengthening the dissemination of thoughts and ideas – and thus their potential to control the process of globalisation itself.

There is an inherent contradiction within globalisation processes: although they can lead to homogeneity and standardisation of culture, they can also provoke diverse coping strategies that create, in effect, more complexity. This contrast indicates the important mediatory role that national and regional institutions play in the implementation of global processes. It further shows that globalisation is, in fact, a dynamic process that involves the interaction of various layers, such as population migration, technological spread, dissemination of religious ideas and the emergence of multilingualism – each of which has its own dynamics and history.

Goods, tools, ideas and technical skills – meaning, products of civilisation – circulate among human groups with different rates of diffusion, but typically faster than cultural products like languages, traditional rituals, ideologies or administrative and political institutions, indicating the crucial role of knowledge in these processes. Objective knowledge belongs more in the field of civilisation than in the field of culture. For example, goods and the technologies that are required to produce them often spread independently.

Successful transfer of knowledge regarding the production of tools requires at least linguistic capabilities. Thus, multilingualism, which is a characteristic of ancient scribal cultures, becomes understandable as another critical factor in globalisation processes and even as an indicator of cultural sophistication. Its im-

portance can be seen in the earliest lexicographical literature, which contain glossaries and tools to aid communication, and might be considered prerequisites for further globalisation. A common or universal language is an illusion. A common understanding of the world would need at least a kind of artificial language which uses clear and distinct concepts.

2.2 Globalisation as a nonlinear process

These prerequisites do not necessarily imply, however, that there is a mechanical progression of processes in globalisation; for instance, the globalisation of markets does not necessarily imply a globalisation of the political system. Rather, the interaction between the various layers might lead to different outcomes, as illustrated by the different ways in which religious and political ideas of order are incorporated in Buddhism and Confucianism, the ways in which knowledge constitutes identity and authority in different historical settings, and the ways in which ideas gain and lose authority.

The common factor in these layers of the globalisation process is knowledge. On the political level, education is considered to be critical in order to master the challenges of globalisation and address the tensions between its different layers. Yet knowledge is more than simply an aspect of globalisation as a precondition and consequence: it is a critical element of its development. The globalisation of knowledge as a historical process with its own dynamics orchestrates the interaction of all the underlying layers. The globalisation of knowledge is not only a relatively autonomous process but also profoundly influences all other globalisation processes — including the formation of markets — by shaping the identity of its actors and its critics.

2.3 Extrinsic and intrinsic factors of globalisation

There are intrinsic and extrinsic dynamics at work within knowledge development that interact and complement each other, creating positive feedback loops. Extrinsic dynamics include ecological, economic, cultural and political circumstances, whereas intrinsic dynamics consist of self-referential improvements of a knowledge system that give rise to an increasingly complex knowledge architecture. Intrinsic and extrinsic developments might be closely intertwined: an extrinsic development, such as colonising a new area, might depend on intrinsic

knowledge achievements, such as advancing astronomy or navigation techniques.

There is also interplay between global and local knowledge traditions. All knowledge traditions start as local knowledge with a specific context, group, range and history. Globalisation of local knowledge involves both intrinsic and extrinsic developments, potentially enhancing social dominance, range of application and degree of reflexivity, or, alternatively, destroying autonomy and reducing complexity. Consequently, this globalisation process should be perceived as a cross-over phenomenon. In addition, the globalisation of local knowledge is typically accompanied by a localisation, re-contextualisation and restructuring of global knowledge. More than simply being applied to a new situation, global knowledge has thus, in fact, become transformed.

Politicians are therefore right to regard education and science as a stable form of knowledge as crucial to people's ability to manage the consequences of globalisation. Knowledge is one of the central elements of globalisation because it affects all forms and all fields of globalisation by shaping the identity of all those involved.

3. Science as an institutionalised form of globalised knowledge

For this to succeed, not only the globalisation of knowledge is necessary, but also the globalisation of knowledge about knowledge, called science. This brings me to the third section of my speech. Scientific knowledge itself is therefore an important factor of globalisation and a prerequisite for building a global knowledge society. A global knowledge society is based on two things: on the one hand, the production of scientific knowledge according to global international standards, and on the other hand, the local ability not only to administrate and apply global, i.e. externally generated knowledge, but also to generate new knowledge and enhance existing ones, and to transfer newly developed local knowledge back into the global scientific community in order to be further developed there. You see I describe the phenomenon of glocalisation in science and regarding scientific knowledge. Science as a process is a continuous, never ending dialectical process of global and local knowledge.

3.1 The global knowledge society

A few years ago, we were still talking about the 'information society', which was to inherit the 'industrial society' (see Wilson et al. 2013). Today there is more or less consensus that the replacement of the 'industrial society' can be better described by the term 'global knowledge society' (see Forstorp und Mellström 2018). But it is not the mere transfer of knowledge that constitutes a global world, but the transfer of scientific, evidence-based knowledge. Theoretical knowledge and the possibility of generating it is the most important local resource of a global knowledge society. And the inclusion of science and knowledge work in the production of prosperity is the most important indicator of the structural change of a society in cognitive terms. Scientifically valid knowledge is therefore the most important immaterial capital in a global knowledge society. What is needed is not formal, accessible knowledge, but forms of living knowledge such as experiential knowledge, judgement, self-organisation and independent local knowledge production. They are called 'human capital' in business management terms and are regarded as decisive value-adding factors. But all this happens locally.

Scientific knowledge work is characterised by the fact that the relevant knowledge is continuously revisited and permanently regarded as capable of improvement. Scientific knowledge is in principle regarded not as truth but as a resource of development and it is inevitably linked to non-knowledge. Although scientific knowledge is more certain than experiential knowledge, which accompanies the natural process of globalisation, its uncertainty is not least triggered by the expectation that the change associated with the knowledge society will not come to an end and that one's own knowledge will have to be constantly revisited. Scientific knowledge work aims at permanent knowledge generation through research, which aims at innovation in the form of contributions to theory formation to stabilise the uncertainty. The results of this research are mirrored back into the global scientific community which thinks globally and acts locally. In this setting, higher education institutions, research institutes and universities are the institutionalized forms of the globalisation of knowledge.

3.2 Institutionalisation of scientific knowledge

Developed knowledge societies therefore need institutionalised academic places of knowledge transfer and knowledge generation. Under the conditions of the globalisation of knowledge, the establishment of such places has the purpose of participating in global knowledge and making it fruitful in a locally structured way. Its purpose is to control the implementation of global knowledge itself and

not to leave it to the natural course of change or to depend solely on external factors. And finally – and this is important – it gives the opportunity to actively participate in the local and global production of scientific knowledge itself. Because these processes are no longer natural, coincidental, non-linear processes, but processes that must be consciously planned, higher education institutions and universities as local places of global science also need their own scientific ethos, which regulates the self-control of knowledge transfer and knowledge generation. That means, although the generation of scientific knowledge is always local, it must strictly follow its own intrinsic laws and methods and must be largely independent of external (political, ideological, religious) factors. We in Germany speak of the freedom of teaching and research, which is guaranteed in our constitution. After all, scientific knowledge that is exposed to the suspicion of not being free in its formation and in its results and of being instrumentalised by non-scientific purposes remains globally ineffective.

In principle, the real scientific knowledge thus generated is always in the strictest sense a de-regionalised knowledge, not cultural knowledge, but – to use a term of Immanuel Kant – ‘world-knowledge’ (*Weltwissen*), and the scientist as scientist must see himself as a ‘citizen of the world’ (*Weltbürger*) (see Kleingeld 1998). Scientific knowledge differs in this way from the mere knowledge of experience or the everyday-life-knowledge that arises during the natural globalisation of knowledge. Scientific knowledge applies not only regionally, but globally. In principle, it must have an intersubjective plausibility for every rational being, regardless of its background of experience or its localisation. Scientific knowledge has not occurred by accident but was methodically generated. Therefore, it has the claim not only to be valid under every space-time condition, but it claims general validity and reliability. Scientific theories emerge at a distance from the personal world and in relative freedom from pressure to act. Their achievement consists in the creation of versatile explanatory patterns. While the range of non-scientific knowledge is small and solves obvious problems, the range of scientific knowledge is variable: it depends on whether it refers to singular events, to delimitable phenomena, to overlapping phenomena or even global problems.

The impression that all of us may have is that scientific knowledge and science move in a super global space. This is incorrect because science is a specific strategy of problem-solving competence for problems with varying ranges. If it did not have this differentiated problem-solving competence, it would be completely useless and superfluous.

3.3 The function of science in a glocalised world: practice and intervention

In the final analysis, science always serves to solve local problems, or let's simply say: 'real' problems with the help of general insights.

In the most general sense, one could therefore define science as follows: 'Science is the coherent conceptual formulation and methodical organisation of "reality", in order to gain knowledge of disposition and orientation for human practice'. From this definition we can learn the following:

- Scientific knowledge is conceptual knowledge. It is formulated in a language that functions as precisely as possible because it is validated by general definitions. I.e.: The use of scientific knowledge presupposes the learning of the global language of science. The conceptual language of science and the understanding of scientific terms is always global. Abstract terms have the function of reducing the complexity of perception. Only in this way do they enable intersubjective communication with clear and distinct terms that are free of equivocation and therefore reliable. This enables reliable global communication and understanding.
- Universal validity also characterises the way of generating scientific knowledge. This way is methodical in the sense that one must follow a very specific path in order to generate scientific knowledge. The methodical requirements of generation and verification of the validity of scientific knowledge (freedom from circles, inner logical consistency, outer consistency, explanatory value, economy, falsifiability and experiment) apply always and everywhere, if knowledge is real scientific knowledge. Even the methods of sciences must be global.

Members of the global scientific community can only be those who know and apply the global conceptual language of science and its globally valid methods. But, the purpose of modern science is not contemplation, theory formation for the sake of theory formation, or knowledge generation, or 'l'art pour l'art'. Its purpose is to enable effectively changing the world and to intervene in an evidence-based way in the world of natural and social affairs. Modern science always has as its goal the change of practice in the sense of provoking interventions in the processes of the world. The old distinction between basic science and applied science has already proven to be obsolete in the recent theory formation of modern science theory. And the demand for the freedom of value of science and research would be a paradox (Popper is right). For research is always positively guided by justifiable interests, purposes and the desire of sense: it seeks truth and tries to understand the order of the natural and of the human world to be able to solve real local problems and to reduce suffering and evil. Therefore, science is a

prudent approach and the most important step to changing the world positively without harming the natural and human world. That's the challenge of science and the mission of universities.

4. Conclusion: Glocalisation as challenge for science and the mission of universities

In conclusion, science is the institutionalised form of globalising knowledge. It shortens the laborious path of natural global knowledge production. This has advantages and disadvantages. The most important disadvantage is that scientific knowledge is always abstract and global, i.e. homogeneous in its demands. However, if it wants to fulfil its purpose of contributing to the evidence-based change of the natural and social world by drawing on general laws, it must artificially produce the dialectic of global and local to produce strategies of application and applicable knowledge. Universities have an important function in conveying global and local aspects of scientific knowledge. In this sense, the mission of universities regarding the glocalisation of science is fulfilled in seven points:

1. Glocalisation of science and university means active *participation and communication* of local scientists in the scientific discourse of the scientific community to generate, develop, communicate, discuss and evaluate scientific knowledge. Participation: Universities participate and take an active and passive part in the generation, further development, communication and exchange of global scientific knowledge. Participation also means that academic teachers and researchers see themselves as an active part of the scientific community. They are representatives of the worldwide scientific community and local experts at the same time.
2. Glocalisation for science and university means *differentiation and specialisation*. It does not mean homogenisation. Only in this way does the local perspective enrich science and, conversely, allow science to have local relevance. The local perspective is an important extrinsic factor of scientific progress. University rankings with their homogeneous evaluation criteria convey the illusory impression that homogeneity is the goal of the global university landscape. Rankings are market instruments and nothing more.
3. Glocalisation for science and universities means *implementation and dissemination*: Universities implement global knowledge in local contexts. They do this primarily through teaching and academic qualification of students so

that they can solve real problems at the local, regional, national and international level.

4. Globalisation for science and universities means *application*: Universities and academic teachers not only reproduce existing scientific knowledge; they apply it and develop it independently. Even academic teaching is a productive application. Teachers must always productively relate global knowledge to concrete, always cultural contexts and make local problems understandable in the light of global knowledge. But the opposite is also true: the evaluation of the experience of the application of global knowledge in the exploration of concrete fields of application generates general knowledge, which must be reflected back into the scientific community and thus contributes to the progress of science. Application itself must therefore always be productive and generating its own type of knowledge.
5. Globalisation for science and universities means *transdisciplinarity*. The old-fashioned research strategies – multidisciplinary as well as interdisciplinarity – are not adequate to solve real existing problems which are always local problems. Universities must leave the stakeholder perspective and bring on board the shareholders of scientific knowledge and research. The shareholders of science and universities are the state, politics, society, the human subjects and the human objects of scientific knowledge generation because the results of scientific research affect everyone. Those affected must be respected and integrated in developing scientific questions and research. Science is no longer made in the ivory tower.
6. Globalisation for science and universities therefore means transfer from practice to theory, from theory to practice. Transfer is a never-ending dialectical process. Its goal is *innovation* – both in the real and in the scientific world.
7. Globalisation for science and universities means *responsibility*. Science, universities and research institutions are important factors of economic prosperity, of social development and of a democratic culture. The results of research and scientific teaching have an important influence on society. Science therefore must be sustainable in various perspectives. Access to academic education is an important element of social justice. Science and universities shape the future. The results of the sciences change living conditions. Science and the university form an identity for teachers and students and promote their behaviour. Universities are concrete places of ethos formation where future decision-makers of a society spend formative years of their lives. The oft-lamented phenomenon of brain drain instead of the desirable brain circulation indicates a lack of responsibility, too. Universities

must therefore be places where students learn to assume responsibility for their concrete local actions by adhering to general ethical standards which, of course, are global.

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