Chapter 5
The *Bildung* Theory—From von Humboldt to Klafki and Beyond

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Bildung

Bildung is the central theory of education in the German speaking part of Europe and in Scandinavia (Sweden, Denmark, and Norway), and it is also influential on traditions of education in some South American countries, like Brazil (Sjöström, Frerichs, Zuin, & Eilks, 2017). *Bildung* covers a more than 200-year-long central European tradition of education dating back to works of Wilhelm von Humboldt in the late eighteenth century (see a translation of Humboldt's work from 1793 in Westbury, Hopmann, & Riquarts, 2000). Since then it has had an important role in central and northern European educational philosophy and policy.

Bildung is a theory of defining the aims and objectives of any education. It is a complex educational concept that has connections to both the Enlightenment and Romanticism. In the eighteenth century, *Bildung* was mainly connected to humanity and in the end of the nineteenth century it became mainly understood as a value and commodity (Sjöström et al., 2017). There was a decline in the use of the concept during the 1960s and 1970s, due to both the Sputnik shock and the student movement. However, since the 1980s the concept has to some extent reappeared and during the last two decades it has been reconsidered from late/postmodern perspectives (see for example Sjöström, 2018).

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B. Akpan and T. Kennedy (eds.), *Science Education in Theory and Practice*,
Springer Texts in Education, https://doi.org/10.1007/978-3-030-43620-9_5

Over the past two centuries, various scholars have contributed to clarify the concept of *Bildung*. Some important early *Bildung*-theorists from Germany were Wilhelm von Humboldt (1767–1835) and Johann Gottfried Herder (1744–1803). Examples of *Bildung*-scholars from Scandinavia are Nikolaj Frederik Severin Grundtvig (1783–1872), Carl Adalph Agardh (1785–1859), and Ellen Key (1849–1926). More recent German scholars in the field were Hans-Georg Gadamer (1900–2002), Paul Ricoeur (1913–2005), Erich Weniger (1894–1961), and Wolfgang Klafki (1927–2016).

The concept of *Bildung* is rich and complex. Generally, it consists of two elements: an ideal picture of desirable knowledge and skills, and free learning processes, or in other words both "the process of personal development and the result of this development process" (Fischler, 2011, p. 33). The seminal works leading to our contemporary understanding of *Bildung* stem mainly from the 1950s to the 1970s. Klafki and others defined *Bildung* (or *Allgemeinbildung* meaning *Bildung* for all and in all human capacities; see further below) as the ability to recognize and follow one's own interests in society and to behave within society as a responsible citizen (see the translated and updated contributions of Klafki in Westbury et al., 2000). This was linked to developing the capacity for self-determination, participation, and solidarity within society. Within this debate, *Bildung* was never understood as something one can be taught, but *Bildung*-oriented education is suggested as a way for everyone to support developing *Bildung* on their own. *Bildung* in a theoretical view is more of a concept of achieving capacity and skills than a set of facts and theories to be learned. *Bildung* is viewed more as a process of activating potential than a process of learning (see a translation of Weniger's work from 1952 in Westbury et al., 2000).

Schneider (2012) describes *Bildung* as a reflexive event and its function to design and form the self, a complex meaning-making process that occurs from childhood to advanced age. It is understood as a lifelong challenge and opportunity and is connected to developing critical consciousness, a process of character-formation and self-discovery. It is connected to issues of finding truth, value, and meaning. For Bauer (2003, p. 212), *Bildung* covers "creative, critical and transformative processes which change the relationship of self and world in conjunction with a changing social and material environment." In other words, *Bildung* consists of autonomous self-formation and reflective and responsible action in, and in interaction with, society. As a humanistic theory, *Bildung* theory (or better theories as will be described below) has similarities to some of the theories described in this book in Sect. V, such as systems thinking and transdisciplinary teaching. Contemporary ideas of critical-reflexive *Bildung*, which is in focus in this chapter, adds philosophical as well as political dimensions to the teaching and learning of science. As such, it is a vehicle for promoting socio-political activism, that is, assisting students to become active citizens in addressing science and technology-related issues at both local and global levels.

Because there is no precise English translation, the German term *Bildung* has been used in the international science education literature (see, for example, Elmose & Roth, 2005; Hofstein, Eilks, & Bybee, 2011; Sjöström, 2013). The often-used translation of *Bildung* as only "education" ignores its special roots and the unique

philosophical framework behind the concept. See Westbury et al. (2000) for some translated original contributions from the history of *Bildung* and the related concept of *Didaktik*. It is necessary to say that the *Bildung*-connected meaning of the term *Didaktik* in German and Scandinavian languages differs a lot from how the word *didactics* is used in English (Gundem, 2010). *Didaktik* in German and Scandinavian languages means the praxis knowledge about teaching and at the same time it covers the research area about teaching and learning (Kansanen, 2009).

In the German-speaking countries there has for a long time been a debate about what is to be meant by *Bildung* with its both individual and societal implications when it comes to the teaching and learning of science (e.g., Marks, Stuckey, Belova, & Eilks, 2014). Also in Scandinavia, there has been an interest in this debate. For example, in 1998 Svein Sjøberg published the first edition of his teacher education textbook *Science as part of Bildung for all—a critical subject-Didaktik* (our translation). It has become a standard text in science-teacher education in the whole of Scandinavia. In recent years, the concept of *Bildung* has been used to justify new philosophies of science education, like the ideas of critical scientific literacy (Sjöström & Eilks, 2018) or eco-reflexive science education (Sjöström, Eilks, & Zuin, 2016).

Before further applying the concept of *Bildung* on science teaching and learning and connecting it to the concept of "scientific literacy," we will first describe different ideas related to *Bildung* and then also its connection to what is called critical-constructive *Didaktik*.

Different Ideas Related to *Bildung*

With reference to the literature, Sjöström and Eilks (2018) and Sjöström et al. (2017) recently identified five educational traditions directly related to the *Bildung* theory. They can be called: (a) classical *Bildung*, (b) liberal education, (c) Scandinavian *folk-Bildung*, (d) democratic education, and (e) critical-hermeneutic *Bildung*:

(a) *Classical Bildung*: Classical Bildung is based on von Humboldt's way of understanding *Bildung* as a process of individualization, where the human being develops personality in all their human capacity. However, today von Humboldt is often—at least at universities—more associated with free search for knowledge, free from both the state and the market. The works of von Humboldt are also sometimes misused. His idea that *Bildung* manifests itself mainly in languages, led to a long time of devaluing the sciences for developing own worldviews in the individual.

(b) *Liberal education*: The thoughts behind liberal education can also be tracked back to von Humboldt in the means of education as character-formation. The character-formation ideal is emphasized especially in the English version, whereas the canon has been emphasized in the American version. A famous representative for a more critical and cosmopolitical version of liberal education is Martha Nussbaum (1997, 2010). She argues for ethical self-reflection and

critical approaches to the own culture and its traditions as essential part of education. This is needed to create enlightened citizens, rather than efficient workers and uncritical consumers. Nussbaum uses typical *Bildung*-type arguments for liberal education, however, without explicitly using the term.

(c) *Scandinavian folk-Bildung*: From the late nineteenth century a unique tradition called *folkbildning* in Swedish (might be translated as "*Bildung* for the whole people") was developed in Scandinavia. *Folk-Bildung* is less academically oriented than the classical *Bildung*. In this tradition, *Bildung* was combined with a pronounced benefit-approach. The political dimension was much more explicit in *folk-Bildung* than in the classical German version, but it was not especially radical.

(d) *Democratic education*: The idea of education for all was also developed in the USA by John Dewey (1859–1952). The connection of democratic education with *Bildung* lies in promoting social-ethical foundations of a society to promote democratic habits. Dewey used the term *Bildung* in his work, although not systematically.

(e) *Critical-hermeneutic Bildung*: This tradition is rooted in the works of Hans-Georg Gadamer and Paul Ricoeur and was developed mainly in the 1950s and 1960s by Erich Weniger and Wolfgang Klafki. They developed a new understanding of *Bildung* connected to educational practices and a democratic and emancipatory view of society. They created the term *Allgemeinbildung.* Within this concept, part of the word, *Allgemein* (which can be translated as "general") has two dimensions. The first dimension means to achieve *Bildung* for all persons (like in the Scandinavian approach of *folkbildning*). The second dimension aims at *Bildung* in all human capacities. Klafki's thinking was based on the thought that responsible life and action of any citizen in a democratic society needs *Bildung* as the capacity to determine one's own life, to be able to participate in society, and to act solidary toward others. This educational philosophy has a clear democratic and critical approach and is the most complex and advanced concept of *Bildung* (Sjöström & Eilks, 2018). It has later been influenced by late/postmodern perspectives in contrast to the other four *Bildung*-traditions, which are mainly based on Western modernism (e.g., Sjöström, 2018).

Klafki's Concepts of Material, Formal, and Categorical *Bildung*

Klafki's *Bildung* theory and its connected ideas of *Didaktik* include both epistemological aspects and practice-oriented concepts for use in lesson planning. Klafki explained his view of *Bildung* with the term categorical *Bildung* (see the contributions of Klafki in Westbury et al., 2000). It was developed based on an analysis of 150 years of views of knowledge and learning in educational theory. Klafki identified two main ideas of thought: (1) material *Bildung* and (2) formal *Bildung*, respectively.

Then he suggested the concept of (3) categorical *Bildung,* which includes elements from both material and formal *Bildung*.

(1) In material *Bildung* theories, content knowledge is prioritized over developing general competences of the learner. In other words, the objective side is prioritized over the subjective. There are two subgroups of material *Bildung* theories: scientific *Bildung* and humanistic *Bildung*, respectively. Scientific *Bildung* is based on a belief in the objectivity of knowledge, that is epistemological positivism. Humanistic *Bildung* focuses on cultural quality. It is about learning about human traditions.

(2) In formal *Bildung* theories, competences of the learner are prioritized over learning of content knowledge. In other words, the subjective side is prioritized over the objective. There are two subgroups of formal *Bildung* theories: functional *Bildung* and method-based *Bildung*, respectively. Functional *Bildung* has its roots in the philosophy of Rousseau and is also the type of *Bildung* emphasized by von Humboldt. Focus is on human powers and potentials. Method-based *Bildung* focuses on the processes of learning methods and ways of thinking to "master life." This line of thinking is connected to ideas of meta-learning and learning strategies. It is connected to the ideas of John Dewey.

    Generally, Klafki prioritized formal over material *Bildung*. However, there are several arguments to why formal *Bildung* theories are not enough of their own. The main problem with pure formal *Bildung* theories is that it is hard to develop any competences without having any content to apply them on. How can a teacher motivate students to develop skills without engaging in specific content? Instead of turning back to a content-based curriculum, however, Klafki suggested the concept of categorical *Bildung*.

(3) In categorical *Bildung*, Klafki suggested to connect both views. He suggested that any learning activity should contribute to both material and formal gains in the learner. He suggested selecting content that is elementary and basic for the discipline; that is fundamental for essential experiences of and insights into the world; and that has exemplary significance to offer structure for understanding the field of study.

The relationship between the three different types of *Bildung* is illustrated in Fig. 5.1. Material, formal, and categorical *Bildung* can further be connected to the five *Bildung*-traditions (described above) in the following ways:

Content orientation

Skills orientation		**Low**	**High**
	Low		Material *Bildung*
	High	Formal *Bildung*	Categorical *Bildung*

Fig. 5.1 Relationships between material, formal, and categorical *Bildung*

- Material *Bildung* emphasizes content knowledge. It is in line with the American version of liberal education, mainly focusing the canon of topics. Important aspects of especially humanistic material *Bildung* can also be found in classical *Bildung*, although von Humboldt's orientation is probably better described as formal *Bildung*.
- Formal *Bildung* emphasizes the development of the person. For example, the character-formation ideal is emphasized in the English tradition of liberal education, which focuses on skills development. Both the Scandinavian "folk-*Bildung*"-tradition and democratic education have many aspects that can be categorized as formal *Bildung*.
- Categorical *Bildung* emphasizes both content and the skills development in the learner. We would claim that critical-hermeneutic *Bildung* is most compatible with categorical *Bildung*.

Except emancipation, Klafki's view of *Bildung* can be described with terms such as autonomy, responsibility, reason, and interdependence, but also humanity, world, and objectivity education. He suggested the following three elements as guiding principles that characterize *Bildung*:

- Self-determination ability (to be able to take up one's own interests as part of society).
- Ability for participation (to be able to actively participate in and contribute to the development of society).
- Solidarity ability (to act responsibly in society with a view on those whose opportunities for self-determination and participation are limited).

In line with the thinking of Klafki, *Bildung* can be suggested as a critical concept in a late/postmodern world (Elmose & Roth, 2005; Sjöström & Eilks, 2018; Sjöström, 2018). It can form the basis for new interpretations of *Bildung* to come up with challenges of our contemporary society as a risk society to make education an eco-reflexive and transformative practice (Sjöström et al., 2016) and to provide relevant education in all its dimensions (Stuckey, Hofstein, Mamlok-Naaman, & Eilks, 2013).

Bildung and Critical-Constructive *Didaktik*

For educational operation Klafki and others developed a tool called *Didaktik* analysis as being part of what has been called critical-constructive *Didaktik* (see the contributions of Klafki in Westbury et al., 2000). According to Duit (2015, p. 325) *Didaktik* "stands for a multifaceted view of planning and performing instruction. It is based on the German concept of *Bildung* [… and it] concerns the analytical process of transposing (and transforming) human knowledge (the cultural heritage) into knowledge for schooling that contributes to Bildung." It is about answering the three fundamental *Didaktik*-questions: *why*? (intentions—aims and objectives),

what? (topic of instruction—content), and *how*? (methods of instruction and media used) (see also for example Duit, 2012).

Klafki's *Bildung* theory is, as already indicated above, connected to the German tradition of *Didaktik* (also called *Bildung*-centered *Didaktik*). If the German understanding of *Didaktik* is compared to the Anglo-American concepts of curriculum and instruction, *Didaktik* can be understood as teaching based on *Bildung*, focusing on matter and meaning, and autonomy of teaching and learning. Kansanen (2009) compared subject-specific *Didaktik* (in German *Fachdidaktik*) with Lee Shulman's idea of *Pedagogical Content Knowledge* (PCK). According to him, *Didaktik* is much broader and also containing aspects of values and other characteristics related to curriculum theory and pedagogy. *Didaktik* focuses predominantly on the *why*-question (and its implication on practice), while the pragmatic Anglo-American curriculum tradition focuses mainly on the *how*-question (Duit, 2015). *Didaktik* supports the idea that education is not only about teaching methods but also an issue of selecting and justifying content for education (Fischler, 2011).

Didactical analysis, originally suggested by Klafki in 1958 (see the translated and updated contribution of Klafki in Westbury et al., 2000; see also Duit, 2015), offers guidance to reflect whether an issue or topic is relevant enough to be taught. It consists of five questions:

1. What wider or general sense or reality does this content exemplify and open up to the learner? What basic phenomenon or fundamental principal, law, criterion, problem, method, technique, or attitude can be grasped by dealing with this content as an "example"?
2. What significance does the content in question, or the experience, knowledge, ability, or skill to be acquired through this topic, process in the minds of the children in my class? What significance should it have from a pedagogical point of view?
3. What constitutes the topic's significance for the children's future?
4. How is the content structured? How can it be placed in a specifically pedagogical perspective by questions 1, 2, and 3?
5. What are the special cases, phenomena, situations, experiments, persons, elements of aesthetic experience, and so forth, in terms of which the structure of the content in question can become interesting, stimulating, approachable, conceivable, or vivid for children of the stage of development of this class?

These questions try to identify epoch-typical relevant knowledge and key problems to learn about, which are of importance for the individuals and the society the students live in and operate, today and for the future. Except learning the science behind relevant issues such as climate change, students should get "the potential to learn about how such an issue is handled within society and one can learn about the interplay of science with ecology, economics, politics, cultural beliefs and values" (Marks et al. 2014, p. 287).

Connecting *Bildung* to Different Visions of Scientific Literacy

Roberts (2007) has suggested two different visions of scientific literacy to understand science learning. The more traditional Vision I describes science learning as mainly focusing learning science content for later application and further education. This approach is often considered from and driven by the inner structure of the corresponding academic discipline. For a more student-oriented approach to science education, Roberts suggested a Vision II. In Vision II science learning should provide the learner with understanding about the usefulness of scientific knowledge in life and society by starting from meaningful contexts.

Inspired by the ideas of education for sustainability, a Vision III of scientific literacy was recently suggested (Sjöström & Eilks, 2018; Sjöström et al., 2017). Largely inspired by critical versions of *Bildung*, it emphasizes science learning for scientific engagement and "knowing-in-action." This point of view wants to strengthen the learning beyond science content, contexts, and processes. It argues for general skill development via engagement with issues of science that is relevant for a sustainable development of our society and global world. Figure 5.2 provides an organizer to understand the differences between the three visions. Visions I and II focus on individual content knowledge development and how it is applied in everyday-life contexts. In the tradition of critical-hermeneutic *Bildung*, Vision III aims at critical skills development and transformative learning for actively shaping the future society in a sustainable fashion.

Scientific content knowledge and contextual understanding about science might be considered necessary pre-requisites to participate in informed scientific and societal discourses on the technological applications of science and its corresponding effects on the environment and society. However, this is not enough. Contemporary

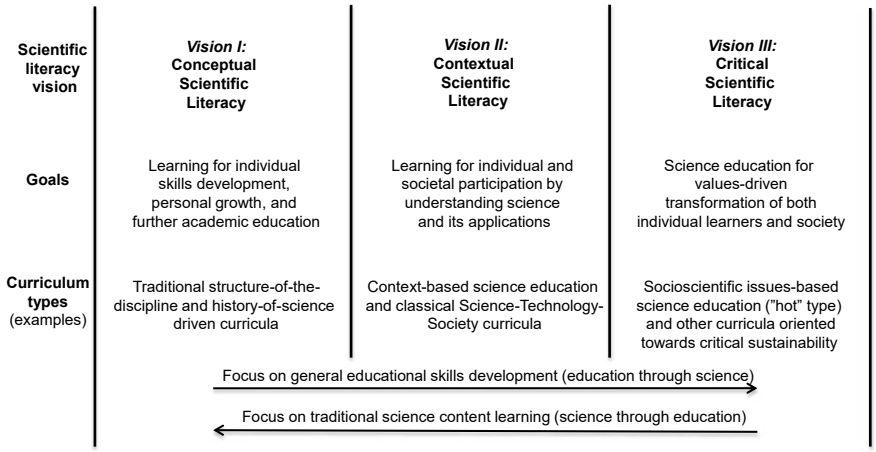

Fig. 5.2 Three different visions of scientific literacy (from Sjöström et al., 2017), where vision III can be connected to critical-reflexive *Bildung*

Bildung theory suggests that skills and a critical stance are also needed that promote understanding of the responsibility of any individual and at the same time enables and directs the individual to act accordingly within society.

Applying *Bildung* and *Didaktik* to Science Education

In this section, we will briefly describe selected theoretical and empirical works where the ideas of categorical *Bildung* in a critical and reflexive interpretation according to Sjöström and Eilks (2018) are applied to science education. Critical-hermeneutic *Bildung,* or critical-reflexive *Bildung,* in science education adds philosophical as well as political dimensions to the teaching and learning of science. It focuses on both meta-perspectives and socio-political actions grounded in a problematizing stance toward contemporary society (see for example Elmose & Roth, 2005; Hofstein et al., 2011; Sjöström, 2013).

There is not much written about ideological assumptions that underpin different formulations of science education, but Pedretti and Nazir (2015, p. 934) recently wrote: "a view that science education should be focused on teaching science content (a predominantly transmissive view) rather than focused on social reconstruction and change (a transformative view) can produce radically different experiences and challenges in the science classroom." The latter view includes values, worldviews, politicization, and actions and is connected to critical-reflexive *Bildung*, whereas the first view hardly will be able to open all the learners' corresponding perspectives.

Coming from *Bildung* theory, Stolz, Witteck, Marks, and Eilks (2013) have elaborated a set of five characteristics, including provable criteria, for identifying socio-scientific issues (SSIs) that lead to *Allgemeinbildung*-oriented learning. They suggested SSIs for the promotion of *Bildung* in science education to be: (a) authentic, (b) relevant, (c) undetermined in evaluation in a socio-scientific respect, (d) offering the chance for open debate, and (e) connected to science and technology (see also column two in Fig. 5.3). In their model they suggested clear criteria: (a) concerning authenticity, they ask whether there is an authentic debate in society on any issues, documented in everyday-life media; (b) relevance asks whether there is any decision to be drawn, at the individual or societal levels, that would make a difference to the life of the learner so that any debate is worth pursuing; (c) openness asks whether there are different points of view that are mirrored in positions by different stakeholders in the authentic debate on the individual or societal levels; (d) offering the chance for open debate asks whether debate is possible by exchanging arguments without harming any individual learner; and, finally, (e) connectedness to science and technology asks whether there are arguments from science or technology used in the public debate. Based on this, they suggested implementing understanding of communication and decision-making practices about techno-scientific queries from society into the teaching and learning of science (for example by mimicking corresponding societal practices in role plays and business games).

Concept of the socio-critical and problem-oriented approach to science teaching

Objectives	Criteria for selecting issues and approaches	Methods	Structure of the lesson plans
Allgemeinbildung/ education through science	Authenticity	Authentic media	1. Textual approach and problem analysis
(Multidimensional) Scientific Literacy	Relevance	Student oriented science learning and laboratory work	2. Clarifying the science background, e.g. in a laboratory environment
Promotion of evaluation skills	Evaluation undetermined in a socio-scientific respect	Learner centred instruction and cooperative learning	3. Resuming the socio-scientific dimension
Promotion of communication skills	Allows for open discussion	Methods structuring controversial debating	4. Discussing and evaluating different points of view
Learning science	Deals with questions from science and technology	Methods provoking the explication of individual opinions	5. Meta-reflection

Fig. 5.3 Framework outlining the socio-critical and problem-oriented approach to science teaching (from Marks et al., 2014, based on Marks & Eilks, 2009)

It is obvious that such critical versions of SSI-based teaching are related to *Bildung*, but it is not fully clear how much it is still connected to democratic education rather than with critical-reflexive *Bildung*. The curriculum model by Marks and Eilks (2009), called the socio-critical and problem-oriented approach to science teaching, uses the term *Allgemeinbildung* as the first instance of objectives (column one); it is used in the meaning of Weniger and Klafki.

The curriculum model by Marks and Eilks (2009) is a *Didaktik*-model in the tradition of *Allgemeinbildung* and the German subject-specific *Didaktik*. It suggests science teaching should start with actual and authentic media from everyday life to demonstrate the authenticity and relevance of any SSI for the individual and society. Media is used to provoke questions on a topic and also to demonstrate how any given topic is related to both society and science. Questions in the lesson plans generally cover both issues of science and technology as well as corresponding ecological, economic, and societal impacts. Learning the science behind a technology is justified by allowing students to understand the sources and processes behind any development and the controversy around its scale. It allows an evaluation of the issue from a scientific point of view, but it does not stop there. Science teaching of this type aims at understanding how the individual and the society is communicating and deciding about the issues of science and technology in its multidimensional relations and impacts. Therefore, the model suggests a thorough analysis of which SSI-related questions can be answered by science and which cannot. Science cannot answer any political or ethical questions; it can only contribute to their understanding. In a democratic society, such questions are negotiated and decided in public forums, media, and parliaments. Consequently, the *Didaktik*-model suggests moving over to mimicking authentic societal practices of communication and decision-making

as essential parts of SSI-based science lessons with different pedagogies to make the learner skillful for self-determination, participation, and solidarity (Marks et al., 2014).

Typical issues that are authentic, relevant, open-ended, debatable, and science-based often stem from the environmental and sustainability debate. The issues of climate change, renewable energy and materials supply, green engineering, sustainable agriculture, preserving biodiversity, risks of chemicals in the environment, or provision of clean water resources are only a few among many examples. However, health and living issues are also important and highly relevant since questions of the chemicalization of our environment, the provision of organic food, the use of chemicals in consumer products, or questions of genetically manipulated food growth are all authentic, and decisions about these—all on the individual, societal, and/or global levels—are highly relevant for our present and future and the challenge of transforming our contemporary society that is thoroughly impacted by developments in science and technology.

Summary

Bildung as a theory of education is very old. It covers a history of more than 200 years. The meaning and understanding of *Bildung* in theory and practice changed over time. It only slowly found its way into the international literature of science education. With growing ecological and technological challenges in our current societies (and a growing number of fake news about them), however, reflecting the ideas and directions of the concept of *Bildung* for science education might be considered to be more relevant than ever. Categorial *Bildung* in the means of Klafki is needed for the responsible citizen to behave and to react to challenges like climate change, the chemicalization of our world, or the need for more efficient and sustainable use of natural resources. It is also highly relevant in times of needed political decisions on the development and transformation of our today's world for a sustainable future. Both knowledge from science and technology is needed as well as skills to apply this knowledge for a self-determined life, participation in society, and solidarity with others. *Bildung* gives guidance to how to select content and learning objectives for this direction via its tools like *Didaktik* analysis or societal-oriented approaches to science teaching—and in the other way around it also provides criteria to assess teaching practices whether they are of potential to promote *Bildung* to enable the young generation to become responsible citizens.

- *Bildung* is a unique central and northern European tradition of education that has its roots in the late eighteenth century.
- *Bildung* just recently was being recognized in the international science education literature.
- Recognizing contemporary interpretations of *Bildung* involves rethinking science education toward a more critical view to allow transformative learning of science,

which promotes capabilities in the student for self-determined life and responsible citizenry.
- Contemporary interpretations of *Bildung* suggest a more thorough operation of current and controversial socio-scientific issues as drivers for modern science education.

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