3 Learning through Research: Independent Learning. Self-Learning Processes and Self-Learning Abilities in Inquiry-Based Learning

Matthias Wiemer

3.1 Acting Independently: Learning Through Research

Upon raising the question of the possibilities and necessities of inquiry-based learning in a course of studies, three lines of reasoning can be identified: Inquiry-based learning

- is geared towards education *through scholarship* (*Bildung durch Wissenschaft*),
- (as part of the qualification process) is oriented towards the acquisition and (further) development of subject-related and interdisciplinary *competencies* and
- should enable sustainable and "deep" *learning processes* (cf. Huber 2009, pp. 12–18, translated).

These reasons overlap and complement each other at various points. Particularly noteworthy here is that each of these lines of reasoning emphasizes student independence, simultaneously requires self-organized action on the part of learners and is geared towards their further development. Learning processes are required that focus on more than the appropriation and accumulation of reproducible knowledge with their claim to self-organization, both from the perspective of the individual in the sense of personal development in the field of scholarship and forging an identity in the discipline, and from the perspective of social demands in the sense of acquiring and developing competencies. Such learning processes can only occur "when the learner organizes, elaborates on and critically reflects on his or her own knowledge. Beneficial are those situations in which independent decision-making and structuring has not been taken away, in which personal interests can be articulated and pursued in depth" (Huber 2009, p. 17 et seq., translated).

M. Wiemer (✉)
Georg-August-Universität Göttingen, Leitung Hochschuldidaktik, Göttingen, Germany
e-mail: Matthias.Wiemer@zvw.uni-goettingen.de

H. A. Mieg (ed.), *Inquiry-Based Learning – Undergraduate Research*,
https://doi.org/10.1007/978-3-030-14223-0_3

Against this background, it is not surprising that even in the basic document by the Federal University Assistants' Conference (BAK) regarding inquiry- based learning, it is clear that the didactic implementation is characterized, in particular, by the design of open learning environments that typically involve a high degree of student independence (e.g. by selecting the methods and strategies, or the starting point in their own interests) (cf. BAK 1970/2009, p. 16).

This central role of independence and autonomy does not mean that students must develop their professional knowledge, acquire research-methodical action and practice scholarly attitudes and mindsets alone and without supervision, however. Supervision of inquiry-based learning processes by educators remains indispensable and is relevant on various levels, for example for initiating, advising on and supervising student research activities and learning processes with reference to the support of social processes such as group formation, integration into a scholarly community and reflection on their own learning and research. In this respect, with this strong emphasis on both independence and also the necessity of supervision by educators, inquiry-based learning can be described as a manifestation of *guided self-study*, or, in other words, as a teaching-learning method that generally provides students with a great deal of room for organizing, planning and carrying out their own learning, while at the same time being characterized by the activity of the educators who *initiate* learning activities through suitable inducements, who *support* students as they enact their goals, *screen* and *evaluate* the results, and *provide* students with *feedback* (cf. Landwehr and Müller 2008, pp. 58–73).

Besides looking at the independent and self-organized learning processes of the students, the focus is also on the development of a specific scholarly (research) conduct, which presupposes the learner's engagement with themselves, with their own interests and goals, and with the respective placement thereof relative to scholarship or the discipline with the goal of achieving *education through scholarship* (*Bildung durch Wissenschaft*). The article focuses on the significance and organization of self-organized learning for inquiry-based learning and argues the need to integrate suitable latitude and opportunities for self-reflection into the design of inquiry-based learning environments.

3.2 Independent Learning Formatted Through Research Activity

If *self-learning* merely indicated an individual who is learning, this would have little added value to learning, since it is true of every learning process that learners "always [decide] for themselves within the acquisition process what affects them and what [they] absorb. *Learning is always independent learning*" (Faulstich 2002, p. 63, translated, emphasis by author). The emphasis on self-learning abilities goes beyond the mere reference to self, underscoring the learning process as an actively self-organized "action-regulated process within the person who is nevertheless always part of a specific situation driven by external influences" (Reinmann 2010, p. 79, translated).

In order to make this process of self-organized learning activity productive for teaching, it is useful to distinguish between various phases and dimensions, which can be focused upon or at least differentiated during planning and implementation. A model for structuring self-regulatory processes that is widely prevalent in the literature is presented by Zimmerman (2000). This model focuses on those processes taking place within the person, which can be represented in cyclic phases (cf. Zimmerman 2000, p. 16 et seq.):

- The planning phase ("forethought phase") includes, inter alia, analyzing the respective (learning) task and setting the learning objectives as well as planning the learning and selecting suitable learning strategies. During this phase, there is also an analysis of one's own self-motivational beliefs (perceived self-efficacy and expected outcomes).
- During the action phase ("performance or volitional control phase"), the planned processes and selected strategies are implemented and the focus is directed towards one's own attention focusing, intentional control and emotional control. Self-observation and keeping records of learning is important so that the approach and learning behavior can be monitored and, if necessary, regulated.
- The self-reflection phase is used to evaluate and grade the learning processes (e.g. by comparing the goals with the results) and the reaction to the results obtained (self-satisfaction, emotional and affective reactions). The specific aim of the self-reflection phase is to optimize the design and planning of future learning processes.

With the cyclic phase model, the focus is on (meta-)cognitive, emotional and motivational processes that correlate with factors pertaining to the person, as well as with behavioral and environmental factors (Zimmerman 2000, p. 13 et seq.).

Against the background of the phases of self-regulated action presented above, some conclusions can be drawn regarding inquiry-based learning. Schneider and Wildt (2009) argue that both the teaching and learning processes in inquiry-based learning are formatted in a specific manner, that is as or through *research activity*. For clarification, according to Kolb, these processes synchronize the (empirical) research cycle with the cycle of experiential learning (ibid., p. 56 et seq., cf. Mieg in this volume). The educator's task is to design learning opportunities and occasions for students in such a way that these (must) be realized as research activity; the student's task is to adapt their learning processes and strategies to the research format.

In terms of Zimmerman's phases of self-regulated learning, it appears that this analogy continues, for example if

- the *planning phase* is synchronized with the processes of topic identification, specification of a research question, and the planning of research processes,
- the *action phase* is synchronized with the conducting and accompanying monitoring of the research, and
- the *self-reflection phase* is synchronized with the interpretation and evaluation of the research results.

The synchronization of the phases shows once again that research and learning processes have analogous logics and processes; however, it obscures the fact that all phases of learning process would also have to occur in every phase of the research cycle if the goal of inquiry-based learning also includes *learning how to conduct research*. This is because in order to learn how to conduct research and to learn by conducting research, it is not just the research process as a whole that must be planned, experienced, observed and reflected upon, etc., but the formulation of the question, laying out the research design and all other steps in the process as well; and this, in turn, in relation to the whole research process.

3.3 Self-Organized Learning: Self-Regulation – Self-Guidance – Self-Determination

In order to connect and break down the various aspects and levels of self-learning abilities with pre-structured and arranged learning environments, Reinmann (2010; following up on Sembill et al. 2007) distinguishes between various dimensions of self-organized learning. With a notion of learning as a process of self-organization, she proposes the terms self-regulation, self-guidance and self-determination therefore (cf. Reinmann 2010, p. 79 et seq.):

Self-regulation comprises the internal structuring of the learning processes. These include, above all, those cognitive metacognitive and emotional-motivational abilities also mentioned in Zimmerman's phase model, which make it possible to consciously examine (and monitor) one's own learning processes and learning behavior, to plan learning and to select suitable strategies, as well as to observe one's own learning processes and to adapt or adjust these as needed.

Self-guidance comes into focus as a second dimension with reference to the contextual environmental variables. Whether the learner learns in a self-guided manner, which "can have a serious and consequential effect on essential decisions as to whether, what, when, how, and toward what [they] learn" (Weinert 1982, p. 102), is always dependent on the external structure, on the (didactic) pre-structuring by educators and on environmental variables that constitute and influence the amount of leeway in selecting an activity and for decision-making.

Self-determination: Whether learning is actually experienced and perceived as self-organized, however, depends not only on the choice and design options provided by the learning environment, but above all on the extent to which the *self-determined learner* succeeds in "harmonizing *external* requirements and circumstances […] with *internal* goals and norms" (Reinmann 2010, p. 80, translated). *Self-determination* as a third dimension of self-organized learning means that the learner assumes responsibility for the internal and external structuring and is able to identify with external requirements or balance learning with the respective goals that exceed the learning task (e.g. career aspirations), for example. "Questions about the self, from identification to the ability to shape a 'good'

life" (Sembill et al. 2007, p. 4, translated) are also integrated into the learning processes with this dimension.

Digression: "Self-Learning Architectures"
The ample leeway in selecting an activity, the learner's independent activity and the individualization of learning processes that open up the possibility of inquiry-based learning does not mean that learning now takes place independently and outside of external structures in a power-free learning space. Forneck (2005) points out that, in the discussion about self-guided learning, it is sometimes possible to detect an "emphasis on the self" (ibid., p. 7), which suggests that self-guided learning were learning without external guidance and influence. Here, however, instead of an absence of external control, we should assume "other forms of structuring and thus of the guidance of learning processes" (ibid., p. 17, translated). These other and changing forms of guidance implement "learning architecture" that, as an integrated concept of self-guided learning, connect or correlate (1) *highly structured learning materials* (known as "self-learning architectures"), (2) *learning guidance*, (3) *new, cooperative forms of teaching and learning* and (4) *new documentation, reflection and auditing practices associated with individual learning* with one another (Forneck 2005, 2006). In the case of all four elements, the focus is not just on the acquisition of learning techniques, but also the self-reflective development of learning practices that correlate the respective contents to the individual learning pathways, sensitivities and the learning environment.

3.4 Occasions for Self-Reflection in Inquiry-Based Learning Processes

Self-organized learning is not a *guaranteed success* and does not necessarily result from didactic design approaches that provide students with a great deal of leeway to decide their own activities and make their own decisions. In addition to this leeway, students need self-reflection processes in particular, which can be systematically integrated into the design of the self-learning architectures via topical occasions and triggers. Here, the self-organized learning in inquiry-based learning can be tied back to *education through scholarship* (*Bildung durch Wissenschaft*) and *skills development*: Huber points out that, without self-reflection, "it is not possible to speak of education" (Huber 2009, p. 13), and he specifies three dimensions that scholarship prescribes for reflection: "the self-reflection of scholarship as a mode of rational cognition, the self-reflection of the subject through scholarship, and the reflection on the common good to be promoted thereby" (Huber 2009, p. 13). These dimensions, in turn, can be associated with three areas of competency, which comprise the encounter with or dealing with the subject (professional competence), the

subject's encounter with themselves (self-competence) as well as with others (social competence) (cf. Euler 2005, p. 260 et seq.).

With reference to these dimensions of reflection, it is possible to list some of the subject-related occasions that emerge from the specific format of inquiry-based learning, and that can be a trigger to self-reflection in inquiry-based learning and in self-learning architectures. Looking back on the dimensions of self-organized learning, these occasions thereby require that learners engage in adaptation processes within the meaning of self-determined learning, such as:

- balancing their own knowledge interest and the processes of the independent construction of knowledge with discipline-related research interests and processes of the collective construction of knowledge;
- practicing new, research-led patterns of information processing;
- conducting activities in environments with open outcomes and uncertain bodies of knowledge;
- individual motivation and enthusiasm for the chosen subject and its fundamental questions;
- "designing oneself into the future" as a scholar (thus not just the question of what constitutes an activity in scholarship and the selected discipline as such, but also a consideration of how the student imagines themselves as a researcher, whether the field of scholarship can be considered a possible career goal, and where, given the student's own strengths and weaknesses, etc.);
- making it possible to experience basic scholarly values and attitudes in a scholarly community as well as communication and interaction processes coded for the specific discipline;
- the transition from an ordinary perspective to a scholarly perspective, and the development of one's own justifiable and justified standpoint;
- the search for possible objections to this point of view, because the "'demands of scholarship' also include raising objections oneself or systematically searching for objections as an [...] operationalization" (Huber 2009, p. 10, translated).

With the learner's critical eye on themselves and on themselves as a participant in scholarship, the focus is likewise on the development of a specific scholarly (research) attitude, which is characterized, inter alia, by "distance from one's own prejudices and affects and [by the] independence of one's own judgment" (Honnefelder 2011, p. 25, translated). If learning always means "gaining an outsider's view of a subject and thus of oneself, challenging what is familiar, as well as abandoning self-assurance and forfeiting what is familiar" (Meyer-Drawe 2012, p. 15, translated), this applies to inquiry-based learning perhaps to an even greater degree. This is because, with the "transition from life-world experience to scholarly knowledge" (Meyer-Drawe 2012, p. 14), inquiry-based learning addresses a threshold, which virtually demands that one see the world *and one's self* with different eyes and from a different perspective.

3.5 Conclusion: Self-Education in Inquiry-Based Learning

Within the context of self-learning abilities and self-organized learning, the above-mentioned triggers and occasions thus make it possible to inquire as to the "subject" (i.e. the individual learner) of inquiry-based learning. This "subject" is generated by implementing and experiencing learning and research processes, and requires a "certain questioning *attitude* […], the disposition of someone who seeks knowledge" (Huber 1991, p. 194, translated). Thus, inquiry-based learning tasks students with "working on their own identity in a specific way" (Ludwig 2011, p. 10, translated). The acts of finding an identity in the field of scholarship and of developing scholarly research habits – both of which are indispensable for the preparation of independent research activities and which can also be decisive for the development of occupational competences – remain incomplete if they are not experienced through active participation in independent practice. Schneider and Wildt (2009) point out that the orientation of learning on research processes remains "[…] on a trivial level without dependence on or integration into a theoretical frame of reference" and does not necessarily yield "scientifically challenging learning processes" (ibid., p. 59, translated). It can likewise be stated that the implementation of inquiry-based learning will remain impeded if there is no reflection on the self or the relationship of the self to the object and other learners and educators. In that case, the confrontation with oneself as a person conducting research, the clarification of one's own standpoint with respect to the subject being researched, and one's activity in a research and learning community would thus be left to chance.

References

Bundesassistentenkonferenz (BAK). (1970/2009). *Forschendes Lernen. Wissenschaftliches Prüfen*. Neuauflage nach der 2. Aufl. Bielefeld: UniversitätsVerlagWebler.

Euler, D. (2005). Forschendes Lernen. In S. Spoun/W. Wunderlich (Hrsg.), *Studienziel Persönlichkeit. Beiträge zum Bildungsauftrag der Universität heute* (S. 253–272). Frankfurt/Main: Campus Verlag.

Faulstich, P. (2002). Vom selbstorganisierten zum selbstbestimmten Lernen. In P. Faulstich/D. Gnahs/S. Seidel/M. Bayer (Hrsg.), *Praxishandbuch selbstbestimmtes Lernen. Konzepte, Perspektiven und Instrumente für die berufliche Aus- und Weiterbildung* (S. 61–98). Weinheim, München: Beltz Juventa.

Forneck, H.-J. (2005). Selbstsorge und Lernen – Umrisse eines integrativen Konzepts selbstgesteuerten Lernens. In H.-J. Forneck/U. Klingovsky/P. Kossack (Hrsg.), *Selbstlernumgebungen. Zur Didaktik des selbstsorgenden Lernens und ihrer Praxis*.(S. 6–48). Baltmannsweiler: Schneider Hohengehren.

Forneck, H.-J. (2006). *Selbstlernarchitekturen. Lernen und Selbstsorge*. Baltmannsweiler: Schneider Hohengehren.

Honnefelder, L. (2011). Bildung durch Wissenschaft? In L. Honnefelder/G. Rager (Hrsg.), *Bildung durch Wissenschaft?* (S. 11–30). Freiburg, München: Alber.

Huber, L. (1991). Bildung durch Wissenschaft – Wissenschaft durch Bildung. Hochschuldidaktische Anmerkungen zu einem großen Thema. *Pädagogik und Schule in Ost und West*, *39*(4), 193–200.

Huber, L. (2009). Warum Forschendes Lernen nötig und möglich ist. In L. Huber/J. Hellmer/F. Schneider (Hrsg.), *Forschendes Lernen im Studium. Aktuelle Konzepte und Erfahrungen.* (S. 9–35). Bielefeld: UniversitätsVerlagWebler.

Landwehr, N./Müller, E. (2008). *Begleitetes Selbststudium. Didaktische Grundlagen und Umsetzungshilfen* (2., korr. Aufl.). Bern: hep verlag.

Ludwig, J. (2011). *Forschungsbasierte Lehre als Lehre im Format der Forschung* (Brandenburgische Beiträge zur Hochschuldidaktik 3). Potsdam: Universitätsverlag.

Meyer-Drawe, K. (2012). *Diskurse des Lernens* (2., durchges. und korr. Aufl.). München: Wilhelm Fink.

Reinmann, G. (2010). Selbstorganisation auf dem Prüfstand: Das Web 2.0 und seine Grenzen(losigkeit). In K.-U. Hugger/M. Walber (Hrsg.), *Digitale Lernwelten. Konzepte, Beispiele und Perspektiven* (S. 75–89). Wiesbaden: VS Verlag für Sozialwissenschaften.

Schneider, R./Wildt, J. (2009). Forschendes Lernen und Kompetenzentwicklung. In L. Huber/J. Hellmer/F. Schneider (Hrsg.), *Forschendes Lernen im Studium. Aktuelle Konzepte und Erfahrungen* (S. 53–68). Bielefeld: UniversitätsVerlagWebler.

Sembill, D./Wuttke, E./Seifried, J./Egloffstein, M./Rausch, A. (2007). *Selbstorganisiertes Lernen in der beruflichen Bildung – Abgrenzungen, Befunde und Konsequenzen.* Berufs- und Wirtschaftspädagogik online, Ausgabe 13. Retrieved 28 April 2015 from www.bwpat.de/ausgabe13/sembill_etal_bwpat13.pdf

Weinert, F.E. (1982). Selbstgesteuertes Lernen als Voraussetzung, Methode und Ziel des Unterrichts. *Unterrichtswissenschaft*, *2/1982*, 99–110.

Zimmerman, B. (2000). Attaining Self-Regulation. A Social Cognitive Perspective. In M. Boekaerts/P.R. Pintrich/M. Zeidner (Hrsg.), *Handbook of self-regulation* (pp. 13–39). San Diego: Academic Press Inc.