Chapter 2
An Invitation to Deep Active Learning

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The central message that we want to convey in this book is that learning in universities ought to be not only active but also deep. Why should learning be deep as well as active? What does "deep" mean here? If we add "deep," how is that different from mere active learning? In this introductory chapter, I will answer these questions as I open the door to deep active learning.

What Is Active Learning?

First, what does active learning mean? Bonwell and Eison's *Active Learning: Creating Excitement in the Classroom* (1991) is a pioneering work that lays out the principles of active learning and one of the most frequently cited works, even today. In this article, the authors list the following as general characteristics of active learning:

(a) Students are involved in more than listening.
(b) Less emphasis is placed on transmitting information and more on developing students' skills.
(c) Students are involved in higher-order thinking (analysis, synthesis, evaluation).
(d) Students are engaged in activities (e.g., reading, discussing, writing).
(e) Greater emphasis is placed on students' exploration of their own attitudes and values.

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In addition, active learning is defined as "involv[ing] students in doing things and thinking about the things they are doing." (Bonwell and Eison 1991, p. 2). In other words, active learning is a matter of acting and then learning by reflecting on those actions. Eric Mazur of Harvard University has said, "Just as you can't become a marathon runner by watching marathons on TV, likewise for science, you have to go through the thought processes of doing science and not just watch your instructor do it."[1] Here, too, it is asserted that, in order to learn the thought processes for "doing science," it is important to become aware of those processes on one's own, after having actually tried them (action and reflection).

Active learning in Japanese higher education became an "official educational method" owing to a report by the Central Council for Education, published in August 2012 under the title *Towards a Qualitative Transformation of University Education for Building a New Future: Universities Fostering Lifelong Learning and the Ability to Think Independently and Proactively* (the so-called Qualitative Transformation Report) and the Acceleration Program for University Education Rebuilding (AP) begun as a result of the report, thereby spurring its widespread adoption. In the Qualitative Transformation Report, active learning is defined as "the general term for a teaching and learning method that incorporates the learners' active participation in learning, unlike education based on one-sided lectures by the instructor." On that basis, "it seeks to foster generic capabilities, including cognitive, ethical, and social capabilities, cultural refinement, knowledge, and experience." Comparing this description against the five characteristics laid out by Bonwell and Eison, we can see that it emphasizes (a), (b), and (d), and it is clear that the description especially stresses a contrast with "education based on one-sided lectures by the instructor."

In Chap. 5 of this book, Mizokami defines active learning as "all kinds of learning beyond the mere one-way transmission of knowledge in lecture-style classes (=passive learning). It requires engagement in activities (writing, discussion, and presentation) and externalizing cognitive processes 1 in the activities" (p. 79). In this definition, Mizokami looks at "externalizing cognitive processes in the activities" in addition to the features described above.

In this chapter, I have adopted Bonwell and Eison's comprehensive definition of active learning, adding a sixth characteristic to their general characteristics (a) through (e):

(f) It requires externalizing cognitive processes in the activities.

In addition, I would like to discuss the question of why learning at university level should be not only active but also deep.

[1]"At M.I.T., Large Lectures Are Going the Way of the Blackboard," *New York Times*, January 12, 2009. Retrieved from http://www.nytimes.com/2009/01/13/us/13physics.html.

Problems with Active Learning

From Surveys and Case Studies

Given the demands for universalization of university education and various new abilities such as "graduates capabilities" (*gakushiryoku*) (Ministry of Education, Culture, Sports, Science and Technology: MEXT) and "adults' basic skills" (Ministry of Economy, Trade and Industry: METI), active learning has appeared on the scene and become widespread as a driving force for putting an end to the "input only, one-sided, passive lecture" format that formerly prevailed at Japanese universities, and for transformation to student-centered paradigms.

Yet, active learning is not a "silver bullet" for reform of university teaching. In fact, active learning has not necessarily produced the hoped-for effects. Far from it: there are several pieces of evidence that may even suggest that it produces results contrary to expectations.

1. In 2013, Benesse, a major Japanese educational services company, surveyed 5000 university students from all parts of Japan, for its Second Survey of the Scholastic and Daily Life of University Students. According to this survey, despite the fact that availability of active learning-type classes which incorporate group work, discussion, and presentations has been increasing, the number of students who thought "I like classes in which it is easy to earn credits, even if I am not very interested" as opposed to "I like classes that I am interested in, even if they are more difficult" increased from 48.9 (2008) to 54.8% (2012). In addition, in questions about everyday life, university students who thought that "University instructors should provide advice and support" as against "Things should be left to the student's own initiative" increased sharply, from 15.3 to 30.0%. These results suggest, ironically, that the more active learning style classes spread, the stronger students' passive attitudes regarding learning and lifestyles become.
2. The Massachusetts Institute of Technology (MIT) is known for its learning environment using Technology-Enabled Active Learning (TEAL), which has significantly influenced learning environment design at institutions in Japan, including the Komaba Active Learning Studio (KALS) at the University of Tokyo's Komaba Campus (cf. Chap. 5 of this book). A TEAL classroom contains 13 round tables, each seating nine students, and the students use networked computers, clickers, multifaceted screens, whiteboards, and other tools as they engage in interactive, cooperative, active learning.
   But, TEAL is not accepted by all students.[2] When TEAL was described in the New York Times, intense arguments for and against it arose. This is the opinion

[2]In March 2013, I visited MIT and Harvard University, where I had opportunities to observe classes based on TEAL, lecture courses at Harvard, and project-based learning (PBL) classes taught by Professor Eric Mazur. The attitudes toward learning of students in the TEAL classes

that received the most support: "Probably, a school should offer both options (active learning and lectures). Some people do learn best quietly, thoughtfully, by themselves, and by following a skilled … faculty member through the development of an idea, rather than in an active buzzing setting, which can be distracting. But for anyone, the chance to self pace … certainly is a better use of time, as is the opportunity for learning by doing."[3]
In fact, MIT does not offer only courses based on active learning with TEAL. It also offers courses that combine TEAL with lectures and recitations (sessions in which the class is divided into several groups for discussions) as well as courses that teach theoretically sophisticated content.[4]

3. Based on experiences of participation in a variety of active learning classes, Mori (Chap. 6 of this book) states that even active learning has not resolved the issue, seen in lecture-style classes, of disparities in quality of student learning. Mori also points out the emergence of "free riders," the deactivation of group work, and a gap between thought and action as being among the new problems that have arisen in active learning. These remarks are consistent in many respects with my own experiences of teaching and observing in university classes.

The Twin Sins

Why do these situations occur? Curriculum researchers Wiggins and McTighe (2005) refer to "coverage-focused teaching" and "activity-focused teaching" as the "twin sins" of instruction (p. 3). Coverage-focused teaching is an attempt to teach all of the contents of the textbook and lecture notes without any omissions, while activity-focused teaching is aimed at getting students to learn by having them participate in various activities other than listening.

As we have already seen, active learning appeared on the scene as the antithesis of lecture-based instruction or, in other words, coverage-focused teaching. Yet, is it not now the case that the pendulum has swung to the other side, toward activity-focused teaching? As the phrase "twin sins" indicates, neither coverage-focused teaching nor activity-focused teaching gives rise to effective learning, and they are two sides of the same coin.

Some problems that remain unsolved and some of the new problems that arose after the introduction of active learning are described below.

(Footnote 2 continued)

were not particularly active, at least not in the classes that I observed. For details, see Matsushita et al. (2014).

[3]From the highlighted reader's comment on the article in Note [1].

[4]See the website for MIT's physics course for first-year students. Retrieved from http://web.mit.edu/firstyear/advisors/academics/physics.html.

Discrepancies Between Knowledge (Content) and Activities

When active learning is introduced into classes, time is designated for activities, thereby reducing the time available for transmitting knowledge (content). Moreover, in order to have the students engage in higher-order thinking, they must acquire knowledge (content) appropriate for such thinking. How is it possible to connect the two and ensure that both transmission of knowledge and engagement in activities occur? And, how can we achieve a balance between the two?

Passivity Induced by Classes that Aim at Active Learning

In active learning, the activities are structured and, to the extent that students come under strong pressure to participate in these activities, they are no longer asked to decide whether or not they wish to participate of their own volition. In addition, active learning frequently occurs in the form of group activities, so the responsibility of each individual becomes difficult to define. What, then, is necessary to bring about the kind of active participation that active learning was originally intended to encourage?

Diversity of Learning Styles

Given the value judgment that active learning classes are better than lecture-style classes, students who do not like active learning are likely to be regarded either as being unable to change their traditional views on learning or as being unwilling to expend their own time and energy on learning (cf. Cain 2012). Has active learning given full consideration to diversity of learning styles?

Deep active learning focuses particularly on the problem of discrepancies between knowledge (content) and activities, and it is aimed at reconstruction of active learning. I will begin by questioning the theories and concepts that are believed to underlie active learning.

The Connection Between Knowledge and Activities[5]

The Structure of Learning Activities

In various theories of learning, learning has been described as the relationship among three structural elements: the learner (self), the object, and others. For example,

[5]This section is a major expansion and revision of Matsushita and Taguchi (2012) "1.2. How Should We View Learning?".

Manabu Sato, Japan's leading scholar on curriculum and learning, defines learning as "restructuring three relationships: a relationship between the learner and the object world, a relationship between the learner and others, and a relationship between the learner and himself/herself." He called it "the trinity theory of learning" (Sato 1995).

Yrjö Engeström of the University of Helsinki, who has expounded a theory of learning based on activity theory, posits a model of an *activity system* that refers to the three elements described above as the *subject*, the *object*, and the *community*, and to the mediating elements that tie them together as *instruments*, *division of labor*, and *rules* (Engeström 1994, 2015). Instruments include not only physical and external instruments but also symbolic and internal instruments, such as language, signs, and knowledge. Division of labor refers to the division of work and roles and the power relationships among the members of the community. Rules are the clearly stated or tacit regulations, norms, and customs regarding actions and interactions. The subject works on the object using instruments and transforms it into *outcome*, and the subject shares work and roles with the other members of the community. Having rules in common, the subject also participates in the community. Engeström understands learning as this kind of activity (Fig. 2.1).

If we explain the differences between lectures and active learning in terms of this, the results are as follows.

In a lecture, the entity positioned as the subject of the activity is the instructor, and the object is the student. The instructor transmits knowledge to the student using such instruments as textbooks and blackboards, and the outcomes are evaluated by means of tests and reports. The instructor and the students meet, at most, once a week during a semester in most Japanese universities (cf. Chap. 5 of this book), and no community exists except in a formal sense. The division of labor between the instructor and the students is such that the instructor speaks and writes on the board, while the students listen and take notes. Rules, such as those that stipulate how many sessions the students need to attend and the extent to which lateness and private conversations are allowed, are either directly conveyed by the instructor or indicated tacitly.

In contrast, active learning puts the student in the position of subject. The class is described in terms of what the students do and what they become able to do. For example, in problem-based learning (PBL), the object is the problem, and a problem related to the values and realities with which the students are dealing is chosen (cf. Chap. 10 of this book). The instruments that the students need in order to solve the problem are either those that they learn about on their own by seeking

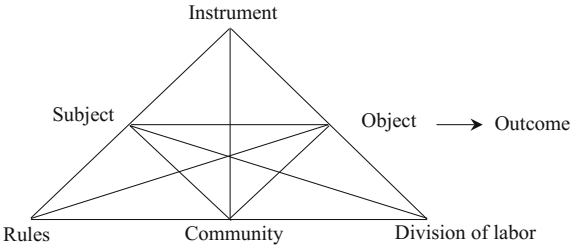

Fig. 2.1 A model of an activity system. *Source* Adapted from Engeström (2015, p. 63)

knowledge outside of class or those that are provided to them through lectures during class time. Moreover, PBL has clear rules about division of labor, with a stage in which the students learn in groups with the instructor as a facilitator, and a stage in which the students learn on their own outside of class, in line with the class processes. Thus, if the students can solve the problem with the support of their instructor, they achieve an outcome. When students and instructors spend a semester repeating the PBL process in this way, they are more likely to form an actual community than would be the case with classes based on the lecture format.

Note, however, that these are cases in which active learning is deemed successful. Whilst group activities can facilitate learning by students, they may also inhibit it. For example, there are cases in which there is a tacit understanding within the group to make half-hearted efforts in order to achieve mediocre outcomes (a tacit rule). Moreover, the division of labor within the group may be unacceptably unequal, allowing some members of the group to be free riders. Furthermore, if the students approach the subject without enough of the knowledge that is supposed to be the instrument for solving it, they will spend excessive time on the task without being able to arrive at anything but a superficial outcome.

Thus, using the model makes it easy to understand the features and potential pitfalls of active learning.

The Processes of Learning Activities

What we have seen above is the structure of learning activities, but how can the processes of learning activities be stated in theoretical terms? Here, too, we can use the ideas of Yrjö Engeström as a reference. That is because his theory incorporates *deep learning* (Marton and Säljö 1976, described below) and has a high level of affinity with deep active learning.

Engeström (1994) describes the processes of learning activities in a six-step *learning cycle*, as shown in Fig. 2.2.

The starting point of the learning cycle is the conflict that arises between problems that the students encounter and their existing knowledge and experiences (motivation). In other words, it is the learners being confronted with the situation of being unable to deal with an immediate problem using their previously acquired knowledge and experiences. These students start engaging in learning activities with the aim of resolving the conflict (orientation). Then, they acquire the knowledge that they require for that task (internalization). Subsequently, they actually apply the knowledge in an attempt to resolve the conflict (externalization) but, often, instead of stopping at mere application of the knowledge, they discover

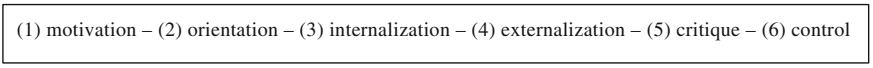

Fig. 2.2 Six-step learning cycle. *Source* Engeström (1994)

the limits of that knowledge as they apply it and are forced to reconstruct it (critique). Finally, they look back over the sequence of processes thus far and make revisions, as needed, before moving on to the next learning process (control).

Internalization and Externalization

This learning activities process also brings the features and potential pitfalls of active learning into sharp relief. One example is internalization and externalization.

As previously stated, (f) "It requires externalizing cognitive processes in the activities" is a feature of active learning. In classes based on one-sided knowledge transmission lectures, most of the time is spent on internalization of knowledge and the only externalization element is having the students regurgitate memorized knowledge during tests. In contrast, active learning has properly placed externalization of cognitive processes within learning activities. This is a signal achievement for active learning.

Yet, just as internalization without externalization does not work well, the same is true of externalization without internalization. Externalization without internalization is blind. Internalization without externalization is empty.

In its eagerness to criticize lectures that involve internalization only, active learning has tended to devalue internalization. Viewed in terms of the learning cycle, the definition of active learning provided by Bonwell and Eison at the beginning of this chapter, "involv[ing] students in doing things and thinking about the things they are doing," focuses on externalization and control.

In contrast, the issue in deep active learning is how to combine internalization and externalization. Actually, all of the examples of deep active learning discussed in this book try to combine internalization and externalization, such as knowledge acquisition outside of class, with problem-solving and discussion within the class shown in the flipped classroom in Chap. 6 and PBL in Chap. 10.

It is true that the relationship between internalization and externalization is not a one-way progression from the former to the latter. After students have internalized knowledge, they reconstruct it through externalization activities such as using it to solve problems, talking to people, or writing, thereby deepening their understanding. At the stage when knowledge is internalized, the activity system model positions it as an object (for example, in the case of "understanding perspective," "perspective" is the object of "understanding."). However, at the stage of externalization, it becomes an instrument (for example, in the case of "analyzing a work of art in terms of perspective," "perspective" is the tool of analyzing.). So, using knowledge as an instrument further deepens students' understanding.

The Span of the Learning Cycle

The learning cycle can occur over a variety of time spans, be it one class session, a semester-long course, or a 4-year undergraduate degree program. For example,

a common design for a single class session involves first presenting the problem, then conveying knowledge about it and, finally, discussing and making presentations about the problem, using the knowledge. A course design typically seen in U. S. universities is three class sessions of 50 min each per week. Including lectures, discussions, and exercises in the course makes it easy to combine internalization and externalization.

Extending this to a 4-year undergraduate degree program, most Japanese universities and undergraduate divisions have made more time available in their curricula and set up various ways for students to deal with externalization during their final year. These include writing papers, making presentations, and taking oral exams in relation to their graduation theses and graduation research projects. In order to ensure high-quality externalization, it is essential for the students to have a deep understanding of the knowledge that they have internalized through classes and independent study.

In these ways, the learning cycle can be realized, whether by class, by course, or by program. But, I would like to point out that the learning cycle should be visible, not only to the instructor but also to the students. For example, some instructors in the fields of science and technology assert that they need to cram students' heads full of basic mathematics and physics at the early stage of undergraduate education in order to equip them to undertake high-quality graduation research projects. In such cases, the 4-year learning cycle is visible to the instructors but not necessarily to the students. Effective ways of making the learning cycle visible to students may include using a curriculum map or having the students interact with older students who have completed their graduation or master's level research projects, so as to give them a feeling for the importance of the basic courses. It may be even more effective to embed much shorter learning cycles within the 4-year span, allowing the students their own repeated experiences with learning cycles and having them acquire that mode of learning. As in Rikkyo University's College of Business, some universities have set up Leadership Programs and specialized elective courses along parallel lines so that the curriculum balances leadership and specialized knowledge like the two wheels of a bicycle (Kawaijuku Educational Institution 2014; cf. Higano, Chap. 11 of this book). The Faculty of Dentistry at Niigata University also builds its curriculum around PBL, with relevant lectures and seminars arranged around this core, so that the learning cycle is repeated several times (cf. Chap. 10 of this book).

The Lineages of Learning Theories Focusing on Depth

Thus far, we have looked at the features and potential pitfalls of active learning whilst paving the way for discussion of deep active learning. So, what does "deep" mean in this context? In the following, I would like to lay out lineages of learning theories focusing on *depth*, which is the theoretical basis of deep active learning.

Deep Learning

The contexts that underlie deep active learning are such concepts as *deep learning* and a *deep approach to learning* (Matsushita 2009). Put into theoretical form by Ference Marton of the University of Gothenburg, Noel Entwistle of the University of Edinburgh, and their colleagues, it has been widely put into practice in higher education in such countries as the United Kingdom, certain Scandinavian countries, and Australia.

A Deep Approach to Learning

The starting point of this research was the following study by Marton and Säljö (1976). Students were given an essay to read, after being told that they would later be asked questions on it. The students' approaches to this task were clearly divisible into two types. Some students focused on the meaning that the text was seeking to convey and tried to understand it thoroughly. Others focused on fragments of information that seemed likely to appear in the test and tried to memorize them verbatim. Marton and his colleagues referred to the former approach as the "deep approach" and the latter as the "surface approach" (see Table 2.1).

In later research, by incorporating Pask's (1976) theory on learning strategies, Entwistle (2000) identified two strategies in the deep approach: the *holist* strategy,

Table 2.1 Defining features on approaches to learning

Deep approach	*Seeking meaning*
Intention—to understand ideas for yourself	by
Relating ideas to previous knowledge and experience Looking for patterns and underlying principles Checking evidence and relating it to conclusions Examining logic and argument cautiously and critically Using rote learning where necessary	
	And as a result
Being aware of one's own understanding as it develops Becoming more actively intersted in the course content	
Surface Approach	*Reproducing*
Intention—to cope with course requirements	by
Treating the course as unrelated bits of knowledge Routinely memorizing facts or carrying out set procedures Studying without reflecting on either purpose or strategy	
	And as a result
Finding difficulty in making sense of new ideas Seeing little value or meaning in either the courses or the tasks set Feeling undue pressure and worry about work	

Source Adapted from Entwistle (2009, p. 36).

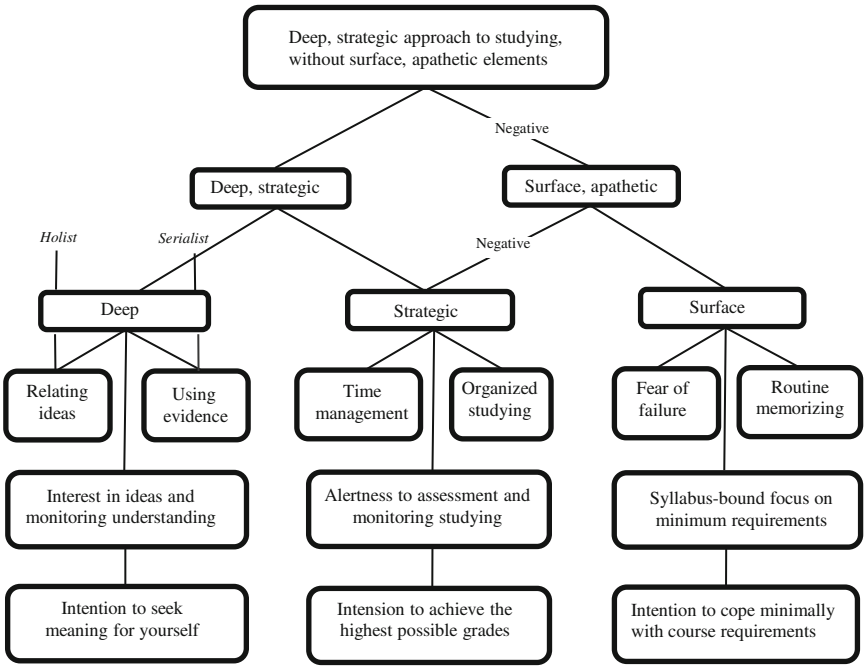

Fig. 2.3 Student approaches to learning and studying. *Source* Entwistle (2000, p. 4)

in which students try to create connections among the ideas and identify the overall patterns and principles, and the *serialist* strategy, in which students try to use evidence and examine the logic of the argument. Entwistle and his colleagues (Entwistle et al. 2000) also proposed the concept of *strategic approach* as opposed to the *apathetic approach*. While the deep approach is characterized by an interest in the content and significance of the subject matter, the strategic approach is characterized by self-regulation of learning and the alertness to assessment requirements. Entwistle (2000) presents the insights from his research in the form of Fig. 2.3.

Although it is difficult to see from this figure, the strategic approach can be connected not only to the deep approach but also to the surface approach. For example, students who do not fully understand the subject matter but are skilled at taking tests may use a surface, strategic approach.

The Effects of Teaching and Assessment

Approaches to learning are different from learning styles. Learning styles are characteristic patterns of acquiring and processing information in learning situations. Some innate factors are involved and these are difficult to change

(Entwistle et al. 2000; Aoki 2005). In contrast, approaches to learning are the course of action that a student will be relatively likely to take when placed in a certain learning situation. Therefore, approaches to learning are the result of interaction between the student and the learning situation.

The deep, strategic approach generally tends to result in a higher level of learning outcomes but that is true only when the assessment method exactly evaluates the learner's understanding of the concept. Conversely, when the assessment method does not evaluate understanding of the concept, the surface, strategic approach yields better results but this does not lead to long-lasting, quality learning. So, we can see that, in order to encourage students to take a deep approach, there needs to be a suitable type of education, not only in terms of teaching (curriculum and instruction) but also in respect of assessment. John Biggs refers to linkage between the learning that the instructor wants the students to acquire, on the one hand, and teaching and assessment, on the other, as *constructive alignment* (Biggs and Tang 2011), and this concept is also suitable for learning approaches.

Objects of Learning and Variation Theory

Marton, who, along with Entwistle, developed the theory of approaches to learning, has recently placed greater emphasis on the *object of learning* in promoting deep learning (cf. Chap. 4 of this book). Marton distinguishes three forms, the *intended object of learning*, the *enacted object of learning*, and the *lived object of learning*, and gears them to learning objective, the space of learning, and outcome of learning, respectively. Viewed in terms of education, they correspond to the field of goals (curriculum), instruction, and assessment.

Moreover, by positioning the learning content as the *indirect object of learning* and capability as the *indirect object of learning*, Marton seeks to integrate content and capability under the concept of object of learning. For example, in the case of such learning goals (intended object of learning) as "*to be able to solve* equations of the second degree," "*to understand* photosynthesis," "*to be able to see* similarities and differences between different forms of governments," "*to be able to see* different religions *in terms of* what unites them and what sets them apart," "equations of the second degree," "photosynthesis," "forms of governments," and "religions" are the direct objects of learning. On the other hand, such capabilities as "to be able to solve …," "to understand …," and "to be able to see … in terms of …" are the indirect objects of learning (p. 62). Thus, the object of learning are understood in two dimensions, that of "intended," "enacted," and "lived," and that of "direct" and "indirect."

What Marton is trying to understand with the theory of approaches to learning is how variations in the lived object of learning arise through different approaches to learning with the same text. In contrast, the *variation theory* in this book focuses narrowly on direct object of learning and attempts to clarify how understanding of

the object of learning varies depending on variations in how it is presented. In other words, it is fair to say that looking at both the intended object of learning and the enacted object of learning takes us a step farther in constructing a theory of pedagogy.

In his *The University of Learning: Beyond Quality and Competence*, co-authored with John Bowden of Australia's Royal Melbourne Institute of Technology, Marton sounds a warning about competency-based higher education reform. Rather, Bowden and Marton (1998) argue that in the era of low predictability it is particularly important to possess the capability of discerning and focusing on critical aspects of situations, beyond the generic skills. Variation theory is a theoretical attempt linked to this assertion.

Deep Understanding

The second lineage of depth in reference to student learning that I would like to mention is *deep understanding*. Understanding is a characteristic of deep learning, and there are overlaps between deep learning theory and deep understanding theory. Even so, I take deep understanding as a different lineage because I want to shine some light on the axis of *depth* of understanding that goes beyond the dichotomy between "deep" and "surface."

McTighe and Wiggins (2004), known for their book *Understanding by Design* (2005), show the *structure of knowledge* in graphic form in Fig. 2.4.

This structure of knowledge is characterized first by having an axis of depth of understanding, and second, by showing content knowledge and intellectual manipulation in a corresponding relationship.

At the most surface level are factual knowledge and discrete skills. Deeper down are transferable concepts and complex processes. And then, principles and generalizations are positioned at the deepest level. Transferable concepts, complex processes, and principles and generalizations comprise *enduring understandings*. What Wiggins and McTighe mean by enduring understandings is the understanding that answers the question, "What do we want students to understand and be able to use several years from now, after they have forgotten the details?" They are "central to a discipline and are transferable to new situations" (Wiggins and McTighe 2005, p. 342).

I would especially like to note the concept of *understanding* developed by Wiggins and McTighe. When they refer to understanding, they are referring to a complex concept with six facets: explanation, interpretation, application, perspective (critical and insightful points of view), empathy (the ability to get inside another person's feelings and worldview), and self-knowledge (the wisdom to know one's ignorance and how one's patterns of thought and action inform as well as prejudice understanding) (Wiggins and McTighe 2005, Chap. 4).

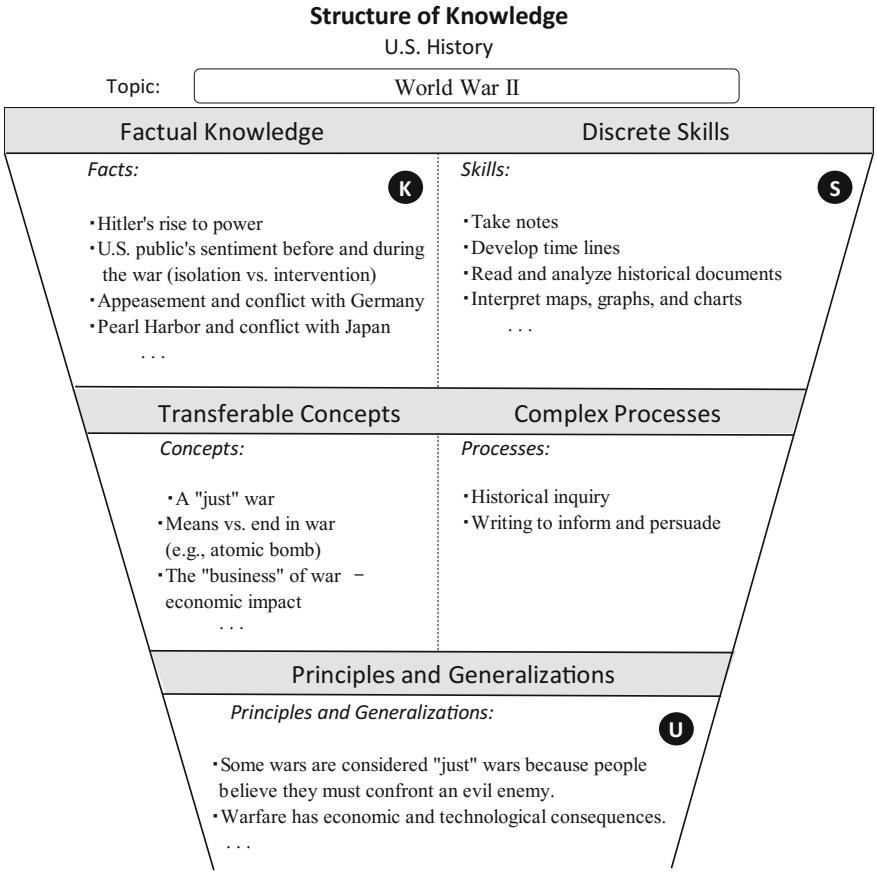

Fig. 2.4 An example of structure of knowledge. *Source* Adapted from McTighe and Wiggins (2004, p. 66)

This view of understanding is different from that of active learning theories. Most active learning theories seem to follow Bloom's taxonomy[6] in taking the cognitive domain as a hierarchical structure consisting of knowledge, comprehension,

[6]Bloom's taxonomy refers to the taxonomy of educational objectives developed by Benjamin S. Bloom et al. It was first developed as a theoretical framework for creating test items in university education and it is made up of three domains: the cognitive domain (published in 1956), the affective domain (published in 1964), and the psychomotor domain (incomplete). Of these, the most influential domain and the one that has the direct connection to active learning is the taxonomy of the cognitive domain. Later, Bloom's colleagues (Anderson and Krathwohl 2001) revised Bloom's taxonomy (cognitive domain), incorporating results from fields such as cognitive psychology, to create the Revised Bloom's Taxonomy. A major feature of the revised version is that knowledge, which was classified as lower-order cognition in the original version, has been repositioned as a dimension independent of cognitive processes. Moreover, the cognitive process

application, analysis, synthesis, and evaluation. For example, the "higher-order thinking (analysis, synthesis, evaluation)" described by Bonwell and Eison is nothing more than the higher-order cognitive processes in Bloom's taxonomy. On the other hand, "knowledge" and "comprehension" have been positioned as lower-order cognitive processes in Bloom's taxonomy. I believe that this is a remote cause for knowledge and understanding not having been emphasized to any great degree in active learning theories. Yet, Bloom's taxonomy itself is currently being revised (Anderson and Krathwohl 2001), and knowledge is being appropriately repositioned as the knowledge dimension, independent of cognitive processes.

The understanding described by Wiggins and McTighe is different from the comprehension described in Bloom's taxonomy. It refers to overall workings of the intellect, including higher-order stages such as interpretation and application as well as procedural knowledge and meta-cognitive knowledge in addition to conceptual knowledge.

As stated previously, deep active learning takes the view that understanding deepens through repeated internalization and externalization. The concept of understanding espoused by Wiggins and McTighe can be the theoretical base for this kind of deep active learning.

Deep Engagement

The third lineage of depth in student learning is depth of student engagement.

Student engagement (or involvement) first became an object of attention in higher education in the early 1990s with the publication of Pascarella and Terenzini's *How College Affects Students* (1991). An impetus for the spread of this concept in North America was the National Survey of Student Engagement (NSSE), which was first conducted in 1999. This survey looked at the extent to which students put time and effort into university resources, learning opportunities inside and outside the classroom—including regular curricular classes, co-curricular programs such as study abroad or service learning, and clubs and other extra-curricular activities—and the degree to which these offerings led to their learning and development or, conversely, what impacts the resources and opportunities offered by the university had on student learning and development.[7]

For the purposes of the NSSE, *student engagement* means engagement not only in regular classes but also in co-curricular and extra-curricular opportunities for

(Footnote 6 continued)

dimension has been revised from "knowledge, comprehension, application, analysis, synthesis, and evaluation" to "remember, understand, apply, analyze, evaluate, and create" (Ishii 2011).

[7]The subjects of the survey were first-year and fourth-year students. Data was gathered concerning the development of students in the undergraduate courses at each university and comparisons between one's own university and other universities of similar type. The data can be used to evaluate universities. See the NSSE website (http://nsse.iub.edu).

learning within and outside of the classroom. However, in this book, we focus particularly on classes in the regular curriculum. Elizabeth F. Barkley defines *student engagement* in university classes as "a process and a product that is experienced on a continuum and results from the synergistic interaction between motivation and active learning" (Chap. 3 of this book, p. 40). She describes student engagement in a *double helix model* consisting of motivation and active learning.

The focal point here is that student engagement is understood as a continuum. In other words, there is an axis of depth of engagement ranging from non-engagement to surface engagement to deep engagement. Deep engagement is close to what the psychologist Csikszentmihalyi (1997), known for research on happiness and creativity, refers to as *flow*. It is a state in which one is fervent, immersed, and in a veritable trance. One is probably unlikely to encounter such engagement in a university class but most people have probably experienced a class that was so interesting that time seemed to pass quickly. This subjective sense of time is one of the indices for deep engagement.

Barkley sees student engagement as an interaction between motivation and active learning. She defines motivation as an interaction between expectancy ("I think I can do this assignment") and value ("This assignment is worth doing"), and active learning as the mind being actively engaged. Note that motivation, a theme hidden within deep learning (a deep approach to learning) and deep understanding, becomes a major theme here, drawing attention to the affective factors of the depth axis. Another point worth noting is that Barkley understands active learning more as *minds-on* than as *hands-on*. Her status as the co-author of a handbook on collaborative learning techniques (Barkley et al. 2005) gives weight to her definition.

The Meaning of Deep Active Learning

Given the different but interrelated lineages of learning theories focusing on depth (deep learning, deep understanding, and deep engagement), activeness in active learning can be viewed from an internal aspect and an external aspect and depicted in two-dimensional form as in Fig. 2.5 (Matsushita 2009).

Barkley's definition of active learning, in which the mind is actively engaged, is in contrast to the current state of active learning (easily confused with physical activity) in that it emphasizes an internal aspect of activity (A or B). That is to say, deep engagement is a phrase that expresses the depth of internal aspect of activity.

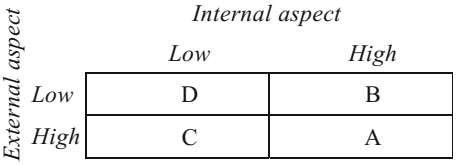

Fig. 2.5 Internal and external aspects of activity

On the other hand, activity-focused teaching, as Wiggins and McTighe point out, is teaching whose outcome is learning in which students are not active in the internal aspect, even if they are active in the external aspect (C). Coverage-focused teaching is teaching whose outcome is learning in which neither the external nor the internal aspect is active (D) as a result of focusing only on covering the content.

Deep active learning is learning that emphasizes activity not only in external aspect but also in internal aspect (A). The use of "deep" is an implied criticism of active learning classes where activity in the external aspect is emphasized and activity in the internal aspect tends to be devalued.

For all that, deep active learning is not some kind of newly proposed theory or practice. Rather, it is an attempt to identify and illuminate consideration for the dimension of depth in the theories and practices that have been proposed as active learning.

Summary

- Active learning has been considered as acting and then learning through reflection about one's actions. Pushed by the national educational policy, this new educational method is spreading rapidly to Japanese universities in response to the challenges of universalization and competency-based education.
- Active learning has appeared on the scene as the antithesis of one-sided, lecture-based knowledge transmission but, due to excessive criticism of coverage-focused teaching, we have ended up with problems caused by activity-focused teaching.
- It is easier to grasp the features and likely pitfalls of active learning, based on the theories of the activity system and the learning cycle, which respectively delineate the structure and the processes of learning activities. Higher-order thinking and externalization of cognitive processes on the part of students are basic characteristics that active learning should incorporate but the essential prerequisites for that are acquisition and understanding of knowledge (internalization). Lecture classes and active learning classes are not antithetical; rather, they complement each other. They are different in terms of degree of emphasis on internalization or externalization (or acquisition of knowledge or higher-order thinking that makes use of knowledge) within the overall learning cycle. The learning cycle can extend over a single class period, a semester of a course, or even a 4-year program. However, both instructors and students need to perceive and be aware of the learning cycle.
- Deep active learning emphasizes depth of learning but this context of "depth" can refer to deep learning, deep understanding, or deep engagement. If we understand activity in terms of internal as well as external aspects, then we, through deep active learning, emphasize activity not only in the external aspect but also in the internal aspect.

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