Creative Problem Solving as a Learning Process

Connecting the Dots between Thinking, Doing, and Reflection

Andreas Ninck
Institute for Corporate Development
Bern University of Applied Sciences
Bern, Switzerland

ABSTRACT

The Business School at the Bern University of Applied Sciences is offering a new MScBA degree program in business development. The paper presents a practical report about the action learning approach in the course 'Business Analysis & Design'. Our problem-based approach is more than simply 'learning by doing'. In a world of increasing complexity, taking action alone will not result in a learning effect per se. What is imperative is to structure and facilitate the learning process on different levels: individual construction of mental models; understanding needs and developing adequate solutions; critical reflection of methods and processes. Reflective practice, where individuals are learning from their own professional experiences rather than from formal teaching or knowledge transfer, may be the most important source for lifelong learning.

Keywords: problem solving, action learning, knowledge generation, reflective thinking, innovation

LEARNING CHALLENGES

While designing the educational concept of a new course in 'Business Analysis & Design' we have taken the chance to rethink some of the traditional education models and to implement new activity-based study methods. We understand active and problem-oriented learning as the answer to the transformation taking place in the working and learning environment. In brief, the challenges can be characterized as follows:

Increasing complexity: The problems that our graduates will face in the workplace of the future can be characterized as being increasingly more complex. This is why our teaching method has to focus on dealing with complex systems (large number of components, high degree of behavioural variability) and to place the spotlight on related methods (cf. Fig. 1).

Conceptual thinking: Even though in terms of structure we still find ourselves entirely engrossed in the transformation from an industrial society to a knowledge society, visionaries are already discussing the next age, which is much farther beyond what we currently understand as knowledge management. Daniel Pink [1] has come up with the term "conceptual age". This is the age where lateral thinking, empathy for the user, and collaboration with stakeholders is more important than factual knowledge and linear thinking.

Constructive learning: In the past, learning typically involved memorizing and reproducing facts. When it comes to the practical use of the acquired knowledge in complex situations, this way of learning is only partially effective. For managers of the future, in fact, expertise in creative problem solving will be high in demand. Therefore, a future-oriented learning approach has to make the transformation from reproduction to production, from knowledge acquisition to the development of skills, from testing to encouraging and from dogmatic teaching to coaching.

Learning to learn: Knowledge management is a central task of the knowledge society. To date, the predominant idea has always been that knowledge must primarily be conveyed in an explicit form (books, lectures, etc.). For future managers, who are confronted with new challenges on a daily basis, we advocate a move away from the institutionalized learning of facts towards the construction of new knowledge and the development of reflective skills.

PROCESS MODEL REQUIREMENTS

While designing the educational concept for our new course, we were led by the ideas of Henry Mintzberg who states: „Management is craft, meaning that it relies on experience – learning on the job. This means it is as much about doing in order to think as thinking in order to do." With this in mind, the challenge therefore was to define a process model, which provides an answer to the following seemingly conflicting challenges:

Structure vs Flexibility: How do we design a process model that is intended to clearly structure the communication process with the different stakeholders, and yet which has enough flexibility to allow the students to individually tailor the solution process?

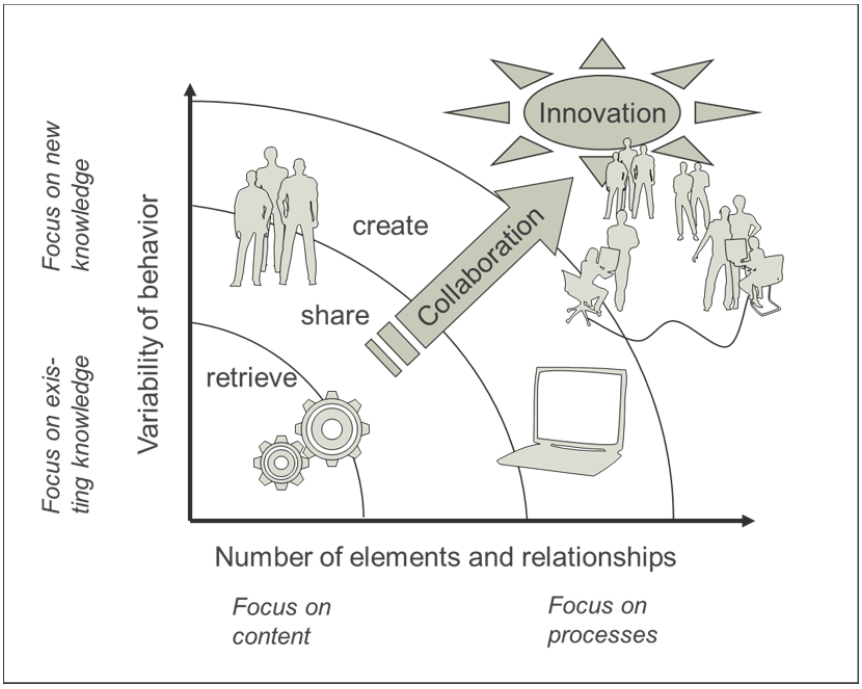

Fig. 1: Complexity is the result of a greater degree of behavioural variability. The development of innovative solutions requires collaboratively constructing new knowledge [2]

Divergence vs Convergence: How can we go about organizing the process in a way that on the one hand we can incorporate as many needs and ideas as possible in a divergent process, and on the other hand we can keep redirecting the focus again and again, thus converging it towards our goal?

Abstract vs Concrete: How should we design a process that encourages the students to repeatedly change the level of abstraction, so as on the one hand to stay close to the problem, and yet on the other to break away from the concrete object and to develop abstract models of an intended solution?

GENERAL PROCESS

For a long time, the problem solving process was characterized by the mindset, that one knew what the problem was and that the task was to find the right solution. However, often it turned out that solutions did not meet the needs of the users. In recent years we have been facing a paradigm change. Solutions are no longer being developed exclusively 'inside-out' from the point of view of a company or a service provider, but increasingly 'outside-in', from the point of view of the user or in general the stakeholders ([3], [4], [5]).

Figure 2 gives an overview of the general process model. It is more or less a modified merger between the Stanford "design thinking process" [6] and the "double diamond process" of the UK Design Council [7]. With the diamond shapes the need for divergent and convergent thinking is illustrated. As a result of the analysis phase we produce a specification of the demands. During the design phase we come up with a rough sketch of a possible solution. The whole process is heavily based on the collaboration with stakeholders.

With regard to a stakeholder-centred approach, problem solving is primarily understood as a learning process. The goal for developers and stakeholders is to interact for the sake of generating new knowledge regarding possible solutions. The learning process is not simply linear, but cyclic and iterative. A cyclic approach means that we go through a development cycle, once or several times per phase, at the end of which there is a concrete understanding of an issue, which is narrowed down to its very essence (cf. Fig. 4). By an iterative approach we understand that sometimes it is reasonable to take a step back in order to incorporate new insights into an earlier phase. For example, we might discover at the time when we develop and test an initial prototype that certain requirements are not sufficiently understood and so it is necessary to redefine the specifications. In specific terms, problem solving means nothing more than applying a step-by-step learning process to find one's way toward the needs of stakeholders and toward solutions which adequately satisfy these needs.

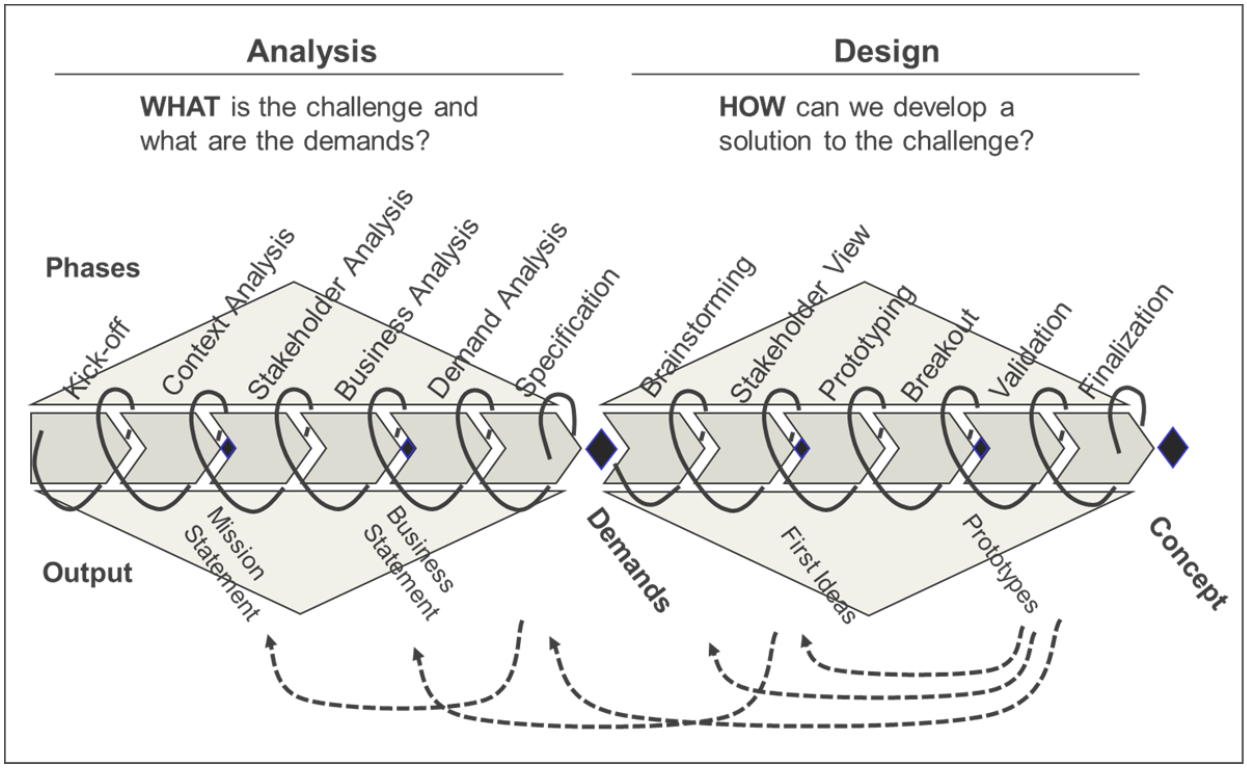

Fig. 2 General process: Understanding the problem before searching for possible solutions. The spiral indicates the cyclic approach; the dashed lines represent iterative steps.

THINKING CYCLE

We understand learning within the concept of constructivism ([8], [9], [10]). Accordingly, reality is not objectively perceived, but it is a construct that we lay out for ourselves based on our own mental models. Learning means nothing more than the continuous adaptation and addition to our set of mental models (cf. Fig. 3).

When we perceive information, only aspects that can be associated to our current mental models will penetrate into our consciousness. Ideally, we can match the incoming information with our mental models. A difference between our perception and our models leads to "perturbations" [11], which forces us to rebuild our mental models. As a consequence there is no one universal reality (objective reality), but each person has their own view of reality (subjective reality).

In the context of problem solving, we are particularly interested in the process where two persons (A and B, e.g. the problem solver and a stakeholder) communicate in order to develop a common understanding of a topic. Communication is more than just exchanging information. If A says something to B, it is not possible for B to know what is happening in A's mind, and vice versa. We feel that communication is closer to the Latin verb 'communicare', which means 'to share'. This means that persons A and B will start a collaborative learning process in order to develop a common understanding. Schrage [12] brings it to the point when he defines this process as: "two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own".

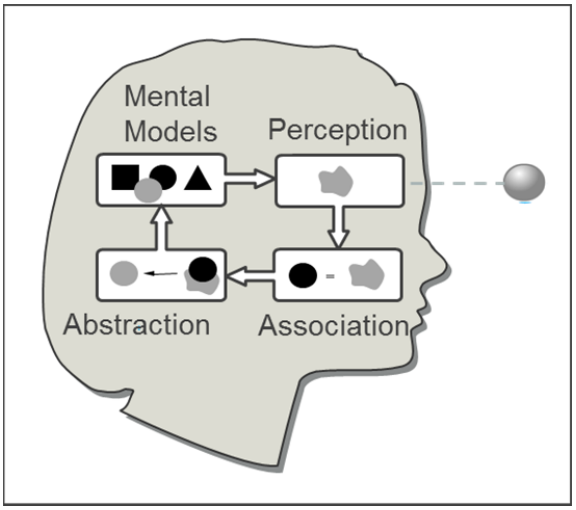

Fig. 3: Learning = Constructing new mental models.

The collaborative development of shared mindsets and models is the basis for creative problem solving. Artefacts play a key role in making the thinking process tangible. Schrage [12] assumes that in a collaborative context it is mandatory that symbols, pictures, models or concepts are processed within a shared space: "The images, maps, and perceptions bouncing around in people's brains must be given a form that other people's images, maps, and perceptions can shape, alter, or otherwise add value to".

DEVELOPMENT CYCLE

Each phase of the general process is structured in the form of a development cycle. This is indicated in Fig. 2 as a spiral and illustrated explicitly in Fig. 4. The process is performed with the output in mind. Before we start a new cycle we have to ask, which kind of artefact (model, scenario, drawing, prototype, etc.) we would like to present at the end of the cycle. This result represents the starting point for the next cycle. The development of artefacts in relatively short cycles is important for the ability to steer the process efficiently and effectively. With each cycle the knowledge from the previous cycle is improved and fine-tuned. The cyclic procedure helps us to ultimately resolve two of the main challenges stated above: On one hand there is a divergent phase of understanding needs and developing ideas and a convergent phase of conceptualization and consolidation in every cycle. On the other hand we face an on-going exchange between the concrete scope of the problem/solution and the abstract level of models/concepts. This process of changing views triggers so-called "perturbations", that is, the deliberate disruptions in the cognitive process that lead to the change in mindsets and to a more creative perception and solution process.

In our iterative spiral model the feedback culture is central. At the beginning of each cycle, different viewpoints are explored with the stakeholders. At the end of the cycle, an artefact is generated which during the next phase can in turn be used as the basis for communication and feedback. At the end of each phase, the most crucial work steps and results are presented in a so-called 'elevator pitch'. These short presentations are intended to prepare students to be ready to collect opinions from stakeholders.

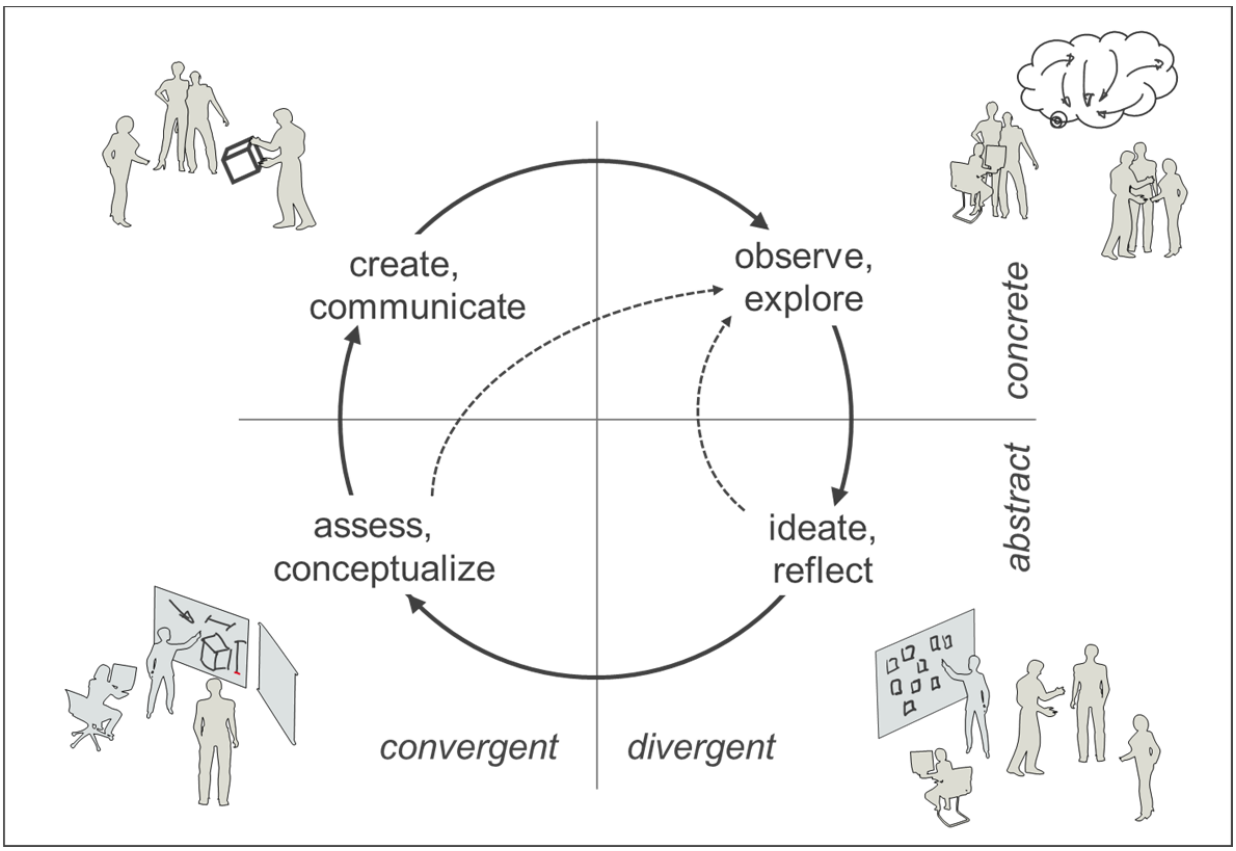

Fig. 4 Development cycle: Based on the results of the previous cycle, each cycle will produce a specific artefact (please compare the similarities with the thinking cycle in Fig. 3)

REFLECTION CYCLE

Today's economy is being affected so strongly by its transformation that the environment and challenge requirements are constantly undergoing change. Problems at this level can no longer be solved merely with a set of fixed methods. In this case, what is needed is an ongoing learning process by which to optimize the methodology. The action-learning approach is more than simply 'learning by doing'. In the world of complex problems, taking action alone will not bring with it a learning process. What is needed is the step that involves reflection, so as to be able to discover specifically what has been learned in the problem solving process. And we also need artefacts (text, images, models, etc.) in order to make the findings tangible for others.

It is important to position oneself as often as possible but at least once during each phase on the meta-level to take a critical look at one's own doing from a bird's eye view. Inspired by Kolb's learning cycle [13] and according to the structure of the thinking and/or development cycle we propose to organize the four steps of the reflection cycle as follows:

- Subject of experience: What is it I am observing?
- General observations: How am I reflecting about new experiences in light of my insights from the past?
- Lessons learned: How can I draw new insights from possible differences, and in what form can I generalize them for future purposes?
- Consequences: In what way do I intend to apply the acquired knowledge in the future?

ACTION LEARNING – CONNECTING THE DOTS

According to Marquardt [14] action learning is: a problem (project, challenge, opportunity, issue, or task), an action learning team, a process of reflective cognition, an action taken on the problem, a commitment to learning, and an action learning coach. In our MScBA course we are setting up the action learning environment in cooperation with business partners like Swisscom (How to implement services around watching TV.), UBS (How to redesign the knowledge portal 'Intellispace for Human Resources'.), Swiss Post (How to address and motivate customers for the new online service 'Swiss Post Box'.), or Swiss Federal Railways (How to improve services at the ticket machine.).

Among the business partners, both an evaluation of the performances as well as oral consultation have shown that the results do consistently indicate a high degree of quality and that they are relevant for practical purposes. Especially interesting are the results of a student evaluation, which focused on finding out the ability to achieve various levels of learning objectives (inspired by Bloom [16]):

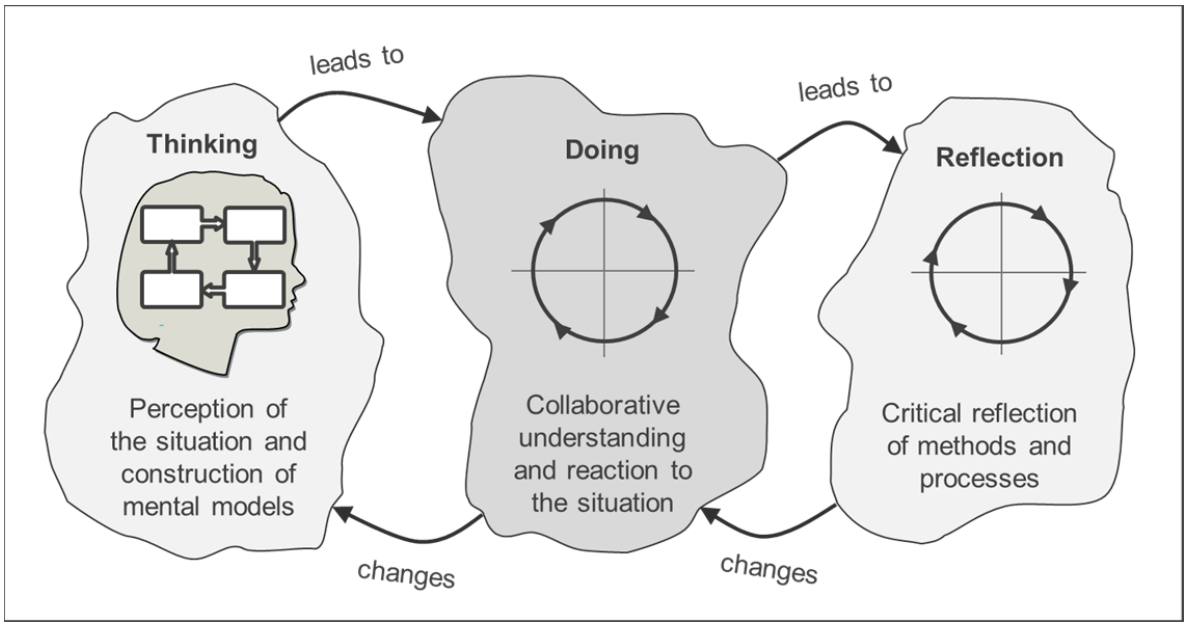

Fig. 5 Action learning is developing competences on three different levels: thinking, doing, and reflection (inspired by Checkland [15]).

1. Knowledge: ability to describe what one has learned
2. Understanding: ability to explain what one has learned
3. Application: ability to transfer what one has learned to a new situation
4. Analysis: ability to analyse a complex situation and to present the findings systematically
5. Synthesis: ability to condense different ideas into a concept
6. Evaluation: ability to argue about the fit of a concept with regard to the requirements of a complex situation
7. Reflection: ability to analyze the own actions and to draw conclusions that can be used to improve results in the future

The evaluation shows that the course in 'Business Analysis & Design' produces significantly higher results on levels 4-7 than the average of other MScBA courses. These results underscore not only the practical value of our action learning approach but also the fact that we apparently have managed to structure and facilitate the learning process on different levels: individual construction of mental models; understanding needs and developing adequate solutions; critical reflection of methods and processes (cf. Fig. 5).

The creation of new knowledge is the main foundation for innovation. The ability to learn quicker than the competitors is a crucial and in particular long-lasting advantage. The challenge is to organize a creative learning environment which keeps the team on "the edge of chaos" [17]. This means to lead the team on a path where maximum creativity exists and where learning best occurs, in a team or organization which is optimally responsive to the complexity of the environment but still structured sufficiently to succeed [18]. Fulmer [19] argues, that for a team to succeed it needs to walk the fine line between stability and change. To stay at the edge of chaos, the team needs a few simple rules and a minimum set of norms or guidance, which are simple but also adaptable [20]. Our experience shows that the structured interplay between thinking, doing, and reflection can help to keep the team poised on the edge of chaos and to solve the somehow paradoxical demand to introduce disorder and to organize creative chaos.

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