
Reflective Learning at Work - A Position and Discussion Paper

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Abstract. The relevance of reflection for learning has long been recognised, and there is a substantial body of theoretical work on reflection. However, many questions regarding reflection at the workplace are still open, especially regarding the actual occurrence of reflection in different workplaces, and the efficient support for reflection.

In our ongoing work to examine the relevance of reflective learning at work in various organisations and to design technological support, we have collected and discussed existing literature on reflective learning. Within this paper, we discuss relevant and open issues in four major topical areas that are relevant to the above research goal, namely (i) the reflection process, (ii) the various scopes of reflection such as individual and organisational learning, (iii) the context or setting in which reflection might take place and (iv) how we can facilitate and scaffold reflection by means of technology. We aim to provide a basis for discussion and to illustrate that research on reflection, especially in the context of work, is far from finished.

1 Introduction

The relevance of reflection for learning has long been recognised, and there is a substantial body of theoretical work on reflection. Within the project *MIRROR - Reflective Learning at Work*⁶, our goal is to facilitate learning by reflection at the workplace using state-of-the-art information technology. However, many questions regarding reflection at the workplace are still open, especially regarding the actual occurrence of reflection in different workplaces, and the efficient support for reflection.

Within this paper we discuss four major topics that need to be considered from a theoretical viewpoint when tackling the challenge of providing technological support for reflective learning at work. These are (i) the reflection process itself, (ii) the various scopes of reflection such as individual and organisational learning, (iii) the context or setting in which reflection might take place and (iv) how

⁶ <http://www.mirror-project.eu>

we can facilitate and scaffold reflection by means of technology. These topics also provide the structure of the present paper. For each topic we will explain our current understanding and present issues for discussion.

2 The Reflection Process: Triggers, Object, Process, and Outcomes of Reflection

Daudelin defines reflection as “the process of stepping back from an experience to ponder, carefully and persistently, its meaning to the self through the development of inferences; learning is the creation of meaning from past or current events that serves as a guide for future behavior” [3]. Reflection has the potential to lead to a better understanding of ones own work practice and work-related experiences and can guide future behaviour [10]. For our purposes, we thus consider reflection and reflective learning to be the same thing.

We start our discussion of the reflection process with the input-output-oriented model of reflective learning proposed by Boud et al. [2], see Fig. 1. This model outlines a three-step process of reflective learning: The learner re-evaluates past experience by attending to its various aspects such as feelings and ideas, thereby producing outcomes such as a better understanding of an experience or behavioural change. However, it does not specify the content of reflection, the triggers for reflection, the reflection process itself, and the outcome of reflection. These aspects need to be better understood, in order to design efficient support, both technological and non-technological, for learning by reflection at work, and in order to illustrate clearly the benefits of learning by reflection for individual learners and teams in organisations, and the organisation itself.

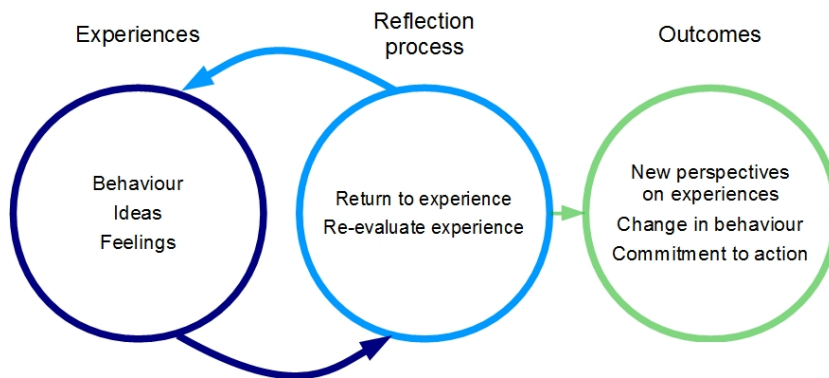


Fig. 1. The process of reflective learning [2]. Note that this illustration redrawn following the original drawing.

The Content of Reflection: Experience(s) In Boud's reflective learning process (illustrated in Fig. 1) we can consider the experience returned to as a single experience or as a conglomeration of single experiences. We follow [2] in defining a single experience as "the total response of a person to a situation, including behavior, ideas and feelings". In everyday as well as academic language "experience" refers both to a single experience within the context of a specific event or situation and general experience in the sense of (tacit) knowledge, skills or attitudes that have been developed over time. In workplace learning, we can thus specify work-related experience as the content of reflection: The subject matter of reflection is likely to be one's own work practice. Reflection in a team context might be based on shared experience instead of individual experience. It is still an empirical question, which aspects of work practice are typically reflected upon, for instance whether it is on task performance, on communication with clients or colleagues, or on one's own reaction to experiences.

Triggers for Reflection Reflective learning does not automatically occur during the course of daily working routines. Reflection arises from the flow of experience prompted by some kind of cue that draws attention to a concrete instance of experience. All typical occasions for reflection that we have found in the literature have in common that they elicit a state of discrepancy. This discrepancy can arise from experiencing a knowledge or skill gap, the mismatch of an individual's expectation and the actual environment, experiencing contradicting information, difference in individual understanding, involvement in social conflicts, a positive change in work processes, improvement in productivity, etc. From a psychological viewpoint, we can thus understand *discrepancy between reality and expectation* as the trigger for reflection. This discrepancy leads to inner discomfort; reflection is one possible, and highly beneficial, strategy for dealing with such discomfort. For practical reasons, we would like to have a more fine-grained distinction between triggers. A practically applicable categorization of triggers is therefore one of our ongoing research endeavours.

Personal and Situational Factors that Influence Whether and How Reflection Takes Place The same situation may make one person reflect whereas another person does not experience a need for reflection at all. We can safely assume that this is influenced by a complex interplay between situational factors and personal factors. On an abstract level, it is reasonable to assume that a person's need, (cognitive) ability and opportunity as well as characteristics of the situation in which reflection takes place influence whether and how reflection takes place. In our future work, we want to identify this interrelationship more precisely. This is the pre-requisite for designing a work environment that fosters learning by reflection, such as establishing reflective practice or tweaking organisational culture so that it holds reflective learning in higher regard.

Reflection and Learning Based on the re-evaluation of a past experience, reflection leads to a new and better understanding of the experience and allows for

deriving implications, conclusions, or 'lessons learned'. Reflection thus includes processes of drawing conclusions with regard to future situations. This, in turn, requires the generalization and abstraction from the concrete experience. The outcome of reflective learning can be cognitive, affective, and/or behavioural (in line with [2]). A resolution or lesson learned is a core part of the reflective process; this constructive element of reflection differentiates it from repetitive thought and rumination (cp. Martin & Tesser [9, 8] for research into rumination), although the outcome does not necessarily have an immediate and/or observable impact on work practice. Thus, following our definition of reflection, reflection always leads to learning.

We aim at a comprehensive categorisation of reflection outcomes that are measurable. This is an essential pre-requisite to evaluate any interventions.

Indicators for the Occurrence of Reflection In general, reflection is considered to be the conscious re-evaluation of one's own experience. Reflection is "a form of mental processing with a purpose and/or an anticipated outcome that is applied to relatively complicated or unstructured ideas for which there is not an obvious solution" [10, p98]. The reflective process is deliberate/careful (active, purposeful), rational (systematic, situated sense-making) with an affective side (attending to feelings, values and attitudes), and includes the rational evaluation of knowledge and beliefs.

Unfortunately, most models of reflection do not specify the concrete mental operations, which would be necessary to assess reflection. However, identifying whether reflection occurs or not will be crucial for any research purposes that involve evaluation of interventions. Our goal is therefore to identify indicators of the reflective process such as perspective taking, counterfactual thinking, and generation of behavioural intentions. Additionally, available models of reflection focus on individual reflection and thus neglect communication activities that become relevant in collaborative settings. Hence, we need to further consider indicators for reflection in collaborative settings. Relevant indicators might be the ones proposed by van Woerkom & Croon [13] such as questioning groupthink, giving and receiving feedback etc.

Reflection and Task Performance The work of Schön [12] explains how knowledge, experience and reflection at the workplace are linked. According to Schön, there are several steps involved in reflective work practice: Knowing-in-action, surprise, reflection-in-action, experimentation, and reflection-on-action. Knowing-in-action refers to the kind of knowledge we can only reveal in the way we carry out tasks and approach problems, e.g., tacit knowledge. Reflection-in-action happens as an integral aspect of work, triggered by situations that challenge knowing-in-action. Solutions to these challenges emerge as an outcome of reflection and are tried out, e.g., enacted in practice (experimentation). This experimentation is re-evaluated through reflection-on-action taking place after the event. The result of reflection is improved knowing-in-action. Although, Schön's model sheds light on the connection between reflection and the task performance

process, we believe that time and opportunity to reflect is essential. Some emotional and cognitive distance to an experience seems also to be necessary for generalization and abstraction from a single experience, e.g., “the role of emotions as possible barriers to reflection” are explicitly mentioned in [2].

We thus think it is difficult to link Schön’s reflection-in-action to the reflection process that we assume based on Boud’s model of reflection. Reflection-in-action in the sense of Schön’s definition seems to be related to problem solving during task performance instead. Dealing with disturbances or challenges during task completion should, in our opinion, not be regarded as reflection as long as there are no lessons learned that guides future behavior. This is, however, an issue for discussion as there is some disagreement in available literature with regard to the relationship of reflection and problem solving during daily work.

3 The Scope of Reflective Learning: Individual, Collaborative, and Organisational Learning

Especially in the context of organisational learning, reflection should not only be considered as an individual cognitive process. Since most business organisations strive to implement teams to successfully face the rapid changes and challenges in business life, we argue that also collaborative reflection should be considered more comprehensively [6]. However, there is little literature that collects how and when transitions between individual and collaborative reflection, or from individual and collaborative reflection to organisational learning and vice versa happen (exceptions include [4, 5]). Rather, existing literature often deals with one single aspect only, such as developing self-reflective capabilities and supervised reflection in educational settings (i.e. individual reflection), with team learning and reflection in work settings (i.e. collaborative reflection), or with organisational learning from a quality management perspective. On the other hand it is highly relevant in the context of workrelated learning to investigate which paths are “travelled” in the real world, in order to efficiently support existing reflection and transfer best practices to other workplaces. Established paths are necessary so that results of reflection by individuals can be shared with a team or the whole organization.

Individual and Collaborative Reflection We suggest a reciprocal relation between reflection within a group and the individual reflection processes: For reflection to be collaborative, participants share experiences. With regard to the outcome of reflection, we need to further specify who learns from reflection: Besides individual learning, reflection may also lead to team learning. Team learning through reflection leads to team development for the purpose of improving team performance in the future. We would like to point out here, however, that team learning is not only the result of a whole team reflecting collaboratively together, but implications for team work practice might, of course, be also derived by a single team member or perhaps by the team lead while reflecting solitarily on his/her personal understanding of team work. Outcomes of collaborative

learning can be, e.g., social norms, implicit or explicit rules for communication, coordination or cooperation, etc.

Reflection and Organisational Learning Reflective learning can also be viewed in an organizational scope. Organizational learning, an organizations improvement of its performance over time [1], can be seen as a consequence of the learning taking place within the context of daily work. Learning includes both individual and team learning. We consider this kind of organisational learning to result from staff's learning experiences as a bottom-up process. For bottom-up organisational learning, continuous evolution of best practice must be stimulated by regular review of organizational routines and practices. Sharing of individual work practice should be encouraged so that others can profit from individual good practice. On the other hand, organisational learning can also be initiated in a top-down approach, when work processes are reflected on at a managerial level. Management responsables may reflect on the organisation's overall performance as well as specific organisational standards and routines on the basis of performance data. This data may originate from work processes directly, or may stem from from reflection processes of single staff members or teams.

4 The Context of Reflection at the Workplace: The Reflection Session

By reflection session we refer to a time-limited activity framing and supporting reflection. Reflection sessions range from individual and spontaneous pauses in between work tasks to scheduled and facilitated reflection meetings in teams. By using the term "reflection session", we distinguish the mental process of reflection within a single learner or the social process of reflection within a team respectively ("reflection"), from the setting in which reflection happens ("reflection session").

Following-up on our earlier discussion of different aspects of learning by reflection, we propose five sets of characteristics (aspects) for a reflection session. The five sets of characteristics include the three elements in Boud's model[2], but add characteristics of the learner and contextual information about the reflection session. Such aspects are necessary to compare reflection sessions, study commonalities and differences between reflection sessions, and subsequently build appropriate support for different reflection settings. We have already begun testing the usefulness of the conceptualisation below on existing empirical data [11, p22ff], but future, continued validation is needed.

Content Characteristics By content we refer to the object of reflection, the past experiences.

- Does the reflection address a single experience or a conglomeration of experience?
- Who owns, or "made", the experience?
- Which work process(es) are in focus?

- Which aspect of the experience is reflected on?

Characteristics of Reflection Process This refers to the question how and by whom the activities in the reflection session are being conducted.

- Who participates in the reflection process? Is the process individual or collaborative? What are the participants' roles in this process?
- Which data is accessed to support reflection?
- Are there specific reflection techniques to facilitate reflection?

Outcome Characteristics Outcomes are any results of reflection sessions. They target both what the learners have actually learned, as well as the tangible artefacts that have been produced.

- What is the scope of reflection? Which actors must ideally learn and change?
- Which (kind of) knowledge is constructed?
- Which tangible artifacts are produced?
- How are outcomes sustained?
- What actual changes in work practice result from reflection?

Learner Characteristics Learner characteristics describe the learning actor(s), which may be a single person, a team or group of people, or an organisation. Naturally there are different characteristics for all these “kinds” of learner. For example:

- Personal disposition, such as need or ability to reflect.
- Group dynamics, e.g., culture of giving respectful feedback.
- Organisational culture.

Characteristics of Reflection Situation The reflection situation encompasses concrete situational factors of the reflection session, such as time and place where the reflection process takes place.

- When does the reflection happen?
- Was the reflection session planned?
- How long does the reflection session take?
- Where does the reflection session take place?

Organisational and Technical Support for a Reflection Session Facilitation and “design” of reflection sessions require knowledge about the specific effects of the above discussed characteristics. Although we have already identified these characteristics of a reflection session, we do not know exactly which options are adequate for which purpose. In some cases, for example, it might be good to have an individual reflection opportunity before the team comes together and shares individual pre-understandings - in other cases, sharing individual experiences and discussion interpretations might be useful in a team context from the beginning (e.g., when single individuals do not have access to information relevant or knowledge applicable). Involvement of a line manager might be useful if she can provide objective feedback but it might hinder a thorough analysis of a specific situation. Some incidents might require an immediate analysis, while in other cases it might be more helpful to wait until emotions have calmed down.

5 The Role of Tools in Reflection At Work

Tools may have different roles in supporting reflection at work. Two broad categories of tool use for workrelated reflection have been identified as (i) gathering data from the work process and (ii) providing support for the reflection session in [7]. From this starting point, we go on to expand the conceptualisation of different roles of tools along the model of reflection of Boud et al. [2] considering the experiences, the reflection process, and the outcomes:

Experiences Here, we can consider technology that captures data about a learner’s experiences, which can be used as a basis for reflection in a reflection session. Such technology may or may not support the work tasks, e.g., a subversion repository supports a developer’s work and also produces log data whilst a video camera does not support the a fireman’s work but produces log data that can be used as a basis for reflection. Finally there are manual data capture tools, e.g., note-taking tools, which serve not only to capture experiences but also serve as a first step in a reflection process since they require an explicit engagement on the learner’s part with an experience.

Reflection Process Technology can also be used to support the reflection process itself. Given the current technological state-of-the-art, the following ideas come to mind:

- Data analysis tools: Data analysis technology can help making sense of complex data that describe the experience that is the object of reflection.
- Reflection recommendation: Assuming that it is possible to automatically identify triggers for reflection, e.g., by detecting emotions, or discrepancies between an actual work process and the prescribed work process, it is possible to recommend a learner to reflect on an experience.
- Scaffolding / reflection guides: Tool support for the reflection session may take the form of process guidance, i.e. scaffold each reflection step. For example, tools may scaffold articulation of individual pre-understandings for the purpose of collaborative reflection. Tools may highlight disagreement and conflicts among individual understandings of an experience. Finally, tools can support the generation of reflection outcomes.

Outcomes In a successful reflection process, returning to an experience and abstracting from it is followed by integrating the extracted findings into existing knowledge. This integration can be viewed as knowledge construction, and thus as learning. Technology can support such knowledge integration, for instance by pro-actively searching for artefacts that contain related knowledge and providing them to the learner. Technologies for knowledge sharing foster the transition from individual learning to team learning.

Challenges for Developing Technological Support for Reflection at Work Some of the described technologies for supporting reflection present technical challenges, such as gathering meaningful data about work experiences, or identifying triggers and recommending users to reflect. Other technologies, such as technologies for knowledge sharing, are technologically well-established.

However, with all envisioned technologies, we face the challenge that little research exists concerning technological support for reflection. A lot of literature deals with how manual note-taking, such as diary-writing, supports reflection. Other work deals with life-logging, which is becoming increasingly popular because of the availability of life-logging consumer goods, such as smartphones, pulse meters, pedometers, etc. Emphasis is often placed on the technical possibility of logging data, but less on which data is actual meaningful for learning. Additionally, we are faced with the challenge of supporting not only scheduled reflection sessions, but to also provide support for spontaneous reflection. We can only assume that scheduled and spontaneous reflection sessions follow different processes and hence require differently shaped support.

6 Summary

To summarise briefly, we see open issues for future research on learning by reflection in the workplace mostly in (i) making theory more applicable which will be done by studying more closely the content of reflection, triggers for reflection, personal and situational factors that influence reflection and by developing methods to identify and assess reflection that occurs at work, (ii) widening the perspective to investigate the interrelationship between individual, collaborative and organisational learning by reflection, and (iii) developing appropriate technological support for reflection. Additionally, fitting reflection into already tight schedules of workers, and identifying clearly the benefits of learning by reflection are two overarching challenges for reflective practice in workplaces. Organizational culture often does not give reflection the time and space it deserves in the work processes. By facilitating reflection however, organisations can use these powerful learning opportunities in everyday work for individual, collaborative and organizational benefit.

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