



Learning from others' experiences: How patterns foster interpersonal transfer of knowledge-in-use



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ABSTRACT

The interpersonal transfer of knowledge-in-use is necessary for individual and organizational learning. Learning from others depends on people's ability to integrate their own and others' experiences. In order to do that successfully, people have to abstract from single experiences (that they themselves or others have had) and recognize those features that different situations have in common. An established instructional method to foster these abstraction and integration processes is to use patterns. These are pre-structured text templates that differentiate between problems and solutions. By pointing to problem–solution pairs they support individuals in considering invariant aspects of similar problems and identifying structural features of situations and problems. In an experiment ($n = 81$) participants read about other's experiences in a pattern or non-pattern format and had to apply this knowledge to a new situation. Then they externalized this new experience by articulating them either in a pattern or non-pattern format. We further measured the knowledge transfer to yet another problem. Congruent with our hypotheses we found that patterns do support the *internalization* of others' experiences and their application to a new situation. *Externalizing* the newly made experiences in patterns led to a stronger focus on structural problem features, which in turn fostered knowledge transfer to new situations.

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1. Introduction

In knowledge-based societies, lifelong learning is important, and people feel it is imperative to learn and develop continually (c.f. Bin-Abbas & Bakry, 2012). The effectiveness of professional learning and development is linked not so much to the ability to exchange and integrate semantic or factual knowledge about terms and theories, as it is to *knowledge-in-use* (de Jong & Ferguson-Hessler, 1996; Matschke, Moskaliuk, & Cress, 2012). Knowledge-in-use is knowledge about how to perform an activity. This tacit knowledge is essential for solving daily problems and meeting challenges (c.f. Joia & Lemos, 2010; Ranucci & Souder, 2015; Venkitachalam & Busch, 2012). Knowledge-in-use can be described as a combination of declarative knowledge (e.g. the names of the different parts of a computer), procedural knowledge (e.g. how to manage specific software on a certain computer) and meta-knowledge (e.g. who might be able to give support if something does not work).

Knowledge-in-use is based not just on one's own activities (Bakkenes, Vermunt, & Wubbels, 2010; Kwakman, 2003; Tillema & Orland-Barak, 2006; Tynjälä, 2008), but also on consideration of others' experiences. Managing knowledge-based resources successfully provides competitive advantages for companies and other organizations (Lytras & Ordonez de Pablos, 2009; Mariano, 2013). People can get an idea from another person (they learn from others), test it in their own situation (they learn by testing an idea in the field), and evaluate how well the idea fits their practice (they reflect on these experiences). For effective interpersonal transfer of knowledge-in-use to new and unknown situations, people need to integrate the experiences that others have with those they have themselves (Lawson & Lorenz, 1999). They have to identify the features that different experiences have in common and that allow for selecting a suitable solution for a given type of problem. Put another way, individuals must develop appropriate problem schemata as mental representations of a situation. Such a problem schema is closely bound to personal experiences and contains knowledge-in-use that is relevant to solve a problem. It bundles distinct experiences with similar situations (Gick & Holyoak, 1983). By analogical reasoning (Sternberg, 1977) individuals transfer

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solutions from one situation to another situation by focussing on the underlying principle. To be able to do this, they have to identify “structural problem features”. These are relevant aspects different experiences have in common (Blessing & Ross, 1996; Chase & Simon, 1973; VanLehn, 1989). Identifying structural problem features requires ignoring irrelevant surface features of a situation (Chase & Simon, 1973; Chi, Feltovich, & Glaser, 1981; Hinsley, Hayes, & Simon, 1977) and identifying those features that are similar on a structural level.

Interpersonal transfer of knowledge-in-use requires both externalization and internalization. Only if people internalize the experiences of others can they apply those already proven solutions to their own specific situation and avoid mistakes previously made by others. To make their own experiences also available to others, individuals have to externalize them, that is, they have to communicate them. One method that is often used for that interpersonal exchange of knowledge is the implementation of a common knowledge base. A knowledge base guarantees sustainable storage of knowledge and makes it permanently available. This is especially relevant for large organizations where transfer is needed across geographical and temporal borders (Allan & Lewis, 2006; Arbaugh, 2000; Arbaugh & Duray, 2002; Dede, 1996, 2004; Marks, Sibley, & Arbaugh, 2005; Pablos & Lytras, 2008; Scherer Bassani, 2011; Wachter, Gupta, & Quaddus, 2000; Watabe, Hamalainen, & Whinston, 1995). In such knowledge bases, individuals can share data, information and experiences, for example by using wikis or shared databases (Cress, Kimmerle, & Hesse, 2006; Matschke, Moskaliuk, Bokhorst, Schümmer, & Cress, 2014). As a consequence information sharing leads to individual learning and collective construction of knowledge (Kimmerle, Moskaliuk, Oeberst, & Cress, 2015).

We assume that instructional support can facilitate knowledge transfer of knowledge-in-use. For several reasons, knowledge-in-use is especially difficult to exchange and to store: It is used unconsciously and automatically. Because it is established through repeated practice over time (Anderson, 1983; Smith, 2001) it is mainly tacit and difficult to externalize, except for explicit parts that are easy to articulate (Polanyi, 1966). Furthermore, knowledge-in-use is embedded in daily experience and thus highly situational (Bereiter, 2014; Billett, 2001; Greeno, 1998; Shulman, 1986; Tillema & Orland-Barak, 2006). This makes it difficult to internalize, as knowledge from others has to be adapted to one's own situation (Argote & Ingram, 2000; Wilke & Bergmann, 1998).

Patterns are proposed as a means of overcoming these problems. Patterns are pre-structured text templates used to collect individual knowledge and make it available for others. As such, they are expected to support the interpersonal transfer of knowledge. (Avgeriou, Papasalouros, Retalis, & Skordalakis, 2003; Beck & Cunningham, 1987; Bokhorst, Moskaliuk, & Cress, 2013; Carroll & Farroq, 2007; Derntl & Motschnig-Pitrik, 2005; Frauenberger & Stockmann, 2009; Gamma, Helm, Johnson, & Vlissides, 1995; Goodyear et al., 2004; Köhne, 2005; Manns & Rising, 2005; Matschke, Moskaliuk, Arnold, & Cress, 2010; May & Taylor, 2003; Wodzicki, Moskaliuk, & Cress, 2011).

From a cognitive perspective, patterns are external text structures that are analogous to the internal representation of knowledge-in-use, i.e. problem schemata (Bokhorst et al., 2013). Each pattern contains problem–solution pairs that focus on the structural features of a problem and considers which invariant aspects of a solution are relevant for similar problems (Frauenberger & Stockmann, 2009; Kohls & Scheiter, 2008; Kohls & Uttecht, 2009; Wodzicki et al., 2011). According to Alexander, Ishikawa, and Silverstein (1977), who introduced the pattern concept, a pattern describes the *situation* or *context* in which the solution may be useful, a *problem* which has occurred, the

associated *solution* that has proven successful and the *forces*, including competing requirements, that influence the solution to the problem.

Patterns are expected to enable a collective process of re-using and revising experiences (Schümmer & Lukosch, 2007). Fig. 1 shows the description of an experience in a pattern format. Fig. 2 shows the description of the same experience in non-pattern format.

Individuals can internalize knowledge-in-use by reading patterns about others' experiences and can externalize their own knowledge-in-use by writing and contributing patterns about their own experiences. Through this interplay of knowledge externalization and internalization in the pattern format, interpersonal knowledge transfer can be facilitated (Kimmerle, Cress, & Held, 2010).

With regard to *internalization* of knowledge from others' experiences, we expect a supportive impact of patterns, because patterns help individuals to focus on the relevant information by explicitly differentiating between problems and solution. In this differentiation they point to the structural features of the problems and solutions. This identification of specific structural features should lead to better transfer of the knowledge to new situations.

With regard to *externalization* of knowledge, previous studies

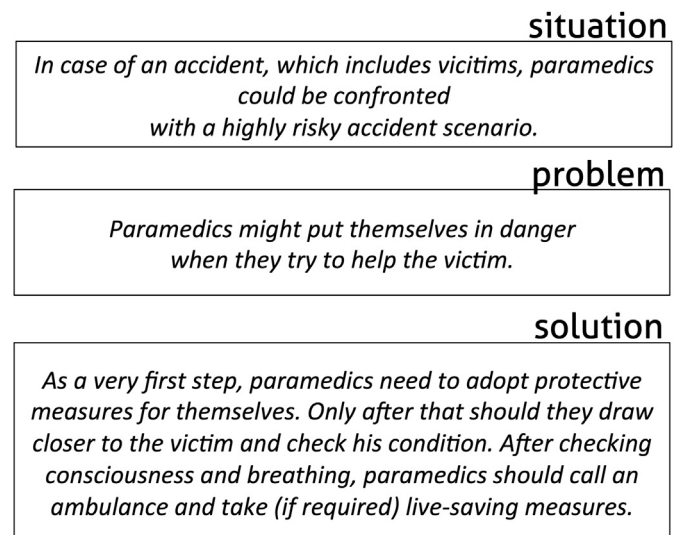


Fig. 1. Description of an experience in a pattern format.

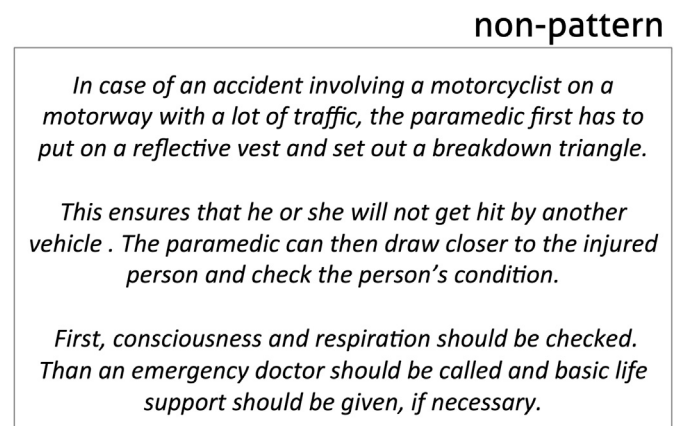


Fig. 2. Description of the same experience in non-pattern format.

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