Abstract

Many recent models of learning and instruction center learning on real-world tasks and problems to support knowledge application and transfer. Among these models are problem-based learning and task-centered learning, two different approaches to learning that are often mistaken for one another. However, there are important distinctions between these two approaches to learning with regard to epistemologies, goals and prescriptions. In this article we provide a description of task-centered learning and differentiate it from the concept of problem-based learning.
Task-Centered Learning Differs from Problem-Based Learning

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A pragmatic view of higher education sees learning as a way to prepare students for real-world situations. In this view, education should require students to apply knowledge, complete meaningful tasks and solve problems (Jonassen & Strobel, 2006; The Secretary of Education’s Commission on the Future of Higher Education, 2006; The Secretary’s Commission on Achieving Necessary Skills, 1991). These skills become more and more important as access to information increases (Lyman & Varian, 2003). The Internet, for instance, is a vast source of decontextualized information, providing the user with facts and procedures on almost any subject. But this vast source does not provide specific directions on how a person could apply its information to complete a current problem or task within a specific context. Thus, when looking up information, a person may need skills enabling them to apply this information to a specific problem or task. Despite the importance of knowledge application and problem-solving skills, the development of these skills has been somewhat neglected in education (Jonassen, 2000; The Secretary’s Commission on Achieving Necessary Skills, 1991; van Merriënboer & Kirschner, 2007).

To promote learner ability to apply knowledge and solve problems, many recent models of learning and instruction advocate centering learning on real-world problems or tasks. Two such models are task-centered learning (TCL; Merrill, 2002, 2007; van Merriënboer & Kirschner, 2007) and problem-based learning (PBL; Barrows, 1996; Hung, Jonassen, & Liu, 2008). Because some overlap exists between these two learning models, implementations of TCL are often confused as implementations of PBL. Therefore, in this paper we differentiate TCL from “pure” PBL because there are specific and important differences between the approaches.

Task-Centered Learning

TCL is a model of teaching and learning that uses real-world tasks as a central strategy. TCL has been called several different terms such as problem-centered instruction, task-centered instruction, or
learning/instruction based on learning tasks (Merrill, Barclay, & Van Schaak, 2008; Merrill, 2007; van Merriënboer & Kirschner, 2007; van Merriënboer, 1997). We choose to use the term “task-centered learning” to describe this approach because the focus of this type of learning and instruction is not simply “instruction” in the behavioral sense of the word (i.e. direct instruction). TCL advocates certain practices for instructional design and teaching with the goal of enhancing student learning and transfer.

Figure 1. General task-centered learning prescriptions (van Merriënboer, 1997; van Merriënboer & Kirschner, 2007; Merrill, 2002, 2007).

Instead of focusing on learning through lecture, TCL centers learning on learning tasks, or activities that require learners to apply knowledge in a specific domain by completing real-world tasks (see figure 1; Merrill, 2007; van Merriënboer & Kirschner, 2007). A TCL process might follow a process similar to the following. An instructor presents students with a new task to be completed. This task is complex and is based on real-world performance within the subject area of the class. For example, in a biology class the task might require students to follow the scientific method to investigate the cause of a widespread fish disease. After being presented with the task, students then learn subject matter that is relevant to the task. In the biology example, this might include the steps in the scientific method, information about diseases and the effects of these diseases on fish. Students are also taught strategies for
completing the real-world task. When students have received enough support in the form of knowledge and strategies, they are asked to go ahead and complete the task in the best way they can. When students complete this task they are presented with another task that is more difficult or complex than the first. This additional task may require the use of additional knowledge of the subject matter or it may have to be performed with less support. Students complete a progression of additional tasks and continue to learn and apply knowledge to the completion of these tasks. In each additional task the level of support given to students is faded as students gain expertise in the subject area. Knowledge transfer is supported through the selection of tasks that have real-world relevance and that offer a high level of variability (Van Merriënboer & Kester, 2008; van Merriënboer & Kirschner, 2007).

TCL may provide a practical middle ground between the cognitive information processing view that knowledge can be provided to learners in ways that increase the efficiency of learning, and the constructivist view that learners must solve complex problems in order to construct their own knowledge. However more research is needed to determine the important learning outcomes of this approach.

**Problem-Based Learning**

In comparing TCL and PBL, it is important to note that implementations and reports of PBL have varied widely in the amount of learner support and guidance given to learners and the complexity of problems that learners solve (Barrows, 1986; Bereiter & Scardamalia, 2000; Savery & Duffy, 1995). For instance, some reports of implementations claiming to be PBL have included a high amount of instructional support and guidance for problem solving, while other reports have included a very low amount of instructional support and guidance (Bereiter & Scardamalia, 2000; Spector, 2003). The PBL concept has become so general that almost any form of learning that uses problems in any way has been called PBL.

Therefore, we chose a specific form of PBL, “pure” PBL, to make a meaningful comparison to TCL. We chose “pure” PBL because this form of PBL has established principles and practices that can be meaningfully compared to TCL. “Pure” PBL refers to those forms of learning and teaching that
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acknowledge medical school origins and follow a structure as put forth by Barrows (1986, 1996; see also Bereiter & Scardamalia, 2000; Savery & Duffy, 1995).

“Pure” PBL includes student-centered learning in small groups in which problems provide the impetus for learning and make up the organizational structure of the learning experience (Barrows, 1986). In this approach, students are provided with a problem to solve or task to complete. They work in groups in a student-directed process to solve the problem or complete the task. In “pure” PBL, the instructor acts as a facilitator who does not provide information to learners or provide learners with direct answers to questions in order to help learners gain skills for finding their own answers (Barrows, 1996; Hung et al., 2008). Learners must self-direct their own learning and information gathering processes in “pure” PBL (Barrows, 1996; Savery & Duffy, 1995). When one problem or task is completed by learners, they are required to complete another problem or task. Learners continue to solve problems in a self-directed and group-oriented way throughout the course of the learning experience.

“Pure” PBL as described in this way has been criticized for its inefficiency due to a deficiency of direct instructional guidance about concepts and procedures important to a specific discipline (Azer, 2000; Glew, 2003; Kirschner, Sweller, & Clark, 2006; Spector, 2003). However, researchers have found that in some cases, learners gain enhanced problem-solving abilities and more flexible knowledge as a result of PBL experiences (Hung et al., 2008).

Task-Centered Learning vs. Problem-Based Learning

On the surface, TCL seems similar to PBL (Barrows, 1996). Both center learning on problems or tasks that are based in real-world practice and both require learners to apply knowledge to complete these tasks or solve problems. Both also involve learners in tasks or problems throughout an entire learning experience. However, important differences between these two approaches exist. Some important areas in which TCL differs from “pure” PBL are provided, including epistemologies, goals and prescriptions. Table 1 summarizes some of the major differences between PBL and TCL.

Epistemologies
Although neither PBL nor TCL emerged from a specific epistemological stance, arguments have been made as to their epistemological roots. PBL is commonly cited as following constructivist assumptions about learning that view knowledge as socially and individually constructed, thinking as a distributed phenomenon, and understanding as situated within a specific context (Hung et al., 2008; Savery & Duffy, 1995). Situated learning (which views learning as a situated phenomenon within a specific context) and social constructivism (which posits that knowledge evolves during social negotiation) have also influenced PBL (Dolmans, De Grave, Wolfhagen, & Van der Vleuten, 2005; Savery & Duffy, 1995).

Table 1.

<table>
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<tr>
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<th>Task-Centered Learning</th>
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<tr>
<td><strong>Epistemological Influences</strong></td>
<td>Cognitive information processing, situated learning, andragogy, motor learning, cognitive apprenticeship</td>
<td>Constructivism, situated learning, social constructivism</td>
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<tr>
<td><strong>Goals</strong></td>
<td>Application and transfer of knowledge to realistic contexts; Efficient and effective learning and transfer of knowledge</td>
<td>Flexible knowledge, problem-solving skills, self-directed learning skills, effective collaboration, and motivation</td>
</tr>
<tr>
<td><strong>Prescriptions</strong></td>
<td>Facilitator provides specific types of learner support and guidance on task performance (including procedural and supportive information) that is faded over time, group learning depends on the nature and complexity of task</td>
<td>Facilitator typically avoids providing specific resources to use, learning guidance, scaffolding, or direct answers to questions to enable learners’ development of problem-solving skills, group learning is essential</td>
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behaviors in realistic settings (van Merriënboer & Kester, 2008). Teaching and learning practices such as those suggested by motor learning (in which performance of physical tasks is emphasized and whole task sequencing is conducted), and cognitive apprenticeship (in which a “master” helps an “apprentice” complete tasks by making implicit processes visible to the apprentice) have also influenced TCL (Gagné & Merrill, 1990; Merrill, 2002; van Merriënboer & Kester, 2008; van Merriënboer, 1997).

In sum, both PBL and TCL are influenced by situated learning and these models both attempt to situate learning activities through the use of problems and tasks that may feature contextual elements such as social and physical environments similar to real-world environments. However, TCL is more heavily influenced by cognitive information processing and also has a variety of other influences (including andragogy, motor learning and cognitive apprenticeship). PBL has had strong constructivist epistemological influences, which are not generally present in a TCL approach. These differences in underlying epistemologies have an influence on how PBL and TCL differ in goals and prescriptions.

**Goals**

The goal of PBL is to develop problem-solving skills among learners while they learn (Barrows, 1996; Jonassen, 2000). More particularly the goals of PBL environments for learning have included flexible knowledge, problem-solving skills, self-directed learning skills, effective collaboration, and motivation – aims which follow constructivist assumptions about teaching and learning (Hmelo-Silver, 2004). Conversely, TCL is more pragmatically oriented, the major goal is to produce effective application and transfer of knowledge to realistic contexts (Merrill et al., 2008; Merrill, 2007; van Merriënboer & Kirschner, 2007; van Merriënboer, 1997); however, because complex tasks are often used in learning, problem-solving skills may also be gained by learners in a TCL experience (Van Merriënboer & Kester, 2008). Efficiency – or achieving learning application and transfer in as short a time as possible – is another goal of TCL, which distinguishes it from PBL. Cognitive information processing models of sensory, working and long-term memory are often used to explain how TCL environments might support learning effectively (e.g. van Merriënboer & Sluijsmans, 2009; van Merriënboer & Sweller, 2005). Thus TCL models may focus on the importance of working memory capacity and cognitive structures for
learning by suggesting that learning activities should connect to a learner’s existing cognitive structures and avoid overloading a learner’s limited working memory capacity. These overall goals lead to different prescriptions for instructional design within TCL and PBL.

**Prescriptions**

While both TCL and PBL center learning on problems or tasks, they differ in task sequencing and instructional support. In a PBL episode, the instructor/facilitator typically avoids providing learning guidance, scaffolding, or direct answers to questions to enable learners’ development of problem-solving skills (Barrows, 1996; Hung et al., 2008). For example, when asked a direct question about a specific subject-matter item, a PBL facilitator will suggest that students find the answer individually or as a group. Guidance in the form of specified reading assignments or information sources is also discouraged to allow learners to go through realistic self-directed problem-solving processes (Savery & Duffy, 1995). Groups of learners working together to solve problems is also an essential characteristic of PBL (Barrows, 1986, 1996). These prescriptions are aligned with constructivist assumptions about the central role of the learner in the learning process and the situated and social nature of understanding.

In contrast, TCL advocates specific types of learner support and guidance on task performance (including procedural and supportive information) that is faded over time (Van Merriënboer & Kirschner, 2007). Thus, while an instructor in a PBL approach would not provide suggestions on how learners are to proceed in solving a problem, an instructor in a TCL approach might tell learners what steps to take and what resources to use (such as specific prior knowledge items, websites, job aids, presentation notes, textbook sections, etc.) when completing a task. In TCL an instructor might also show learners how to do the task and explain the reasons for doing tasks in a certain way. In contrast to PBL, an instructor in a TCL approach may also provide direct answers to learners’ questions as appropriate and help guide learners in their knowledge acquisition. These prescriptions are aligned with a cognitive information processing view of learning in which learners have limited working memory capacity, but gain more elaborate mental knowledge structures as their expertise increases (Van Merriënboer & Sluijsmans, 2009; Kirschner et al., 2006). The prescriptions of TCL are also aligned with a cognitive apprenticeship
approach to teaching and learning, especially with the use of modeling, scaffolding, coaching, and articulation (Brown, Collins, & Duguid, 1989; Collins, Brown, & Holum, 1991).

An instructor in a TCL approach provides a high level of support and guidance for learning at the beginning and then fades this support and guidance over time as learners gain expertise. After learners gain sufficient expertise, the level of support and guidance that they receive would probably be similar to the level of support and guidance that novice learners receive in a “pure” PBL approach.

Models based in TCL are designed to balance the use of learner-initiated tasks with instructor support, thereby engendering effective and efficient learning (Merrill & Gilbert, 2008; Merrill, 2002). With regard to the use of learner groups in learning, not every model of TCL specifies whether groups should be formed for learning. Instead, a decision of whether to form groups is based on the realistic nature and complexity of the task (i.e., if the task is complex, or generally completed in groups in the real world, then group learning would be warranted).

**Discussion and Conclusion**

The epistemologies behind TCL and PBL lead to differences in goals and prescriptions in each approach. The overall goal for a TCL approach is to support effective application and transfer of knowledge, however the overall goal for a PBL approach might focus on building students problem-solving, self-directed learning and collaboration skills. In PBL, the learner is required to find, evaluate and apply knowledge to a problem or task with little instructional support. In TCL, instructional support is given to novice learners to help them find, evaluate and apply knowledge to a problem or task. This support is faded over time as learners gain expertise. In PBL, group work is seen as an essential aspect of the learning and problem-solving experience. In TCL group learning depends on the nature and complexity of the task.

Both TCL and PBL center the learning experience on real-world problems and tasks that they require learners to complete. Both approaches also require learners to apply their knowledge of the subject area to complete these real-world problems and tasks. In the information age, Learners will need to know how to apply knowledge in order to complete real-world tasks and solve problems. More models
for approaches to learning that support learner application of knowledge like TCL and PBL will be needed to help our learners succeed in a changing world.

References


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