# KP-LAB: BREAKING NEW GROUND ON HOW TO CREATE KNOWLEDGE THROUGH LEARNING

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## Introduction

This document, presents a synthesis of the pedagogical methodological work done within the framework of the KP-LAB (Knowledge Practices Laboratory) project, which, together with a consortium of 22 research institutions from different European countries, has been investigating the concept of trialogical learning for the past four years. We begin with a description of the **underlying approach** of the project, and describe the context in which it has emerged as well as the basic tenets or characteristics of the approach. We then present a **framework**, in other words a way of describing learning in process terms. In the work undertaken by the KP-Lab team, this framework has given rise to a series of **learning contexts**, practical realisations of the framework in different settings, in-company knowledge creation for example, or collaborative work in the classroom. These contexts have given rise to **pedagogical learning scenarios**, descriptions of various methods enabling learners to attain certain learning objectives by performing certain educational activities in a certain order in the context of a certain learning environment - the knowledge creation environment.

This paper was prepared using an interrogative approach, using questions posed to the main project researchers as a way to pinpoint key ideas and descriptions which use the questions commonly asked of the project team as a device to elicit an agreed and clear position on certain fundamental points that require clarification. While fine distinctions in interpretation will naturally exist and research work of this kind gives rise by definition to debate, we believe that this paper presents the state of the art in development of the trialogical approach, and represents a consensual synthesis of the opinions of the KP-LAB team.

## Overview of the Trialogical Approach

The Trialogical Approach aims not to be an over-arching theory but rather a specific approach to knowledge creation through learning which can be used to support research and to develop technology-mediated collaborative practices as a way to improve knowledge creation processes within organisations where the role of both knowledge artefacts and practices are emphasised.

In this approach, the argument is put forward that the type of learning taking place amongst a group engaged in collaborative knowledge advancement which involves several people working together with knowledge artefacts is a distinct and identifiable form of learning. This type of learning is called trialogical learning characterised by a set of processes and practices that are described in the Trialogical Learning Framework.

In the Trialogical Approach, the view is taken that learning does not take place only through monological activities, for example reading a book, listening to a lecture or some other form of knowledge transfer. Nor does it take place only as a function of dialogical activities, for example discussing an idea with a colleague or engaging in group learning activities through project work. But it also takes place as a result of so called 'trialogical' activities where individuals participate in collaborative activities that involve the production of concrete knowledge objects like documents or models which are developed collaboratively and which of themselves are intended for use as tools for future development.

In the Trialogical Approach, an effort is made to build on the rich tradition of social constructivism which has stimulated the emergence of significant research activity in relation to collaborative learning and other forms of social learning and to bring this tradition together with increasingly sophisticated tools and technologies emerging from the field of educational technology which have their traditions more firmly based in individualistically-oriented cognitivist theories of learning.

The Trialogical Approach concentrates on certain kinds of processes and forms of mediation (and related tools) where a group of people are developing concrete objects or artefacts for a particular and specified purpose. These kinds of processes are already being investigated in various approaches to collaborative learning, however what is different about the Trialogical Approach is its effort to provide a more comprehensive view where the emphasis is upon the joint work that takes place involving knowledge artefacts, practices and processes.

## Basic Characteristics of the Trialogical Approach

Any learning or knowledge creation process following the trialogical approach shows these features:

1)  in order to benefit from the notion of trialogical learning, learning activities should be organised around developing shared objects and have as their goal re-usable knowledge artifacts or practices.

2)  in their collaboration during an object-oriented activity, group participants are facilitated by the availability of information related to the evolution of these objects

3)  trialogical learning implies that not only can the group collectively produce more than the individual, but the group's collective zone of proximal development – what the group collectively can learn – is greater than the individual's zone of proximal development

4)  trialogical learning requires there to be opportunities for group members to re-produce their ideas in texts, models, and representations in such a way that they provide a basis for others to continue to work with these artefacts which of themselves can lead to new knowledge, representations, and artifacts.

5)  the Trialogical Approach caters specifically for the type of learning that can take place when collaboratively and iteratively solving ill-defined/complex problems.

6)  in trialogical learning emphasis is placed upon integrating face-to-face and virtual activities

7)  in trialogical learning emphasis is also placed upon delegating high-level responsibility for the knowledge creation process to students and avoiding situations where teachers alone carry out high-level cognitive and meta-cognitive work in respect to the knowledge creation challenge at hand.

These basic characteristics shape the KP-LAB project and form the basis of the framework already described. They are also used by the project team as the basis for the empirical research that has been carried out and also as a guide for the technology development. Furthermore, they are also used to formulate guidelines for others to use to enhance and improve the knowledge creation process.

## Origins of Trialogical Theory

The notion of trialogical learning as a distinct type of learning emerged about 5 years ago and was led by a group of researchers based at the University of Helsinki. It provides a way to define the knowledge creation process and emerged in particular against 3 broad theoretical backgrounds and areas of research and discussion, these are:

- The body of research work related to **Knowledge Building** which examines the processes people use in creating ideas, and solving, in a sustained way, knowledge problems by modifying and commenting upon each others' ideas collaboratively and with external means. While being very useful to the way in which trialogical theorists think about knowledge creation, they argue that in knowledge building, there is too much of a focus on the role of conceptual ideas and that there should be a stronger emphasis upon material elements and practices. Trialogical theorists make the case that such emphasis can give rise to more practical outcomes like finding ways in which people can be helped to better organise their work and learning around different kinds of knowledge objects or artefacts.

- **Cultural historical activity theory** also called cultural historical psychology that builds on the idea that human activities are mediated by artefacts and tools, used and modified by succeeding generations of human beings and grounded in practical, everyday activities. The Trialogical Approach takes these ideas on the meaning of practical and tool mediated processes further in order to examine the intertwined system of material, social and practical components that exist within learning practices when related particularly to knowledge creation with the help of new digital technology.

- **Knowledge management practices**, these are the ways of describing and facilitating practices in knowledge management for supporting knowledge creation processes in organisations and includes methods for making implicit knowledge explicit for the use of the whole organisation. Much of this discussion has emerged in the

business world and is linked to experiences related to business management processes. In the Trialogical Approach, researchers aim at further developing these collaborative knowledge creation processes.

The Trialogical Approach to learning emerged also in response to the distinction made between **acquisition** and **participation** metaphors of learning which tried to provide a useful characterisation of basic theories of learning as being related to either one of these two metaphors. Along with several others expanding existing theories on collaborative learning, the University of Helsinki group argued that a third basic metaphor of learning should be defined and developed further in order to take into account changes taking place in contemporary society. Changes like the rapid development of new technology, the pressure to create – and to learn deliberately to create – new knowledge as well as changing existing knowledge creation practices, and the complexity of modern society which requires people to share and combine their expertise in order to solve emerging and previously unforeseen complex problems.

This basic metaphor is the **knowledge-creation metaphor** which aims to understand the way in which people organise their collaborative learning processes and which incorporates the means they use to create and develop a concrete entity together. This entity might be a process, a practice, an artefact or an idea made explicit. The Trialogical Approach to learning builds on this knowledge-creation metaphor.

The term 'knowledge creation' is a metaphor or a way of symbolising various approaches and theories where the act of creating (new) knowledge collaboratively is emphasised. The Trialogical Approach emphasises a specific approach to learning, which takes place when groups of actors are engaged in creating concrete knowledge objects or artefacts, and practices together, and where they are supported in this activity by technology. So they are directly related and sometimes used as synonyms.

The notion of knowledge creation as a distinct field of study has emerged from several contexts. First of all in the study of computer-supported collaborative learning (CSCL) it emerged as a way to understand collaborative learning and knowledge advancement in a more general way than only in the context of computer-supported learning. In this context it is sometimes understood to be simply a continuation of knowledge building, one that recognizes the increased demand in contemporary society for a stronger emphasis upon creativity in this context. Knowledge creation has also emerged in other contexts however when researchers and others have been considering workplace and organisational learning, teacher education and even in the analysis of open source communities.

## The Trialogical Approach as distinguished from other theories of learning

The Trialogical Approach puts forward arguments about new ways of creating knowledge and transforming practices related to collaborative knowledge creation in common learning contexts and suggests ways in which these practices can be enhanced, elaborated and improved through the application of advances in information technology. By putting forward a framework which allows the researcher to consider the processes and practices in collaborative knowledge creation supported by versioning of knowledge artefacts, it provides us with a vocabulary for further development of tools, processes and practices. It also allows for scientific research into the effectiveness of new tools and practices within this common framework.

The Trialogical Approach addresses failings or shortcomings in current knowledge and practices which do not consider the impact mediating tools and practices can have on collaborative knowledge creation in a systematic way.

In particular, as compared to dialogical learning, it is argued that in the trialogical approach, the act of collaboration in which participants interact with an artefact, changing and developing it in an iterative process, creates a set of effects and impacts that change the nature of the collaborative process. New technology provides new means for this type of long-term work with externalised, concrete artefacts, which have different kinds of dynamics than dialogues.

## Recent Developments in the Evolution of the Trialogical Approach

Over the past four years, the KP-LAB projects has developed theories, tools, practical models, and research methods that deliberately advance the ways in which knowledge is created and which help to transform knowledge practices in education and in the workplace. In establishing the framework for the project, the partners who come from a variety of different backgrounds chose to adopt the knowledge-creation metaphor of learning as a way to provide the theoretical basis for the project, and to use the project as a way to develop the associated Trialogical Approach further.

In KP-Lab the aim has been *both* to design new innovative knowledge practices and tools, and to carry out research on them. In this way, the team has sought to bring together a theory-driven approach aimed at implementing existing theoretical ideas and a practice-driven approach by carrying out research into concrete knowledge creation processes

and practices taking place in different contexts. The result of this has been to allow the team to design new technology which has required a conceptual understanding of those knowledge practices which are supported with new technology. At the same time they have aimed to enhance their conceptual understanding of the knowledge creation process as a result of their research on emerging knowledge practices.

In the KP-Lab project, the knowledge creation metaphor of learning operates more as an 'umbrella framework' emphasising commonalities between different approaches which all aim at understanding trialogical processes central to the project's aims and research. In other words, to better understand how people collaboratively create and develop novel knowledge objects and how they enhance their practices in such work with the support of technology.

From a theoretical perspective, the KP-LAB Project has aimed to bring together the three areas of practice-driven research, namely research on collaborative learning, research on technology-mediated learning and research on designing technologies and developing pedagogical models within the actual work of the project.

The project has developed pedagogical approaches and tools for organising learners' activities around shared objects (like texts, conceptual artefacts, externalized ideas as well as practices and ways of working). One aim from the start was to focus more significant research work around these shared, concrete objects than is usually done given the KP-Lab team's belief that collaborative work with these objects or drafts of objects plays a prominent role in the interaction.

During the project, the research team have looked at several concerns related to Trialogical Approach and moved the theory forward by finding answers to a number of different questions which have included work to identify the type of technology that best supports joint work with knowledge artefacts, processes and practices as well as work to identify the kind of support (technical and pedagogical) that best suits trialogical processes.

The project began with a theoretical interest in knowledge creation processes. During the project this approach was first elaborated in order to allow the team to specify and build a set of tools. This work led in turn to the description of a series of pedagogical models which were concretised through a significant number of pilots and experiences. The research carried out during these experiments and experiences has been used to refine the underlying approach and to elaborate and improve the tools. In concrete terms, this has meant that the research team have developed and revised a set of Design Principles for conceptualizing the Trialogical Approach and these Design Principles have been used for practical design purposes within the project. This includes the empirical research work and the co-design processes for tool development. Out of this work has now emerged a set of directions, guidelines and best practices which are being shared with the wider learning community through publications, briefings and other mechanisms.

## Innovativeness of the Trialogical Approach

The Trialogical Approach encompasses a **highly complex series of processes and practices** related to knowledge creation in a **richly diverse series of settings**. The very establishment of such a cohesive and explicit approach that answers theoretical, analytical and practical questions related to knowledge creation is of itself highly innovative in that it provides researchers and practitioners alike with a mechanism and a vocabulary to examine, support and promote knowledge creation processes across a variety of settings.

In more concrete terms, the project team highlights the following innovative aspects of this approach:

- The extent to which it supports advanced knowledge creation processes which **merge project realisation tasks with acquiring sophisticated knowledge creation skills**, in other words, learners are supported in advancing their knowledge creation skills while realising practical, real-life knowledge creation projects.

- Its contribution towards **overcoming polarities** (dichotomies) that still exist in the background of many approaches to learning, for example, between individualistic learning vs. social approaches to learning, tacit knowledge vs. explicit knowledge, conceptual knowledge vs. practices by emphasising collaborative work for creating and developing artefacts and practices together.

- The way in which it **supports both idea-driven work** with epistemic artefacts (in line with inquiry learning) and **organised work for developing processes, communities and practices** around these artefacts (in line with project-based learning).

- The manner in which it provides **the means to analyse** what is happening in iterative, long-term collaborative work which includes jointly versioning, commenting and developing artefacts with knowledge artefacts.

- This approach actively **promotes the teaching of knowledge practices** that are needed in modern knowledge work; e.g., working in teams, planning and developing products jointly for later use, reflecting and developing one's ways of working.

- The way in which it has **facilitated the creation of a set of technologies** which not only support mediation and reflection but also enable researchers to measure the impact of mediation and reflection on the knowledge creation process.

- This approach **focuses on changing practices** which means that the artefacts that are produced and the practices that are modified are re-usable outside the narrow pedagogical confines of the research setting.

- This approach has been piloted with KP-Lab technology in several higher education courses and contexts and been the subject of considerable research effort. This effort has led to the creation of a **significant evidence-base** related to innovative knowledge creation practices.

**Development of Tools to Support the Trialogical Approach**

In concept, any tool which supports collaborative knowledge creation can be used within a trialogical approach. Thus, tools such as wikis for document creation, review/commenting functions within documents (the most common manifestation of which might be said to be the 'track-changes' function found in many word processors, and even a smart-board can be used within this context. Nevertheless, each of these shows certain limitations, and thus the KP-LAB project chose to develop its own tools, which allow for (a) the boundaries of technology in supporting trialogical learning/knowledge creation to be extended, and (b) for the in-depth study of the interactions, learning and knowledge-creation going on within any particular learning scenario.

To this end, KP-Lab technology has provided a basic platform, 'Knowledge Practices Environment', (KPE) to support these knowledge creation processes, as well as offering various other tools and functionalities for supporting innovative, reflective and "object-centered" knowledge practices (planning, versioning, commenting, annotating, making semantic search, etc.).

KPE provides the means for integrating various processes supporting collaborative knowledge creation in flexible ways. These include planning epistemic processes, producing texts and notes, organising work on shared objects across communities, and reflecting on planning processes. It supports collaboration of groups of people around knowledge objects, tracking of the development cycle of specific knowledge objectives, re-use of objects in different scenarios and the creation of flexible ontologies for description of different concepts as necessary. KPE consists of shared space views, support tools, and optional tools. Optional tools are loosely integrated applications that can be selected by the user and made available in a shared space.

Tools to support four types of mediation which have been developed and tested; epistemic mediation related to creating and working with knowledge artefacts, pragmatic mediation related to organising and coordinating knowledge-creation processes, collaborative mediation concerning building and managing networked communities and the social relations required for carrying out knowledge-advancement efforts, and reflective mediation. These tools allow knowledge creation practices to be made visible as well as to support reflection upon and the transformation of such practices.

Several specific tools have been developed in the course of the project, they include the CASS-Query tool to support the investigation of knowledge practices by using 3G mobile phones, Map-It which provides support for the collaborative creation of knowledge in real time discussions and meetings, Activity System Design Tools (ASDT) which support developmental work research processes and Semantic Multimedia Annotation (SMAT) which supports the annotation of video-based material.

A number are worth highlighting. They include the Visual Model Editor (VME) which allows the user to create and edit various kinds of diagrams that depict the relationships among concepts or ideas. For each model the user can choose from a set of predefined visual languages which provide them with various types of nodes and links that can be used in a model. Such nodes and links allow the user distinguish, for example, between variables, resources, actions and goals relevant to a particular project. The VME also allows users to create their own visual modelling language based on specific domain-ontologies in a visual format. Making the semantics of visual models and conceptual maps transparent to the user provides a basic means for scaffolding collaborative modelling activities and allows for systematic comparison of both models as well as the language used.

Secondly, the analytic tools that have been developed within KP-Lab are based on the premise that analysis and reflection are not only understood as providing the means whereby a given way of working is optimised or improved, but also as active and productive processes geared towards the development of shared understanding and transformation of the collective knowledge practice. The analytic or mirroring tools that have been developed within KP-Lab are, for example, the Visual Analyzer and the

Timeline-Based Analyser. These tools allow users to depict, explore, and interpret the electronic digital traces of their knowledge practices in an iterative and collaborative manner. They put the users in charge of making sense of the data available allowing, for example, researchers to compare knowledge practices across groups.

While many of the tools developed and utilised within the project can be described as being innovative in their own right, what is particularly worth mentioning is the way in which the uses of these tools have been analysed as a way to measure practice and the way in which this practice element has in turn informed the overall approach to trialogical learning.

### A Generic Model for the Trialogical Learning Process

The research team have prepared a model which illustrates what generally occurs during a trialogical learning process. This model is not intended as a stand-alone description of the process but should be interpreted along with the Design Principles mentioned earlier and sets of concrete guidelines supporting trialogical processes in different contexts which are under development.

In this model, the idea is that there are two parallel but closely interlinked processes going on, that is, a) **collaborative work for developing knowledge artefacts** (the epistemic mediation/dimension) shown in the figure below in blue, and b) **transformation of common processes and practices supporting this work** (these are the aspects of pragmatic, social, and reflective mediation along with the regulative and relational dimension) shown in the figure below in green. These processes are closely related but it is important to separate them analytically to emphasise the role of both sets of processes in trialogical knowledge creation activities.

There is a **learning community** (or group) where the work is conducted. However, it is also important to represent the **external communities and organisations** which should provide an impetus, reason or motive for the work as well as existing knowledge artefacts and practices such as building materials and models for new artefacts and practices. At the same time, the learning community is aiming at producing reusable knowledge artefacts or practices that can be reused by the community itself or by external communities and organisations. The learning community can also include members of external communities with different practices as close collaborators and active participants throughout the process, an aspect which strongly supports the process of cross-fertilization.

A central feature of this model is that all the activities that have been specified are targeted at **elaborating shared objects**, which means there are concrete mediating elements and outcomes at each activity phase (notes, document drafts, process plans, conceptual models etc.) as well as being the more abstract goal of the entire process (final products or articles to be produced, transformed working practices, etc.). The model also highlights the fact that the end results and outcomes of the process are concrete new knowledge artefacts or transformed practices that are meant for some real or subsequent reuse.

In this generic model, six specific **core trialogical learning activities** are included and shown in the figure below in orange. These concrete activities occur in technology mediated processes for working on shared objects, which are in the middle of the figure. The activities do not follow a strict and pre-defined order and the specific order in which they occur will depend on the particular domain and educational setting where they are applied. In the generic model these iteratively conducted processes are intended to provide a rough outline of phases as a guideline for potential participants.

**A Generic Model for the Trialogical Learning Process**
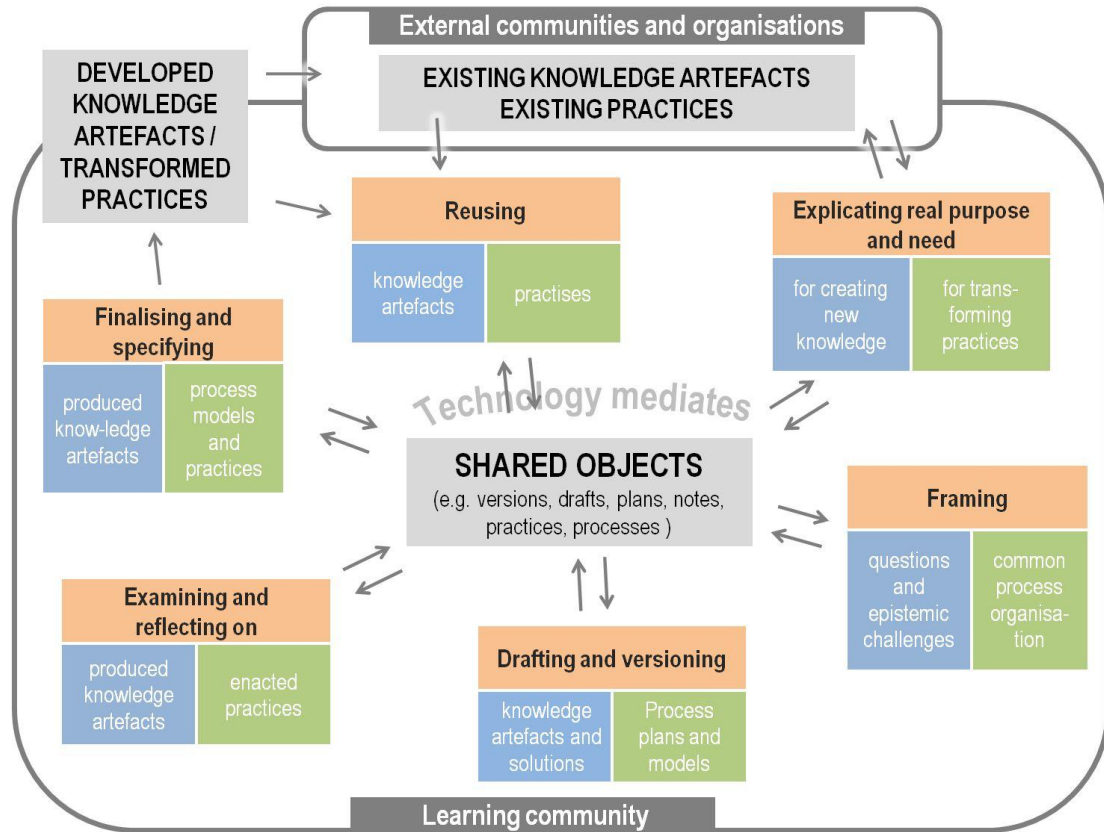


In principle, the Trialogical Approach as described, can be applied to any context which involves **collaborative knowledge creation utilising knowledge artefacts**. In the context of the KP-Lab project, the project team described several learning contexts or practical realisations of the generic model in different settings. These are:

- Higher education courses aiming to teach and support ways of producing knowledge objects together by learning open-ended inquiry practices

- Higher education courses in customer-related projects where multidisciplinary, distributed project work practices are learned with real customers

- Students' practices of conceptual modelling in design projects in universities of applied sciences

- Teacher training interventions aiming at coaching trialogical learning practices

- Project management interventions in work organisations

## Pedagogical Scenarios Supporting the Trialogical Approach

The Trialogical Approach is aimed at those pedagogical scenarios where the emphasis is upon knowledge creation regardless of the setting or context. Examples of such scenarios, each of which is based on a recently completed or on-going piece of project work, include:

- **Supporting globally distributed design work** in company settings where project teams are working synchronously and asynchronously on the creation of common projects which are manifested in blueprints, plans, reports and other types of concrete output. This scenario is applied typically when working with a project team where participants need to jointly represent, discuss, comment, revise and organise knowledge (ideas, solutions, suggestions, reports) which provide a solution to a problem or challenge they face.

- **Enhancing coaching skills** amongst teacher trainers charged with supporting groups of trainee teachers in the creation and use of knowledge objects and instruments such as guidelines, best practice toolkits, resource banks, etc. The trialogical approach facilitates the various steps required in such a scenario including the collaborative identification and investigation of the challenges that are faced; negotiation on possible solutions; modelling of solutions; operationalising or making concrete solutions; implementing instruments in practice; monitoring and determining the effect(s) of such instruments and reflection on the outputs.

- **Facilitating multidisciplinary project work** amongst third level students who are working on real-life customer oriented open-ended assignments in which they need to develop and enhance multidisciplinary, distributed project work practices. In this scenario, the trialogical approach facilitates students to set up a context with complex problems; to take part in questioning and problematizing activities; to construct working hypotheses and solutions; to deepen their analysis; to create knowledge artefacts for subsequent use; to carry out critical user evaluation of artefacts and solutions and finally to reflect on the extent to which their knowledge practices have been transformed.