

# Possibilities of Inducing Pupils' Inquiry Activities during Instruction

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**Abstract:** The contemporary tendencies emphasize the use of so-called inquiry-based learning (IBL). However, there remains a question – by which ways should be the active inquiry of pupils induced? The author of this article finds the answer in the union of the theory learning tasks and theory of the inquiry-based instruction. Via the analytical and comparative approaches, it turns out that two categories of the inquiry tasks can be used. The first one was provisionally marked as “instructive inquiry tasks”, the second one as “inquiry tasks with internal activation”. Both stated tasks have different essence in how are the pupils induced to perform the inquiry learning activities.

## 1 INTRODUCTION

In the education, we can encounter a long-term emphasized requirement of the development of the individual thinking and increase of pupils' activity and creativity, which is still nowadays considered important. In the context of these social requirements on education, the crucial question is by which ways should be the inquiry learning situations created and how should pupils' inquiry activities be induced efficiently. We strive to search for a possible answer by the union of the theory learning tasks and theory of the inquiry-based instruction.

There comes a wide range of variables into the process of the inquiry activities' induction, mainly the individuality of a pupil, specificity of the subject matter, the base of teaching aids which have to be taken into consideration. It is a task of a teacher to have these variables under control and to influence them appropriately to improve the quality of the learning process. However, this is not always simple and the increased effort is necessary, while the use of teacher's didactically-psychological knowledge and skills is assumed. The teacher's attitudes and expectations are also significant. These can be called as factors that make condition the success of teacher's activity considerably.

The learning activities may be realized only in appropriate conditions that, as a whole, create the learning situation. A classification of these

conditionals is largely influenced by the learning tasks that are considered a driving force of the acquisition of the new knowledge. Therefore, they are, in the fields of educational science and didactics, an important theme which was dealt by many authors, both from the Czech Republic and from abroad, e.g.: Vyšín, 1971; Tollingerová, 1971, Tollingerová & Kněžů, 1966; Wahla, 1978; Kuřina 1978; Mareš, 1980; Holoušová, 1987; Ellis, 2003; Molnár, 1990; Nikl, 1997; Chupáč, 2007; Vaculová, Trna, and Janík, 2008; Slavík, Dytrová, and Fulková, 2010; Slavík & Lukavský, 2012; Mareš, 2013; and Knecht, 2014. Many of the mentioned authors strove to define the term learning task. Therefore, it is possible to encounter definitions that basically understand learning tasks as assignments contained in textbooks and collections of tasks, but they can be also understood as opportunities to learn (cf. Knecht, Janík, Najvar, Najvarová, and Vlčková, 2010). This broader definition seems to be the one bearing for the mutual connection with the theory of the inquiry-based instruction.

In relation to the theory of learning tasks, we encounter Professor Tollingerová, who contributed significantly to its development – the taxonomy of learning tasks and process of taxation is connected to her name. However, there were other authors that continued with her research and her theory is still elaborated and improved. If we analyze key areas of the theory of learning tasks, our research would be,

while solving the given issues, based on the two: parameters of the learning tasks and projecting the learning tasks.

## 2 METHODS USED

Those scientific methods were used while processing the study in accordance with the current approaches used in the field of study, cf. N. C. Kettle (2010), M. Bray, B. Adamson and M. Mason (2007), M. G. Lodico, D. T. Spaulding and K. H. Voegtle (2006), L. Cohen, L. Manion, K. Morrison (2003). Those include mainly theoretical methods which are based on the study of published scientific treatises, research reports, curricular documents and strategic governmental documents.

The excerpted findings were subjected to comparative analysis and critical assessment in order to put them into a context and new theoretical framework. In certain sections, we strove to describe issues linked to phenomena which occur within the society, or in the educational theory and practice.

Additionally, analytically-synthetic approaches were used in order to understand relationships which are valid in the educational systems. Marginal findings were abstracted during the process of analysis which enabled their interpretation in new meaning.

## 3 THE BOND BETWEEN THE INQUIRY-BASED INSTRUCTION AND THE LEARNING TASKS

The opinions on the application of the inquiry-based instruction differ. The ones mentioned below are the more positive ones, however, it has to be mentioned that there exist also the more critical ones that are analyzed in more detail in the work of J. Dostál (2015a). However, the criticism is not a complex one, but the work mainly deals with conditions of its successful implementation into the school education. We see one of the basic assumptions of a successful instruction in induction of situations which motivate a pupil to perform the inquiry activities and, by that, not only to acquire knowledge, skills and habits, but also methods of how to acquire, use, enrich and broaden the knowledge independently. As it was already indicated above, one of the most significant

means to induce the learning situations is seen in the learning tasks.

The mutual connection of the inquiry-based task is clearly distinct in works of D. Tollingerová (cf. Tollingerová, 1971). The starting point should be searched in the taxonomy of the learning tasks that the author created (ibidem). She created a category of “Creative tasks” where she classified 5 types of tasks:

- 1) Tasks focused on the practical application;
- 2) Solving of problem situations;
- 3) Questions asking and tasks forming;
- 4) Discovery-based tasks based on one’s own observation;
- 5) Discovery-based tasks based on one’s own considerations.

The taxonomy significantly differentiated the inquiry tasks that are based on discovery. Moreover, she classified these tasks into two categories: Discovery-based tasks based on one’s own observation and Discovery-based tasks based on one’s own considerations. Knecht (2014) similarly highlighted the difference between the inquiry and problem tasks. Nevertheless, there still exists an overlap that is symbolized in the diagram below.

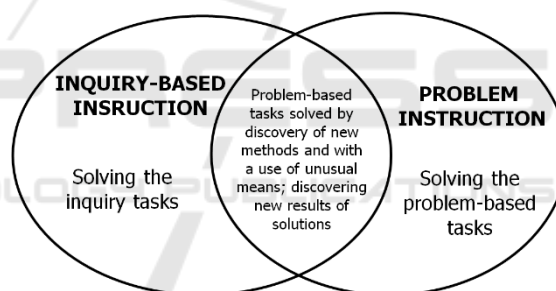


Figure 1: Overlap of the inquiry and problem tasks.

In case of the problem tasks, the crucial factor is a “problem”, which is, as it is well-known, typical by a disruption of the internal balance of an individual. It is linked to the experiencing of a not-wanted state, or difficulties. The disruption of the balance is in the education seen as a motivational factor. The boundaries of the balance disruption differs among pupils and therefore the same task may one pupil consider a problem task and another not (cf. Dostál, 2015b). In contrast to that, the inquiry tasks are not based on experiencing difficulties. Their focus lies in discovery, search, investigation... which has to be taken in account during its projection and preparations.

In the intersection, there are tasks that cause among the pupils the experiencing of a not-wanted state, feeling of difficulties (of both the theoretical or practical nature), although, the essence of their

(re)solution is in the discovery of new approaches or results. They belong to the most difficult ones and for their solving, the pupils must be ready in a form of acquired skills to solve tasks of a lower cognitive difficulty.

The tasks applicable during the inquiry-based instruction can be divided into three groups:

- 1) cognitive ones;
- 2) practical ones;
- 3) creative ones, see the graph on the next page.

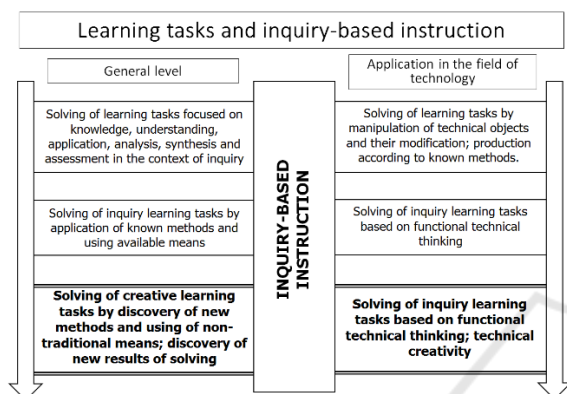


Figure 2: Division of inquiry tasks.

The most significant role in the inquiry concept of instruction is played by the tasks includible in the third category. By the given graph, we suggest that to teach by inquiry means to use only the creative learning tasks. The typical example is performance of the laboratory tasks whose purpose is to introduce pupils to the applicability of the inquiry methods and verification of findings' validity.

In the right part of the image, the application into the fields of technology may be noticed. The tasks focused on the technical constructing may be seen as a top-tasks where new technical objects are created. A long way is necessary to achieve of this level – it is necessary to develop special effort from the side of a pupil. Only some students can achieve it.

#### 4 ACTIVATION APPROACHES TO THE INDUCTION OF PUPILS' INQUIRY ACTIVITIES

The essence of the induction of pupils' inquiry activities, i.e. in the school education, can be seen in learning tasks which can be presented to pupils in a written form, but also in other ones. It remains a question though, how should they be framed in order to achieve the aim to which the task was created for.

It is necessary to mention here that the measuring of the level of aim achievement (evaluation) in the inquiry tasks is not easy and it is always a long-term process.

The meaningful inquiry is composed of many individual steps that follow each other and their sequence cannot be changed (cf. Dostál, 2015a). The pupils go through different fragments of the process of inquiry during their inquiry activities, which was described in works S. Ch. Kong and Y. Song (2014, p. 129) who set a model called "5E" (5E inquiry-based learning model). The projected model is composed by these following fragments:

- [to] engage in the inquiry topics and questions;
- [to] explore via the inquiry methods and processes;
- [to] explain the results of the inquiry process;
- [to] evaluate the process of inquiry and the results;
- [to] extend the topic of inquiry and questions.

During the process of projecting the inquiry learning tasks, it has to be considered the question to what extent the content is it going to be complex, i.e. whether every pupil has to take part in all fragments or in just some of them. Mainly during the group work, it is necessary to divide the activities with respect to the individual educational needs among the individual pupils.

The first analyzed approach here will be provisionally called instructive inquiry tasks. This category of tasks is characterized by more or less specific, exact instructions that lead pupils to perform inquiry activities. The induction of the activities is mainly caused "from the outside". The activities are used mainly in cases where there is desirable to expect which way would the pupil's inquiry go, what course would it have, and what results would be reached. The pupil gets instructions that he/she, at first, has to identify with and then they comes to the stage of performing them, i.e. they explores, discovers and acquires new knowledge and skills. In some cases, the attitudes are even formed.

However, it cannot be stated that the instructive inquiry tasks would be worthless thanks to the focus of pupils' activities by the instruction stated before the activity itself. They are didactically valuable mainly in the phase when the pupils are learning how to perform the inquiry. Based on the works by R. J. Rezba, T. Auldrige and L. Rhea (1999), who classify the inquiry of many forms (according to Banchi and Bell, 2008), then this type of the inquiry tasks induces:

- confirming inquiry – a question and a method of solution are given to pupils, results are

known, the purpose is to prove it by the practice itself;

- structured inquiry – the teacher tells pupils question and possible method of solution – based on that, pupils formulate explanation of the studied phenomenon.

The second approach can be called inquiry tasks with internal activation. This category of learning tasks is characterized by their possibility to start the “internal motor” of a pupil without any instruction that would instructively induce their inquiry activity. The essence is based in placing of the pupil in a conflict between their current knowledge, skills, attitudes and behavior, and a form of the real world and/or needs that cannot be satisfied by the current cognition of the pupil, the level of the pupils’ skills and their readiness to solve the occurring situation. The pupil is led by the conflict, activated to the inquiry, to search for ways of how to resolve the given state, how to reach new cognition and to place the current level of cognition into the balance with the surrounding world. In order to let the pupil feel the conflict, they can be led by artificial situations created via learning tasks. They do not instruct pupil, they suitably set the situational conditions. Additionally, also the inner motives, causing the sceptical view at the world, and stimuli that they cognizes or comes into interaction with, may activate the pupil. This is typical mainly for the informal and non-formal education.

It is important to create conditions on whose base a need to cognize and to adopt the ways of human’s behavior and thinking is developed. The conditions that cause the intellectual difficulties are based in a fact that a pupil is unable to accomplish the given task by known ways. In order to accomplish it, they has to find a new way to (re)solve the task.

## 5 CONCLUSIONS

The induction of inquiry activities may be seen as one of the crucial phases of inquiry-based instruction. It would be positive if the inquiry is started by pupils spontaneously, without any obvious external cause; however, we encounter this in a real instruction rarely. The activity needs to be induced more frequently.

In the article, we have not focused on the motivation to perform the inquiry, but on the ways, how the pupils’ inquiry activities may be induced. Based on the theory of learning tasks, two approaches (marked as instructive inquiry tasks and inquiry tasks with internal activation) were described. The result of

both types of learning tasks is the inquiry and the inquiry induced by both ways may cause positive effects.

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