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Producing Knowledge for Improvement: The 3A procedure as a tool for content-focused research on teaching and learning[1]

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Abstract: *The paper argues for a novel approach in research on (the quality of) the processes of teaching and learning which focuses on the ways in which students develop their understanding and their competences through those instructional activities that have them work with the content (the content-focused approach). Specifically, the paper aims to introduce a research approach that has been developed as a response to some identified challenges of prevailing methods in research on teaching and learning. The 3A procedure is introduced as a specific research methodology for analysing real-life teaching and learning situations in the classroom (captured on video).*

We start by noting some challenges that current research on teaching and learning is facing and indicate how these challenges are met in the proposed research approach. In the second part we briefly mention some of the well-known methodologies that provided inspiration in the development of the proposed approach. Then the 3A procedure is presented and briefly discussed. It consists of three distinct steps of (1) annotating, (2) analysing, and (3) altering a particular teaching and learning situation. To illustrate the approach, an example is provided of an analysis of a genuine teaching and learning situation. In the discussion, we argue that the use of the proposed methodology can bring systematic, empirically grounded, and theoretically argued knowledge that will contribute to the understanding of instructional quality. Such analyses also help in developing a shared language for describing and interpreting teaching. This kind of knowledge (pedagogical knowledge for improvement) – represented in the form of case studies – should become the basis for the building of a knowledge base for teaching and could be used when striving to improve teaching practices.

Keywords: *instructional quality, conceptual structure diagram, teaching and learning situations, pedagogical knowledge, knowledge for improvement.*

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1. Some challenges of current research on teaching and learning

The paper aims to introduce a novel research approach that aims to bring new insights into the processes of teaching and learning, specifically into how students' knowledge is constructed in classroom interactions through *working with educational content* within teaching and learning situations (referred to as *TL situations*).[2]

Our approach – the *3A procedure* – has been developed as a response to some identified challenges of the prevailing research on teaching and learning. The challenges include a lack of content-focused research on classroom processes, a reliance on descriptive knowledge, and the atomisation of research.

Lack of content-focused research on classroom processes

Compared to the abundant research on the inputs (curriculum, teacher beliefs, students' preconceptions, etc.) and outcomes (students' knowledge, competencies, literacy, etc.) of teaching and instruction, research on content-focused classroom processes is scarce. Even though the classroom is the place where almost all of school learning takes place (and can be observed), we are still in need of deeper and better understanding of the processes that take place there, so much so that the classroom has repeatedly been called the black box (e.g. by Long, 1980). In particular, the ways in which students develop competences through instructional activities with the content (*working on content knowledge*) have not yet been sufficiently covered by research. And it is the students' *working with educational content* that lies at the heart of analyses with the 3A procedure. We focus on the very fundamentals of classroom teaching (by looking at how learning tasks are constructed) and learning (by analysing the students' work with content).

Focus on learning outcomes

Much research also succeeds in capturing the outcomes of classroom processes such as students' knowledge or competences. What tends to be left aside, however, is how this knowledge or these competences are constructed and internalised and how they bring about understanding. We lack research on the processes that aid or hinder understanding, concept-building, clarifying, and communicating meaning.

As Midtsunstad (2015, p. 30) points out, the outcome of knowledge construction is never predictable because the students construct *meaning* autonomously in response to the teacher's presentation of the *content*. The task for didactic research is then to investigate which of the ways of communicating lead to understanding (cf. Gruschka, 2013, pp. 31–32).

[2] Below, we refer to these situations as TL situations to point out that we agree with Shuell's (1996, p. 743) notion that teaching and learning are interrelated „so closely that for purposes of educational research one could argue that the two should be studied jointly, as an integrated whole, rather than as separate phenomena".

We believe that it is the *transition* between content and meaning and also between the student's and the teacher's perspectives that should attract the interest of didactic research in the original sense; at least, it is the focus of the primary interest of the 3A procedure presented below.

Reliance on descriptive knowledge

Recent educational research (not only in the Czech Republic) has concentrated on producing *descriptive knowledge* and *explanatory knowledge* concerning the quality of instruction. With enough findings generated through descriptive and explanatory research studies, general research aims may be modified so as also to include producing *knowledge for improvement* (Prenzel, 2012). We believe that such knowledge can be generated through working on everyday TL situations and aiming to improve their quality. Such an approach, however, requires (1) a theoretical model to clarify the relationship between semantic analysis of TL situations and assessing their quality, and (2) a tool for the evaluation of the didactic quality of TL situations. It is the aim of the *3A procedure* that we propose in this paper to meet these two basic requirements.

According to Prenzel (2009, p. 331), bringing understanding of how instruction can be improved is a specific aim of research on teaching and learning in the classroom. This is often done through comparing; the probability of this or that outcome is assessed depending on different conditions and contexts. The same principles (assessing alterations in the TL situations) are employed in the proposed approach.

Atomisation of research

The problem with many of the research findings (at least in the Czech Republic) is that they are to a large degree fragmented rather than integrated into coherent knowledge. Even though fragmented research knowledge is of little help in tackling the issues of teaching and learning, attempts to build a more coherent knowledge base for teaching are only emerging slowly (Janík, 2010).

A better understanding must be developed of teaching and learning processes which will be "knowledge-based", i.e. re-interpreted in the light of individual and collective *knowledge construction* and *knowledge creation* (Peschl, 2006, p. 111). We believe that knowledge develops through communication and cooperation between those who share experience and reflect on it in groups that can be referred to as *communities of practice*, which are 'groups of people who share a concern or passion for something they do and learn to do it better as they interact regularly' (Wenger, 2004, p. 1).

In the case of the *3A procedure* such communities are referred to as *professional communities* (each including novice teachers, experienced teachers, and researchers), which are set up for each individual school subject – languages, maths, science, social science, aesthetics, etc. These professional communities

work together to generate (video) case studies that (re)present various (trans) didactic phenomena. The aim of a *professional community* is therefore to construct a specific type of knowledge (i.e. *knowledge for improvement*) that is shared within the community in theory and used in practice.

Storing and sharing knowledge: the role of case studies

Such complex knowledge – generated and shared in professional communities – is difficult to document and communicate. Often it takes the very specific form of *case studies* (or *experiential knowledge* centred around *exemplars* – Norman et al., 2006). Shulman (1996, p. 479) describes such abstraction as a shift from immediate personal *first-order experience* to reflected, described, and communicable *second-order experience*. Case studies serve as bridges between practising and theorising; they link examples of practice with theoretical constructs and thus make theory easier to grasp. They can act as the underpinning of the knowledge base for teaching and be organised in *case libraries* (e.g. Kolodner, 2006).

The 3A procedure generates *case studies* that are content-bound (the focus lies on ways in which students encounter specific educational content), rooted in genuine practice (real-life teaching and learning situations are analysed), and theory-laden (explanations of the semantic-logic structure build on content theories as well as didactic theories). They are a means of developing (teachers') pedagogical knowledge, the discourse of the teaching profession, and didactic theory.

Assessing the quality of unique phenomena

Quality in teaching and learning is difficult to assess because a single TL situation is – in its complexity – unique and incomparable. It is, however, possible to suggest a better alternative within the gestalt of the situation and then to compare the original situation with itself, or rather *its altered self*. The hypothesis about the high quality of the original situation can thus be tested. For this suggested alternative we adopt the term 'alteration' from the *Popperian* approach to the complex quality of *works of art* as described by Kulka (1989).

Building on this *Popperian* reasoning, we can develop the idea of teachers' professional intuition for the assessment of teaching and learning into a systematic evaluation model that takes into account the knowledge-sharing cycle. Popper's conception of corroboration can also be applied because it has very practical implications for every criticism, including the assessment of the quality of teaching and learning. In accordance with this approach, we see the quality of a TL situation with regard to the criterion of rightness, which is developed from distinguishing between better and worse alternative situations in the context of the whole *didacticwork* (as in "artwork"). It remains true that good situations – analogously with

works of art – 'are more falsifiable than bad ones in the sense that the former are easier to spoil and more difficult to improve than the latter' (Kulka, 1989, p. 197).

2. The 3A procedure

In this section we first briefly summarise the tools and methodologies developed by other researchers to analyse content-focused TL situations that proved to be inspiring for the development of the 3A procedure and then we summarise the basics of the 3A procedure as a novel research approach.

2.1 Methodological inspirations

We draw on *The Model of Educational Reconstruction* (MER; van Dijk & Kattmann, 2007; Komorek & Kattmann, 2008), which comprises basic components of subject-related learning and teaching and integrates three well-known lines of educational research: (1) the investigation into students' perspectives on a chosen subject, (2) the clarification and analysis of science subject matter, and (3) the design of learning environments or teaching-learning sequences. It is inspiring for its complexity in that it includes all the main components of content transformation in lessons and emphasises a constructivist approach to the cognitive activity of students.

Methodological inspirations were also drawn from the *Design-Based Research* approach – *DBR* (e.g. Leach, Ametller, & Scott, 2010). One is the distinction between two basic levels of detail of didactic analysis: *large grain size* and *fine grain size*.[3] The other is the concept of *design briefs*, which are used for communicating knowledge about the processes of teaching and learning and so to support practice with reference to the *grand theory* through *intermediate frameworks.*

We also build on the *CDIs method* (*Critical Didactic Incidents*), which is a method for the analysis of professional activities that aims to achieve the highest possible level of understanding of the key components that are decisive for successful outcomes (Amade-Escot, 2005, p. 128). The CDIs method is based on direct observation of didactic interactions. It was developed in the context of physical education instruction and has been adopted for many professions and led to various categorisations that brought an understanding of demands in different professions.

Finally, we draw inspiration from various long-term continuous collaborative efforts of teachers to improve teaching in their own context through the analysis of video clips of real-life teaching (*Lesson Study* – Stigler & Hiebert, 1999; Rock & Wilson, 2005) or through meeting in groups to discuss their own lessons captured on video (*video clubs* – Sherin & van Es, 2005).

These selected approaches are mentioned because they contributed to the development of the ideas behind the 3A

[3] *Grain size* refers to the level of detail that is used to reflect and describe the practice of teaching.

procedure, each in a different way: TL situations are analysed – similarly to the CDIs and Lesson Study – on the level of fine grain size and with the use of intermediated frameworks – in an analogy to the DBR. In accordance with the MER, TL situations are analysed with respect to the relationship between (1) the investigation into students' perspectives on a chosen subject, (2) the clarification and analysis of science subject matter, and (3) the design of learning environments or teaching-learning sequences. On the other hand, our conception is different from that of MER in that it focuses the analysis on the design of the learning environment, and also on a deep insight into the structure of the content transformation, which makes it possible to explain the relationship between the educational content, teacher and student activity, and educational aims. Our conception of *intermediate frameworks* differs in that we see them not only as domain-specific but also as inter-disciplinary areas, such as pedagogy, or domain-general research on teaching and learning. From the CDIs method we adopt the emphasis on key situations that point to the important actions of teachers and students with regard to the success of teaching. In contrast to the traditional use of the method, we focus not only on an analysis of the critical situation but also on a suggestion for improvement (improving alteration), the success of which can be assessed and tested. The *added value of sorts* of this approach lies in the way the design is inspired by deeper theoretical explanation through Kulka's *Popperian* arguments and also in the transdisciplinary overlap between different domains.

2.2 The procedure

This section presents a specific content-based approach to studying and improving the quality of instruction, which is based on annotating – analysing – suggesting alterations (the 3A procedure). The approach follows from a practical turn in the social sciences and humanities, which is represented by two ideas: (1) practice forms the basis for theory; (2) theory should be practice-based and oriented.

The approach is inspired by Peschl's idea of the knowledge sharing cycle. The procedure makes it possible to assess how well the aims, content, and concrete realisations of pupils' activities are integrated. There is a link between the 3A procedure and reflective practice in teacher education and the procedure has great potential for teachers' professional development.

The approach differs from other video analytical approaches in that its focus is on educational content. It is centred around an analysis of content nuclei and their semantic and logical relationships rather than temporal relationships (i.e. sequencing).

In the *3A procedure*, "3A" stands for a three-step methodology consisting of annotating, analysing, and altering a particular TL situation that has been selected as an illustrative example of a good combination of a teacher's curricular work (selecting content and designing a TL situation) and the realisation of the situation

(Janík et al., 2013; Janík, 2016). The TL situations are typically 8–15 minute-long segments of lessons that are separated from the previous and following segments by clear organisational boundaries.

- *Annotation* is a brief summary of the TL situation and its context. Situations are analysed from various perspectives (e.g. from the perspective of "learning to learn" the situations are analysed with respect to various aspects: metacognition; gaining, processing, and assimilating new knowledge and skills; applying knowledge and skills in a variety of contexts, etc.
- *Analysis* refers to a reconstruction of the situation – it focuses on specific aspects of the situation in order to reveal the potential for qualitative change (improvement). Conceptual structure diagrams are used as tools for capturing the way the content was worked on in the situation. We argue that only such semantic-logical analysis may provide grounds for suggesting alterations within the TL situations.
- *Alteration* is basically a thought experiment in which an alternative course of action is proposed and discussed. First, the original TL situations are assessed and categorised into one of the following levels: (1) failing, (2), undeveloped, (3) enabling, and (4) supportive. It is a principle that it is the failing and undeveloped situations that are in need of alterations. Alterations are then suggested, reconsidered, and discussed in the professional community. Suggesting alterations within the situations is a way for professional learning to occur.

In the first step, a TL situation (a lesson segment) is identified that includes illustrative examples of working with educational content. These TL situations (usually captured on video) are *annotated*. The annotation tends to consist of two parts: first, the curricular context is described (aims, topic, continuity) and then the concrete realisation in the particular unique didactic setting is discussed (didactic realisation of the content, activities of the teacher and pupils).

In the second step, the semantic-logic structure of the situation that has been identified is reconstructed and analysed. This in turn makes it possible to perform more complex analyses of content transformation, which credibly reflects the way teachers think when designing lessons.

The focus of the third step lies in the assessing of the quality of the situations and suggesting alterations within them. We operationalise categories for the assessment of the quality of TL situations; these categories serve as intermediate frameworks for developing theory-based indicators of instructional quality and its aspects, such as cognitive activation, constructive dealing with mistakes, supporting metacognition, etc. The quality of TL situations is assessed (as failing / undeveloped / enabling / supportive) and alterations are suggested, reconsidered, and discussed. As explained above, in this way we aim to produce knowledge for improvement through work in the professional community within the knowledge-sharing cycle.

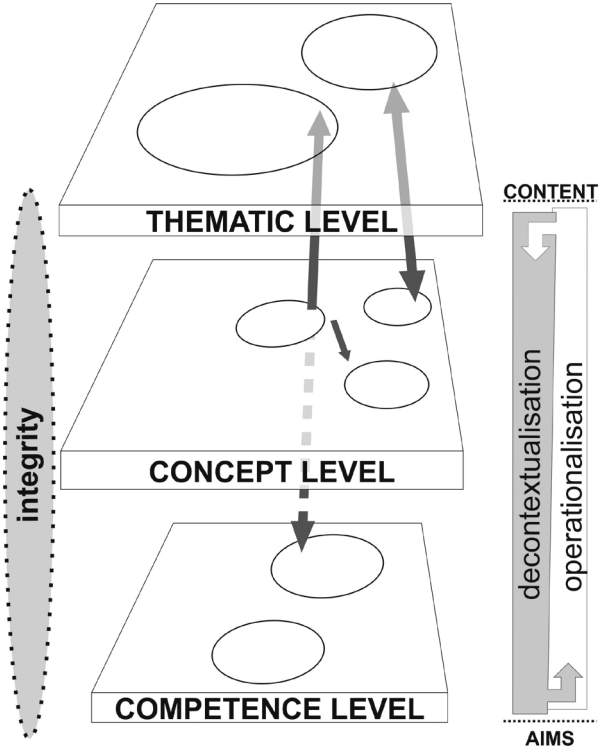

Figure 1. The three levels in the conceptual structure diagram and their integrity

2.3 The conceptual structure diagram

To analyse the TL situation (in the second step of the procedure), we make use of the conceptual structure diagram (visualised in Figure 1). In the diagram, three levels are distinguished:

- the thematic level, which captures concepts related to the theme or topic of the lesson that are close to students' own experience,
- the concept level, which captures concepts of field-specific knowledge and procedures that constitute the curricular content to be mediated to students,
- the competence level, which includes the educational aims that are pursued.

The movement from the thematic to the competence level is one of abstraction

and generalisation; movement in the opposite direction involves operationalisation. In the diagrams, the individual concepts on different levels are connected with arrows where explicit or implicit links were made in the TL situation.

Distinguishing these three levels – and interlinking them – makes it possible to take into account the relationships between the students' everyday experience, the terminological and methodological (substantive and syntactic) structure of the content in the field, and the educational aims (or competences). The didactic quality of the TL situation is closely related to the *integrity* of all three levels, i.e. to the degree to which there is an accord between instructional aims, curricular content, and students' activity and communication.

Technically, the work within the professional communities is supported by a video-based e-learning environment[4] that aids the construction, sharing, and development of professional knowledge. Providing support for constructing, sharing, and developing professional pedagogical knowledge is vital for professional knowledge (in general) to be effectively developed and shared in the professional community through communication.

2.4 Analytic generalisation

Building on the above-mentioned analyses, we then aim to develop relevant theoretical generalisations and verify them with other cases generated by means of the 3A procedure. Accumulated theoretical constructs are the results of analytical generalisation from various cases and they serve well in developing the understanding of instructional quality through reflection on practice. As Bell et al. (2004, p. 425) point out in this context, "an intermediate step between scientific findings, which must be generalized and replicable, and local experiences or examples that come up in practice" must be taken.

This problem is common to all research that aims to generalise findings from individual cases. The general context of our research is thus the methodology of case studies that we adopt for the purposes of research in didactics. We build on Yin's conception of analytic generalisations (Yin, 2011, pp. 98–102). As Yin suggests, it is possible to formulate propositions – based on the qualitative analysis of individual cases – that contain a set of theoretical constructs or hypothetical statements about a case. In the second step, this theoretical basis is applied to similar cases and verified. "The goal is to pose the propositions and hypotheses at a conceptual level higher than that of the specific findings" (Yin, 2011, p. 101).

This approach is analogical to Korthagen's (2011) view on the development of the teacher's professional thinking from gestalt to personal practical knowledge and from personal practical knowledge to formal theory. In both approaches, *local* experience is used to construct generalised propositions that can be verified in practice, which leads

[4] http://didacticaviva.ped.muni.cz

to testable theoretical generalisations. We find these approaches inspiring for research that aims to support reflective practice.

3. Example: *Molluscs*

In this section, the approach presented above is illustrated using a case study[5] built around an authentic TL situation realised within an upper-secondary biology lesson that focused on the external morphology of molluscs. In line with the 3A procedure, first an annotation of the TL situation is provided, then the situation is analysed and an alteration is suggested and discussed.

3.1 Annotation

Context of the situation – aim, topic, continuity

The TL situation that is analysed took place as a part of a biology lesson realised in the fourth year of a six-year upper-secondary comprehensive school (age of students 16–17) in the Czech Republic in 2009.[6] The focus of the lesson was on the external morphology of molluscs. In the previous lessons, the students were acquainted with molluscs' habitat and how their external morphology was adapted to it. In the lesson that is analysed, the students therefore discussed the taxonomic characteristics and habitat of molluscs with respect to their external morphology (e.g. the relationship between the shape of the organ of locomotion (foot) and the mode of locomotion). Two aims of the TL situation can be inferred from the video recording: (1) to understand the relationship between molluscs' external morphology, their place in the taxonomy, their behaviour, and their habitat (domain-specific competence) and (2) the development of general competences (such as competence to learn, problem-solving competence, and communicative competence).

Didactic realisation of the content (activities of teacher and pupils)

The teacher set three tasks for the students: (1) to select and interpret the *key concepts* in the topic, (2) to classify these concepts with respect to *taxonomy* and *morphological characteristics*, and (3) to link selected concepts to "reality", i.e. to *observed characteristics* of actual animals. She made use of group work; she split the class into three groups, each of which then concentrated on one of the classes of molluscs (gastropods, bivalves, and cephalopods). First, each group of students worked with the textbook to study "about" the particular class of molluscs; they sought *key concepts* (concerning their habitat, external morphology, and taxonomy) and sorted them into a table according to hypernyms prescribed by the teacher. Later, the morphological characteristics under research were discussed

[5] In fact, it is only possible to present an abridged version of the case study for illustrative purposes in the present paper.

[6] The lesson is available online at http://clanky.rvp.cz/clanek/r/GCCG/7337/VIRTUALNI-HOSPITACE-BIOLOGIE-MEKKYSI.html/

and observed on authentic objects (exhibits of shells and preserved specimens) and OHP slides.

3.2 Analysis

Analysis of the structure of content (using a conceptual structure diagram)

From the didactic perspective it is obvious that the topic *molluscs* served at least two purposes. One was to acquaint the students with facts about various members of the *phylum mollusca* (and their characteristics) and the other is to illustrate how taxonomy works in biology, e.g. how biological classification makes use of morphological characteristics. These two areas of educational content in biology are reflected on the concept level of the conceptual structure diagram of the situation that is analysed (Figure 2). The competence level shows which domain-specific competences (e.g. classifying) and which general competences (e.g. the problem-solving competence) are likely to be developed on the part of the students (as expected by the state-level curriculum).

Analysis of content transformation, towards the alteration

However, while the teacher succeeded in connecting the concepts on the *concept level* with items of the students' everyday experience on the *thematic level* (abstraction: Level 1 decontextualisation), she did not focus explicitly on *generalisation* (Level 2 decontextualisation), which would involve instances of *higher level abstraction* (such as causal relating or semantic inference). In the conceptual structure diagram, this is indicated by the number and direction of the single or double arrows that interconnect concepts on different levels. The teacher finds herself in this domain often throughout the lesson but she rarely lets the students in to explore it for themselves (e.g. she *states* many facts and presents information that the students could easily have inferred from observation or deduced from literature).

3.3 Alteration

Assessing the quality of the situation

The analysis of the TL situation can be categorised as *enabling* (type 3, see above). Some downsides can be seen in the way the students were (rarely) allowed to show initiative or to abstract from concrete facts towards general (or domain-specific) competences. The lesson provided the students with at least some opportunities to classify, assess, and learn from errors, and also to infer, explain, deduce, and draw conclusions from basic facts. However, more often the students were expected to engage in tasks that were less challenging cognitively (according to Bloom's taxonomy, the students were too often expected to *remember, understand*, *and apply* where they could have been asked to *synthesise* or *evaluate*).

Suggested alteration and its critical reflection

The easiest alteration would be to change the type of some of the questions

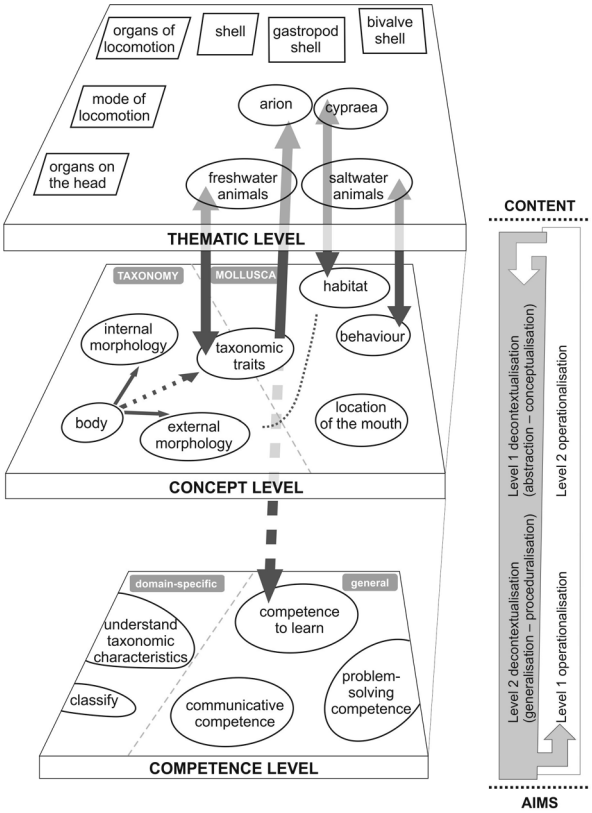

Figure 2. The conceptual structure diagram of the situation

that were asked in the lesson. Instead of questions such as *What is it?* or *Where is it?* the teacher might ask *How do you explain that?* or *How would you say it in other words?*; the need to clarify and argue would require the students to gain distance from their immediate experience (i.e. to decontextualise) and thus develop deeper understanding of the curricular content.

On a more general level, the teacher might dedicate a part of the lesson to more extensive abstraction, i.e. to show what the connections are between an animal's *morphology*, its *habitat*, and its place in the *taxonomy*. Such an approach would shed more light on the links between the concepts in the organisation table used within the situation and it would also make it easier to incorporate

the students' individual work with the specimens. Such an inductive approach – even though very likely to be more time-consuming – would also help develop the students' target competences better.

4. Conclusion

The paper introduced a content-focused research procedure for sharing and developing professional knowledge with the aim of increasing instructional quality. We argue that the use of this methodology could bring systematic, empirically grounded, and theoretically argued knowledge that could contribute to the understanding of the components and characteristics of the quality of instruction and the factors that determine it and to the development of a shared language for the teaching profession (in contrast to the current isolated discourses of theory and practice in education). This kind of knowledge could become the basis for a knowledge base for teaching – possibly in the form of case libraries (e.g. Kolodner, 2006) – and could potentially be used to improve teaching practices (e.g. through pre-service and in-service teacher education).

Professional knowledge must be relevant to instructional practice. Ideally, professional knowledge would be shared and used effectively in general, i.e. without notable differences between individual professionals (e.g. in medicine). This supports the call for teacher professionalisation. Professional pedagogical knowledge should be "clinically grounded" in facts from the educational reality (cf. Shulman, 1996). That is, professional pedagogical knowledge should support teachers' ability to see relevant aspects of teaching and learning and help them assess, explain, and improve their own practices (Minaříková, Píšová, Janík, & Uličná, 2015). Such "grounding" would make it possible to help develop the *language of the teaching profession* (Wipperfürth, 2015). Such specific language enables reflection on teachers' and students' activities and forms the basis for improving them. It is to be regularly developed and cultivated and should build on empirical evidence and facts in order to precisely explain and justify the quality of instruction.

It is the underlying premise of the 3A procedure that didactic theory and research rely on decontextualisation of instructional experiences.[7] All experience from instruction is unique, but it

[7] The subject of didactic theory and research are phenomena dependent on the cooperation between teachers and students in the learning environment. These phenomena cannot be understood but through such interpretation of personal experience that builds on conceptual decontextualisation of individual cases. Theory and research in didactics therefore fully depend on decontextualisation of (teaching and learning) experience. The idea is captured in Shulman's (1996, p. 479) distinction of two levels of teachers' experience: intuitive and personal *first order experience* and conscious and expressible *second order experience*. Similarly, Korthagen et al. (2001) conceptualise the shift from the original and experiential *gestalt* to mental *schemata* and then to *theory*.

can be contained (through description or evaluation) and discussed, i. e. decontextualized.[8] Decontextualisation of experience depends on concepts that facilitate *semantic-logic analysis of the structure of experience* by distinguishing and classifying (typologising) unique cases and also that make *sharing knowledge* in professional communities possible. What the 3A procedure does is it supplies a justified system of concepts that makes it possible to *qualitatively describe, clarify, and evaluate and categorise the processes of didactic transformation in authentic learning environment.* The teacher needs to understand the processes into such depth so as to be able to foresee and solve potential problems if they are to sustain or improve the quality of teaching and learning.

The terminological system of the 3A procedure provides clues for interpretation not through distinct categories (as in criterial systems of evaluation of teaching and learning) but through a model of functional connections within content transformations (model of deep structure of instruction). The categories in the 3A procedure therefore bear their explanatory potential only within mutual relations when interpreting a particular case. For example, the content of the students' experience is accessible to the teacher only through the students' conception (thematic level of the model) but the didactic meaning of the conception is decided only by the way in which it embedded into conceptual context (concept level of the model) and by the educational aims (the competence level of the model, see Figure 1).

If the pupils' conceptions are separated from their conceptualisations and educational aims, then they become disconnected or disintegrated, and the quality of instruction is decreased. The 3A procedure provides a tool *to analyse the way* in which this happens, and also to form *types of cases* characterised by certain quality. When forming these types of cases, the basic distinction with the 3A procedure lies on the continuum between high-didactic-quality situations (categories of *didactic excellence*) and low-didactic-quality situations (categories of *didactic formalisms*), (cf. Janík et al., 2013; Slavík et al., 2017).

Accumulation of knowledge through the analysis of more and more cases is achieved through analytic generalisation (Yin, 2014, p. 98–102) that generate categorisations and definitions of particular types of didactic formalisms (e. g., obscured learning, overloaded learning, mislead learning) or didactic excellences (constructing learning, cognitive activating learning) (Slavík et al., 2017). These procedures are *revealing* in that they bring new didactic knowledge but also *functional* in that the case studies serve as precedents that help teachers to better understand their own practices.

[8] Without decontextualisation (1) no practical learning from reflection of one's own teaching, (2) no empirical research on teaching and learning, and (3) no theorising would be possible.

We believe that analyses of real-life TL situations, such as the one presented in this paper, bring a better understanding of those teaching and learning processes that are "knowledge-based" and at the same time such analyses are informative for practising teachers. They build on the growing body of descriptive knowledge (*what*), procedural knowledge (*how*), and explanatory knowledge (*why*), and generate what could be called 'knowledge for improvement' (*how better*). To achieve this, didactic research should continue to look *into* the processes of teaching and learning (into the "black box") in the same way that exceptional teachers think about their practice, i.e. approach teaching from the perspective of the students' learning.

The approach described here is relevant for basic research in that it follows Putnam's claim (Putnam, 1981, p. 201) that "every fact is value-loaded and every one of our values loads some facts". Through analyses of the didactic transformation of educational content on the level of fine grain size we can interpret facts from TL situations. These facts, however, represent a certain quality of teaching and learning and therefore are subject to evaluations that suggest the possibility of qualitative alternatives – teaching and learning alterations. Without an analysis and theoretical explication of these alterations one cannot acquire a deep enough understanding to explain teachers' professional knowledge for teaching and about learning. Through focusing on explicating teaching alterations on the *fine grain size level*, the approach presented here can contribute (1) to the elaboration of theoretical constructs that support research on instructional quality, (2) to the development of didactic theories, and, in a way, also (3) to *reconsidering the "why, what, in which context, and for what purposes" in educational research.*

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