



JOURNAL OF PRAGMATIC CONSTRUCTIVISM

What's the Problem? On Problems in Problem-based Research and Problem-based Learning

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'A problem is not an objectively existing thing. It cannot be found in the world. We do not know what a problem looks like. We do not know if it is black, noisy, dancing or sleeping'

H. Nørreklit, 1991, p. 38

Prologue

Being a young and hopeful PhD student in the early 1990s, it was kind of a revelation to meet professor Nørreklit's work on problems and problem recognition (H. Nørreklit, 1989 & 1991). Here we found some of the answers to a very specific problem; how to do proper research in an action- and problem-oriented research setting? Professor Nørreklit sketched out a conceptualising method, where we could see ourselves and our research in a paradigm with a theory and some methods that were much better suited for the kind of research problems we were confronted with. That was theory and method that was much better suited to our projects, than the kind of semi-positivist, deductive and naïve realist methods offered by the traditional business school establishment. By taking an outset in real-life problems and looking at them through the lens of the conceptualising method, it was possible to do proper research that simultaneously could benefit the field in question. Our university (Aalborg University) pride itself of being a university where problem-based learning and problem-based research are at the centrepiece of all teaching and research activities and our projects followed that problem-oriented path. Therefore, the analysis of the problem as we found it in professor Nørreklit's work came in handy. Finally, we had something that we found meaningful, relevant, and useful in a problem-oriented research context.

In the following I will take a closer look at the problem of problem and show how problem can be conceptualised and through that form the basis for problem-based research and problem-based learning.

1 Introduction

The concept 'problem' is central, even constitutive, to any research project. However, it appears to be much more equivocal how this pivotal concept of 'problem' should be understood. The question addressed here, therefore is how this 'problem' is and, further, how can it be conceptualised? What is the nature of a problem that can form the basis for problem-based research and problem-based learning leading to potentially successful research and learning processes and outcomes? By 'successful' here, I mean that the participants, the students or the researchers, actually learn something scientific or pedagogically useful both in terms of form and of content. By 'form' here I mean methods; by content I mean curricula or the subject matter in a research project.

The 'problem statement' is deemed central to most research projects and to most PBL models. However, it appears from the extant literature on problem-based learning, that there is a problem with the problem; it is rather confusing, because what is in the problem? Or rather, how can 'problem' be conceptualised? According to the Oxford Learner's Dictionary, a problem is something that is difficult to deal with or to understand. 'Problem' literally means to throw something forward, just as the word 'project' does. This is, I think, interesting as problem-based learning and research are most often based on some kind of project work. The word problem is derived from the Greek 'proballein' which means to 'throw' or 'submit' of 'pro' and 'ballein', to throw (same word as 'ballistics'). Project, on the other hand,

has entered into the Danish language via German from New Latin 'projectum', formed by French 'projeter' 'plan', and further back the Latin 'project', to 'throw forward'. We have the same words in Danish and German where 'udkast' (Danish) or 'Entwurf' (German) literally means 'to throw' but in both languages these words are used metaphorically as sketch, preliminary plan, draft, or design. Thereby both problem and project become something that dynamically concerns the future and are something that we should work on, in a process, which makes it perhaps easier to see that any project in a problem-based setting should consist of both project and problem as there is this close, and processual or correlative even, connection between the two.

The problem is important in any phase of any problem-based project. As in the *initial problem* where the students or researchers show or demonstrate why a certain project is deemed to be important and worthy of attention, especially in the *problem analysis*, where students and researchers analyse and try to conceptualise the true nature of the problem, they want to work with and somehow learn from. The problem analysis should then lead on to the *problem statement* where the research questions are finally put into words which should then be able to guide the research process throughout the remainder of the project's analyses and conclusions by coming up with reasonably plausible answers to the problem statement. All this is well known from the PBL literature. What is less well known, and the central focus of this paper, is the status of the problem that is the cornerstone of the entire problem-based endeavour. The literature on PBL is surprisingly sparse when it comes to discussions on the 'problem in problem-based learning'. O'Grady et al (2012), for example, inform us that:

'PBL is an educational strategy where learning is driven by a problem. The problem could be a challenge or a description of a difficulty, a curious outcome, or an unexpected happening. It could also be an incident where there are interesting elements, or an episode or occurrence that requires either a solution or some explanation.'
(O'Grady et al., 2012)

This piling up of metaphors, however, does not bring us any closer to the problem, even if words like challenge, difficulty, and so on could be interesting contributions to any investigation into the problem of problem. In similar vein, Savin-Baden & Howell (2004) asks 'what is a problem?' Instead of answering their own question, however, they provide us with some, admittedly interesting and necessary, examples but still seriously lacking the requisite insight demanded to somehow solve the problem of problem. That is, they rush on to something else leaving their question unanswered (Savin-Baden & Howell, 2004: 59).

Holgaard et al (2014), drawing on Adolphsen (1985), provide something more substantial in distinguishing between theoretical problems and practical problems. Practical problems are problems as they are found in our everyday lives. These may be very trivial problems, or they could be more complex, such as are found in our everyday lives in business, in organisations outside the university and problems which, for the most part, we may already know how to solve; they are 'no big deal' – solutions are usually readily available. Theoretical problems, on the other hand, are problems as they are found inside the university, in academia. Theoretical problems can take many forms. They could, for example, present themselves to us when our theories do not fit the data gathered from the outside world, or our data do not fit any known theory. This is sometimes called an anomaly and calls for theoretical refinement or development. We could also discover that our theory might have some kind of inconsistency which we need to do something about. In both cases these are, of course, problems and even problems that can form the basis for the understanding of problems, but as we shall see, we need more.

Pedersen (2003: 27) brings in hermeneutical prejudice to stress the importance of pre-knowledge in order to be able to make or construct a proper problem statement. Problems are not simply stated out of ignorance but can only be made relevant on the basis of substantial investigations into the subject matter at hand. With the distinction noted above between theoretical problems and practical problems, and by drawing attention to the importance of pre-knowledge within people's or students' lifeworlds, we are getting somewhat closer to the issue of 'problem': these insights, however, notwithstanding their strengths, have their own flaws and it is argued here that they remain insufficient, albeit necessary, when it comes to conceptualising the problem in problem-based research and problem-based learning. Both practical problems as well as theoretical problems, and pre-knowledge of the actors' lifeworlds, do play a vital role in conceptualising the problem; but more is again needed as I discuss below. Holgaard et al (2014) were correct when they distinguished between practical and theoretical knowledge and Pedersen (2003) was correct to point to the importance of hermeneutic prejudice and the unavoidable nature of pre-knowledge in conceptualising any problem; but we need to take both somewhat further and deeper to gain the core insight that we are seeking here. I will do this by introducing the concept of real problem, as laid out by L. Nørreklit (1978) and H. Nørreklit (1989, 1991), and I will take Pedersen's (2003) idea of the Gadamerian hermeneutic prejudice further into an analysis of the importance of the question of the problem of problem addressed here.

In what follows, I will first analyse the problem in problem-based learning through the lens of pragmatic constructivism - language games, lifeworlds, abstractions, and concepts (Henriksen, 2016, 2019a; Nørreklit et al, 1983;

Wittgenstein, 1953/2009). Any human lifeworld is only possible with a language game to go with it – lifeworld and language game are each other's prerequisite - both are constitutive of each other. A human lifeworld cannot exist without a language game and a language game is always embedded in a lifeworld and in the pre-knowledge of its members. In our language games we use abstractions and concepts. Abstractions are words emphasising certain aspects of reality, neglecting others, while concepts are words that are able to describe a reality while considering all aspects of that reality (Henriksen et al, 2004: 22). The 'tool' to do this is consequently a conceptualising method (Henriksen, 2016). In our case, the task here is to take the word 'problem', as an abstraction, and turn it the 'problem' into a concept. The question addressed here now becomes: *how can we turn problem into a useful concept that can form the basis for a successful problem-based research project or a successful problem-based learning experience?* In the second part, I then turn my attention to Gadamer (1962/1992) and his analysis of the question. As very clearly and rightly pointed out by Pedersen (2003), we need pre-knowledge or prejudice in order to be able to find a proper problem statement. I could continue here with discussion of Gadamer's entire analysis of hermeneutic understanding, but space does not allow for such a detailed philosophical discussion. Instead, I will concentrate on the role of the question in the process and in the attempt to conceptualise 'the problem'. In a final part I will seek to find out what this plausibly means for problem-based research, for problem-based learning, and for research and science in general.

2 The real problem

We met theoretical problems and practical problems above. Theoretical problems are as we know them from the university: we have collected some data and we try to analyse them through a theoretical lens, maybe in a Euclidian/Newtonian fashion, and then discover that the theory and the data do not fit, or we discover that the theory may have some kind of inconsistency. In both cases we then need theoretical refinement or development. In this type of problem-solving the problem is given, meaning that the problem is a university problem, and the result of the research is the solution to the problem such as a new theory or the refinement of an old theory. Such theoretical problems relate to the differences between hypothesised theoretical expectations and reality. In this way, the sciences are developed internally, independent of the broader society. The research is kept safely within each discipline, that is, theoretical problems are not really inter- or cross-disciplinary in any way. Such theories reflect reality to the extent that there are no anomalies involved. In this way the sciences create images of reality – how these images are used is up to politicians, economic interests, or other powerful institutions to decide. Therefore, theoretical problems are merely abstractions or symptoms, which encompass only parts of reality, and not what the problem of interest to PBL here fundamentally is; these, therefore, cannot be the sole type of problem, on which we base our problem-based research, or problem-based learning (Henriksen et al., 2004, p. 148; L. Nørreklit, 1978, p. 3; H. Nørreklit, 1991, pp. 38).

Practical problems are of a different nature. They are found outside the university, in the broader society. Practical problems are given, just like theoretical problems are, and the result of the research is the solution to the practical problem. The research is interdisciplinary simply because practical problems often require different theoretical inputs from various disciplines. The research is developed from external circumstances and tends to be politically controlled, especially in projects where external partners as well as external sources of research finance are involved (Henriksen, 2019b). Under these circumstances the solution to practical problems looks much more like a consultancy job, than research, as it is just a matter of finding one of the already known solutions or finding the right tool. Thereby the research is driven by external interests. Other such practical problems in the lifeworld are trivial; people notice them and simply fix them, no fuss, nothing to see here. Therefore, practical problems are also abstractions which only encompass parts of reality and, therefore, cannot be the sole type of problem on which we base our research or any learning. Such practical problems may, however, be actual symptoms of real problems (Henriksen et al., 2004, p. 148; L. Nørreklit, 1978, p. 9; H. Nørreklit, 1991, p. 44) and this leads us to the core of this paper on addressing the problem of problem in problem-based research.

Both theoretical as well as practical problems, described here as ideal types, are not to be dismissed in PBL or problem-based research. Both can be, and quite often are, important for the research process as they can be vital starting points of departure for substantial problem-based research and learning process, but *only* as its initial problem, as symptoms of something that it is worth investigating further. For example, there is something wrong or not quite right and we need to do something about it. Both theoretical and practical problems may be the starting points of a problem-based research or learning project; but neither could be the actual problem to solve, for that we need a *real problem*. A real problem is found through a process of problem analyses where the real problem is conceptualised and re-conceptualised in a final problem statement. A real problem is dynamic, processual, and future oriented; finding and formulating a real problem is a continuous dialogical process of conceptualising and relating various symptoms into real problems which can then lead to a plausible problem statement.

An example: In 'The Company' there was a problem meeting delivery time. Managers from all departments and the general manager had agreed, at a meeting, that it was very important to meet delivery times, but even if this was deemed important, The Company often had to inform their customers that the delivery of orders had to be postponed or

delayed. Something had to be done and a researcher was called into action. If the initial problem was delayed deliveries, intensive research through interviews and scrutiny of cases of delays showed that there was something else at stake. It turned out that the different departments and the department managers had very different ideas of what 'on time' meant. They had very different conceptions of 'on time' and this consequently resulted in problems of communication between the various departments. 'On time' is when we have promised the customer said the sales department; 'on time' means when we are ready said the production department; 'on time' is when our computer systems tell us said the planning department. As these three ideas of 'on time' are different they, naturally enough, resulted in conflicts. So, when the company was unable to meet its delivery times, it was only a symptom of something else, of something deeper. There were problems of ordinary production management, but the real problem was much more than that, as it was also a question of communication (see Böhme Christensen, 2002). We could say that the *real problem* was a case of misconceptions and the language games of the sales, production and planning departments not being aligned with the broader lifeworld of the factory. The solution to this real problem and the result of the research was not only improved IT and production management systems, but also a new set of concepts; in the case of 'on time', for example, a new and improved language game conceptualised through research and dialogue between the researcher and participants in all departments that was able to conceptualise the real problem, leading to a solution. The research was focused on the totality, not just practical (delivery times) or theoretical (production management) problems. The validity of the research was secured through its connection to the outside world and the science is developed by permeating the given abstractions and replacing them with new conceptions and new abstractions.

Therefore, we can say that the real problems that should form the basis for problem-based research and problem-based learning can be found through a proper problem analysis, where symptoms of practical and theoretical problems are thoroughly analysed. Through such an analysis it is possible to get to the idea of, the core of, the real problem. The real problem can now be described – conceptualised – as something that confronts us when our language games, our concepts and our abstractions are no longer able to guide us in our lifeworlds. The task, therefore, for problem based research and problem-based learning is to first identify initial problems or symptoms and then, through a proper problem analysis to find the real problem, the reason behind the symptoms and find out where the language games fail and need to be improved, because only in this way is it possible to find and execute the actions necessary to remove the symptoms, hence plausibly solving the real problem.

It follows from the above that the *problem analysis* must become the focal point in any problem-based endeavour, and this brings us to *the question of the question*, because only through good questions will we be able to conduct a substantive and fruitful problem analysis that is able to point to the real problem.

3 The question

What is a good question? There is something, for example, that we do not know – our language games do not appear to fit the situation we are in, we've got symptoms and we need a proper problem analysis. Therefore, we need good questions. Gadamer, in his *Truth and Method*, addresses the question of the question.

'The essence of the question is to have sense. Now sense involves a sense of direction. Hence the sense of the question is the only direction from which the answer can be given if it is to make sense. A question places what is questioned in a particular perspective. When a question arises, it breaks open the being of the object as it were. Hence the logos that explicates this opened-up being is an answer. Its sense lies in the sense of the question.'

(Gadamer, 1962/1992: 362).

This quote from Gadamer points to several important aspects of the question. The question must have sense in order to be a genuine question: this means that the question has a direction towards a meaningful answer in that it is future oriented and processual. It is meaningful in the sense that it is possible to find an answer that makes us somewhat wiser. This requires that the question is open, that it has a kind of openness that makes several answers possible; the answer is 'not settled', it remains 'undetermined'. This openness is based on the dialectic relation between question and answer. This, however, does not mean that any answer is possible, because any question is raised within a horizon, and it is this horizon which decides which answers are possible. On the other hand, a good question should also be able to go beyond the horizon and even question its limits (op cit. p. 370). After these initial remarks about the question Gadamer turns to dialogue (op cit. p. 367) and the logic of question and answer (op cit. p. 369).

Gadamer uses the structure of dialogue to show us the importance of the question. In the dialogue, openness, questioning, listening, and answering are the necessary ingredients. In the case of two people conducting a dialogue, the dialogue is a two-folk speak, where the interlocutors use language to reach a common meaning, a common understanding. The dialogue requires a certain element of empathy, even if it is also a change of power (for a more

substantive treatment of dialogue see Henriksen et al., 2004, pp. 152; Henriksen, 2019a). The dialogue is situated, it is a community-of-two and if it is a dialogue the 'other' is truly recognised as a 'thou'.

'What characterises the dialogue, in contrast with the rigid form of statements that demands to be set down in writing, is precisely this: that in dialogue spoken language - in the process of question and answer, giving and taking, talking at cross purposes and seeing each other's point - performs the communication of meaning that, with respect to the written tradition, is the task of hermeneutics' (Gadamer, 1962/1992: 368).

With this we see the importance of the question when we want to know something, and the structure of the dialogue can also form the basis for a logic of question and answer. When we want to perform a proper problem analysis in any potential real problem situation, it should be obvious now that we need good questions. We have some symptoms (the initial problem in the form of practical or theoretical problems) and we begin to raise questions along the lines described above. The answers which we find provide more reasons to raise still more questions and answers that, hopefully, can eventually lead to the real problem. In the case of 'on-time' noted above the initial question related to the failed delivery times and the researcher as part of his problem analysis started to ask questions. He did so by initially looking into the production system and asking questions related to this system; but he also engaged in dialogues with people from the other departments, such as sales and planning, along the lines of the dialogue-principles described above. Through these dialogues, and their inherent question and answer logic, he was able to uncover the reasons behind the failed deliveries. The concept 'uncover' is important here as it points to the hermeneutic truth concept *alethia*, meaning to bring into the open, to uncover. What was brought into the open in this example was the real problem, the failure of communication, of the language games to guide the practices of the factory lifeworld.

With this description of the dialogue and its question-and-answer logic it is now possible to see a possible way from the initial problem to the real problem and thereby also to the *problem statement*. But we need more, because if we have a problem, we also need a solution and the ability to reach that solution, and for this we need a *method*. In the first place that solution would be a new language game, new or improved concepts and abstractions, such as when the people in the factory had to find a common agreed conception of time in order to be able to achieve their customer delivery goals and targets.

4 Concluding remarks

By now we know what a problem is. We initially face a problem in the form of a practical or theoretical problem. But these are mere symptoms, and we need a proper problem analysis in order to find or locate the real problem. The real problem presents itself in the form of a misconception of world and reality and the way to solve the real problem is through a (research) process of conceptualisation and reconceptualisation, through a process of new or improved language games. We do this to find new concepts, abstractions and language games that are able to solve the real problem, thereby removing the symptoms. However, even with this, we still need to ask ourselves some further serious questions related to this description of the problem. For example, how do we secure the quality of the research, how do the language games relate to the world and realities where we found the symptoms? This is about validity. And what about the sciences, like mathematics, physics or chemistry, would the description I have presented above count for them as well? As can be seen from the small case above, I have so far only operated in the area of social science, but would this count for other sciences as well?

'The real problem is always a matter of the possibility of preserving or continuing to construct or develop a reality'
(L. Nørreklit, 1978: 79).

It takes action to get things done, and if we do not want to stay in the tranquil security of the ivory tower but wish to contribute something constructive and meaningful to various lifeworlds and realities, then we also need to find solutions. If the real problem is found through an analysis of a practical problem, the validity of our research is a confrontation of the real problem and eventually the removal of the symptoms that constitute the practical problem. Not by applying some already known remedy, because that would not be research but consultancy, but through a valid, reliable, and transparent research process that addresses the real problem behind the symptoms. This requires and demands direct involvement with the field of interest, where we need actions, where something needs to be done. Problem solving cannot simply be reduced to linguistics. This type of research could be termed action research, participatory research, or whatever. The name here is of minor importance, the key point emphasised here is that the criterion for validity is the removal of the symptoms through a research process that creates new concepts and language games, and which leads to actions that are successful (H. Nørreklit, pp. 44).

What about theoretical problems then? Would this description of problems count for them as well and would it count for the sciences? I think it would. Think of, for example, electricity or gravity. In both cases we had a phenomenon which we did not know how to handle, but through a process of painstaking research it was possible to conceptualise new concepts for the phenomena, creating language games that made it possible to handle the phenomena. In the case of electricity, we got Ohm, Watt, Ampere, Volts etc. and in the case of gravity we got Newton's laws. In both cases the sciences got concepts and language games that made it possible to handle hitherto unknown phenomena, and the validity in such scientific endeavour is precisely this 'ability to handle'. The claim to validity can be extended further in the sciences to the correspondence between phenomena and data and the cohesion of theories, but the validity of the entire endeavour relates to its 'ability to handle'. Here we could engage a Kuhnian perspective (Kuhn, 1962). That is, to say the scientific task is the creation of new paradigms (language games) that are able to get rid of or remove the anomalies (symptoms, theoretical problems). However, the creation of new paradigms within the sciences only happens on very rare occasions. Researchers are most often engaged in puzzle solving within the chosen paradigm, but even this could be seen as an attempt to develop new concepts and develop the language game that is the paradigm.

In problem-based research, it should be possible to solve real life problems through a thorough (valid, reliable, and transparent) research process; its purpose is finding and solving real problems. In this we cannot just use known methods to solve known problems, as this would not qualify as proper problem-based research. In problem-based learning it is somewhat different; in PBL we can, and do, use practical and theoretical problems as pedagogical devices: however, we must also demonstrate and emphasise to our students the significance of real problems. We should not expect students to bring up new paradigms or to always make symptoms go away; something less than that is acceptable in a learning setting. But if students could come up with a problem analysis and a reasonable (real) problem statement, point to useful methods and suggest some plausible solutions in the form of new or improved concepts, then they have really learned something very valuable. Similarly, in science classes we should not expect students to solve theoretical problems through creation of new paradigms; this would of course be simply too much to ask. But through problem solving (Kuhn's puzzles), it is possible to present scientific problems, theories and methods for students and thereby lead them successfully into the world of science. In both cases the students are presented with scientific methods, and they learn to ask good questions and handle problems, practical, theoretical as well as real problems. This is our problem-based task.

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