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## PBL and the Question of Real Learning

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**Introduction – Problems, problem solving and university educations**

In this article I will investigate theoretical considerations related to problem- and practice-based learning. I want to analyse the kind of learning, which is taking place in a higher education context where projects, problems and internships – practicum – constitute the core of the pedagogical model.

Current debates on economy, crises, globalisation etc. most often point to education and especially higher education as the main vehicle in any attempt to recover the economy, get out of the crises and solve the problems. Whether it is industrial associations, the unions or either side of parliament, their plans and solutions always include elements of education and most often higher education. With this, the universities and their study programmes are placed at the centre of any debate on future, economy and global competition. The idea seems to be that the university graduates are able to get jobs, solve problems and thereby able to contribute to the development of wealth in the society, in fierce competition with the rest of the world. This is sometimes called employability, that is, the candidates are able to use their competences in the labour marked or, for short, get at well-paid job. This places new demands on the universities and the university educations. Universities are no longer elite institutions for research and “bildung” of the male members of the upper classes. Higher education for the masses at red brick universities has arrived, as bildung for the elite is no longer enough. If the universities and the higher education programmes were parts of any crises management, then they would have to be able to do more. They should equip the candidates with knowledge and skills that are able to secure jobs for the candidates – for the benefit of the individual and for the society as a whole.

These new demands have not gone unnoticed. The universities are asked to deliver employable candidates and relevant research that the business community can benefit from. These demands have in many instanses been followed by new institutional arrangements where the learned republic with elected leaders is replaced by new management systems inspired by private enterprises (Henriksen, 2006). These changes also seem to have placed the debates about the role of the university in two opposing camps; One camp looking back and wanting to maintaining the humboltian ideals and another camp wanting to manage the university as any other privat enterprise.

These hostile camps are very much concerned with the management of the university and only to a lesser extent concerned with the teachings of the university. But even in the area of education the disagreement is very noticable and most often each camp describes the other camp as a carricature. This could be described with a point of departure in the end goals of the education. “The programmes are too theoretical” it is sometimes said, implying that there is no practical use in the teachings of the university. Or “this is training without any academic content”, the other side would argue. In both cases a dichotomy between theory and practice and between academic bildung and employability is established. This is quite unfortunate as in any university education one cannot exist without the other. These false dichotomies regularly surface, however, when practice is used as a pedagogical device; that is, when practice is used to test theory that has been taught in the classroom. In this way one camp sees the end goal as “Bildung” and the other as “employability” and thereby they have both established very good reasons for talking past one another. For both are right and both are wrong. The university should of course equip the candidates with classical academic skills – bildung, but the aim cannot be to produce unemployable candidates. In the other camp employability is the main purpose, but if this only leads to job-training without any academic bildung the university has also failed miserably.

In this article I will analyse the posibility for university teachings to do both. Both give the candidates the ability to get a job and simultainously maintain high academic standards. I will argue that PBL (Problem and Practice Based Learning) is a way to secure that both academic standards and employability are secured in the educational activities of the university. Based on a very long tradition, the main ingridient in most teaching at universities is lectures. I will argue that in order to secure both employability and academic bildung, lectures cannot stand alone, but need to be part of a more ambitious pedagogic arrangement, where students are active and actually work on projects of relevance. The point is that we need to find other ways of teaching than lectures, not that lectures should be supplemeted by other activities, but that lectures should supplement the students’ own activities when studying.

The Aalborg PBL model (Barge et.al., 2010) has proved its worth. The candidates learn a lot, they graduate within the time scheduled in the study programs and they get jobs after their graduation. Since its inauguration in 1974, Aalborg University has developed the Aalborg PBL model. The main vehicles in the Aalborg PBL model are project organisation, problem orientation and team work. That is, each semester the students work on a problem in a project together with fellow students. In these projects the students work on problems and this problem orientation means that the students work on problems of their own choice within the chosen discipline. The problems could be found in the world outside the university, in companies, in organisations or anywhere else where there are problems relevant for the students to study. In recent years the PBL model has been further developed so the students now can engage themselves in practicum arrangements in organisations and companies (The students typically spend one semester in some kind of internship in an organisation outside the university). The problem orientation also implies that the project integrate theory and practice. One of the main goals is to dissolve the theory practise dichotomy. Another important feature of the Aalborg PBL model is participant direction. This means that the students are in the driver’s seat, they are themselves responsible for the work in the projects and they plan and monitor the work in the project, with guidance and supervision from supervisors. This also includes the team-based approach where the students work on their projects in groups (Barge et.al, 2010).

The principles of PBL as described above is an ideal type PBL model and it could be seen as a rough sketch of what is going on in most study programs at Aalborg University. If the model is as successful as suggested – and there are good reasons to think so - the question is what it does to the students learning, or rather how do the students use the PBL model to learn? I will analyse why problem and practise based learning models are able to secure both bildung and employability. This is done through an analysis of the relationship between the practical projects the students are taking on in the PBL environment they are part of and actual learning that is the outcome of the PBL model. Here the students ability to solve problems is central. Problem solving abilities are securing the employability of the candidates and with a solid academic bildung the ability to solve problems is more likely to happen. Therefore there is no opposition between academic bildung and the ability to apply knowledge, solve problems and consequently secure employability. In the following I will first look at traditional teacher centered, lecture based teaching. Then I will make an excousus and present a hermeneutic alternative to the lecture based models. This alternative is able to show us why PBL is able to secure both employability and academic buildung. Finally I will analyse the problem of problem. The concept of “problem” is central to PBL, of course, and equally central to problem solving and it seems that it can take on different meanings in the PBL context.

## Teacher centred education – employability and bildung

The dichotomy between bildung and employability and the dichotomy between theory and practice, are also pointing to a question of what it means to have learned something. The problem of “having learned something” is often addressed where traditional teacher-centred teaching is under fire, what Freire refers to as the “banking model” (Freire 1970, cap 2). In the banking model of education we reduce what is learned to a reproduction of what the teacher said or what is written in textbooks. If we do that – reduce it to mere reproduction – then new knowledge would have a most difficult pathway into the world and there would be no reason for any PBL model whatsoever, as the teacher and the text book would be deemed to know it all. In the banking model we reduce education to schooling, and we reduce teaching to a question of optimal transfer of the explicit knowledge possessed by the teacher - a mere technical problem.

The banking model of education leaves us with a problem. How do the students apply this knowledge? Returning to our initial problem we could now say that the banking model is able to secure some kind of academic bildung – history has definitely proven that. But when it comes to application of the knowledge gained, it is more doubtful if and how the banking model could secure this application. The application is left to some kind of magical instance in the heads of the students, and therefore it is very difficult to see how the students should be able to use the knowledge gained to solve problems. If application and problem solving is left solely to the student’s own imagination and skilfulness and is not part of any curriculum, then it is foreseeable that employability could be a problem. In the case of PBL and practicum, the internship could be seen as the application of the (scientific) knowledge transferred from teacher and banked by student. The key point being that the teacher’s knowledge is the right knowledge and PBL is simply a matter of mere application. Neither the banking model nor this view of application are acceptable – they are inherently flawed - and an alternative conceptualisation is required if we are to gain a more substantive understanding of PBL and academic bildung and employability.

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## PBL and the hermeneutics of understanding

Hermeneutics offers an alternative to the banking model of teacher centred teaching (Gallagher, 1992). Hermeneutics is concerned with the problem of understanding – what does it mean to understand something? This brings us back to the question raised earlier in this chapter - what and how did the students learn during their studies in a PBL environment? Any learning or understanding builds upon some previous knowledge. Our language in particular, but also all our prior experiences and what we have gained from our upbringing. Gallagher (1992) offers a model of learning based on hermeneutic principles. This understanding of learning includes the elements of tradition, self-transition and production.

## Tradition

"Understanding is to be thought of less as a subjective act than as participating in an event of tradition, a process of transmission in which past and present is constantly mediated” (Gadamer 1992 p. 277).

The knowledge that is a precondition for any learning Gadamer terms “prejudices”. This is to be thought of as pre-knowledge and certainly not to be confused with its meaning in our daily use of language where prejudice has several negative connotations. Prejudices are not subjective in the sense that they are our private constructs; they will always be part of a horizon of meaning within which the knowledge, that is to be learned, makes sense. The horizon, that the prejudice is established within, is part of a tradition. Not tradition as in our ordinary language, where tradition is often viewed as representing something old, perhaps authoritarian or superstitious but certainly something that by all means should be avoided. But in order to establish an understanding of texts, of social phenomena or of understanding itself, it is necessary to rehabilitate the tradition (Gadamer, 1992, p. 277).

The German word “überlieferung” is actually better than the English translation “tradition”. Überlieferung means that something is handed over or passed on from one generation to the next. Tradition represents knowledge and an authority that is able to help us understand, by acting as the prejudices that are a prerequisite for any understanding. In this sense engineering is a tradition and engineering students are introduced to this tradition through education. Tradition represents knowledge – e.g. engineering knowledge - and is affiliated to the authority of knowledge in a particular field - without necessarily acting authoritarian. Authority here is to be viewed in a positive sense. The tradition is a possibility for the gebilded academic to know what it takes to *be* a gebilded academic - through dialogue with tradition, it will be possible to develop the tradition and the knowledge that it represents. In this sense tradition is essential and the process through which the students acquire this knowledge is exactly *Bildung*. Bildung is the German word for education and is every bit as untranslatable as *Überlieferung*. Bildung signifies the process and the result of the process of education and the students will be “Gebildet”, when they have finished their education (Henriksen, 2006). With this we also have a conception of academic bildung. Academic bildung can now be described as the knowledge of the tradition, knowledge that is handed down through the process of learning.

With this we can see that the banking model might be very good at transferring the tradition, but if the students are not allowed to enter into a dialogue with the tradition – discuss it, use it and further develop it. Teacher centred teaching and reproduction of the tradition is not enough, but would only lead to a repetition of some prior knowledge and this is not a way to hand down a living tradition.

## Self-transcendence

Horizon is the individual starting point, but fortunately we are able to let our horizons meet other horizons. Thereby we are able to understand each other, understand texts, understand traditions and thereby learn something. Through a description of other horizons, both understanding and learning become possible. This allows understanding and learning to be described as a fusion of horizons (Gadamer, 1992).

The teacher centred model is also a tradition that seeks to teach the content of traditions, but in most cases in a way where only the teacher, and not the students, is active. The important thing here, however, is students’ active participation in the fusion of horizons and in the event of tradition. That is, the student should actively acquire the knowledge that is the tradition; and this cannot be transferred to a passive student. It is also important because traditions, in order to be kept alive, should be challenged and questioned by those who participate in the tradition. Only in this way can the tradition renew itself and be able to hand over or pass on (Überlieferung) meaningful knowledge. Active participation is therefore essential when one adopts a hermeneutic slant on education. Through the fusion of horizons and by active participation in the event of tradition the student transcends his or her own self – and he or she is changed in the process. One’s horizon is broadened and one gradually over time and active participation acquires the knowledge of a tradition and thereby one is able to not only question one’s own prejudices but change them as well.

## Production

Being changed, being part of a tradition and having expanded one’s horizons is to have learned something. But to fully understand the knowledge of the tradition, knowledge has to be applied. But the knowledge of the tradition is a general knowledge and that general knowledge has to be applied to a specific situation. The students’ knowledge gained through their studies at the university has to be applied to a specific problem in a specific situation. When they are able to do that, and they have demonstrated that, then we can say that they have learned something. As Gadamer put it - Alles rechte Verstehen ist Anwendung – ‘all true understanding is application’ (Gadamer, 1992). When the students are able to apply general knowledge to a specific situation, then we can see that a new situation requires the production of new knowledge. Therefore, having academic bildung is also being able to apply knowledge to new and specific situations and is to be able to produce new knowledge specially suited to the situation and to the specific problem. Production then is not necessarily the production of a physical product, but the production of new knowledge. This is what having learned something means: to be able to produce new knowledge linked to a specific situation on the basis of a tradition.

## Gadamer’s analysis of phronesis - Ethics and judgement of a situation

In *Truth and Method* Gadamer (1992) confronts the problem of how to apply general knowledge to a specific situation. In Gadamer’s analysis of understanding this is shown through an analysis of Aristotle’s concept of phronesis (Gadamer 1992, pp. 312). Phronesis is for Aristotle one of three types of knowledge each of which describes various aspects of human life. The three ways of knowing are phronesis, techne and episteme.

Episteme describes a form of knowledge, which is universal and independent of time and space. The classic example is mathematics. Episteme could also refer to the knowledge of the natural sciences, seeking universal laws of nature. Techne is knowledge of arts and crafts. This is the knowledge of what products one want to produce and also the ability to produce them. This knowledge is dependent on the situation and the people and things, objects or artefacts involved in the production. Phronesis is a social and ethical knowledge that is needed in order for people to be able to commit themselves to other people, to get on with other people, and to succeed and function appropriately in a social context.

As we noted above, the interpretation of tradition forms a central part in the process of understanding and learning. The question is then, how can we apply universal principles to a specific situation and thereby produce the knowledge necessary? This problem is the same as when we want to apply general ethical principles - phronesis: How can we apply universal moral principles to a particular situation? Through an analysis of the concept of phronesis Gadamer seeks to apply the same principles to the interpretation of tradition, because both phronesis and understanding address the problem of relating the universal (principles) to the particular (the situation).

Gadamer begins his analysis of phronesis by asking whether there is a particular philosophical understanding of morality, (the moral being of man) and the role of knowledge for moral issues (Gadamer 1992 p. 313). For Aristotle moral knowledge is of a different nature than, for example, knowledge of physics. Physics is governed by natural laws, but ethics can be described as instructions and rules and is therefore subject to change and influence through history and over time. The question now is whether phronesis is similar to techne or whether it resembles episteme. Phronesis cannot be epistemic knowledge, as phronesis is not knowledge of an object. A situation where a person wants to find out what is the right thing to do is not objective. Situation and person are not independent, since such a situation requires knowledge (phronesis), action and commitment. Therefore, phronesis cannot be epistemic, because this kind of knowledge involves application; universal knowledge, for example mathematics, cannot guide people in a dynamically changing world.

"What Gadamer suggests through Aristotle, by contrast is that history is productive of real knowledge that is applicable because it differs and that it differs because it is applied. (Weinsheimer, 1985) ".

Therefore, phronesis is more like techne than episteme, since both techne and phronesis are applied knowledge. Both are similar to the kind of knowledge a craftsman uses to produce a given product. He has a general idea of what he wants to do, maintain, fix or make, what purpose it will serve, who will make use of it, and so on. Besides this general knowledge, he has a practical knowledge of materials, tools, processes and so on. All this knowledge was handed to him through tradition, through experience and through formal training as an apprentice. This is another form of learning because it is different from the teachings of the banking model and is specifically directed towards application. Someone who already possesses this knowledge, a master, and is a knowledge, which can be used immediately, teaches it. Phronesis knowledge resembles this kind of craft knowledge.

In a situation where ethical knowledge is required a person has a general idea of what is right and wrong and this is acquired through bildung, through tradition. It is learned at an early age, before common sense can guide the child’s actions, and it allows the general idea to serve as a prejudice; ethical knowledge cannot exist without prejudices. This general idea of knowing the right is insufficient as it also requires action and engagement in any particular situation, and when situations change it is not enough to determine what should be done in advance because the right thing to do is codetermined by the situation and demands judgement.

From this discussion we see that there are similarities between phronesis and techne - there are, however, also some differences. Man is not a material that can be changed similar to whatever material the craftsman works on. Craftsmanship can be learned and forgotten again, but not ethical knowledge. When right and wrong are learned, they are not forgotten. Techne can be described as a means to an end, but phronesis is much more than the means to achieve a goal. Phronesis is also about friendship, forgiveness, sense of community, and much more which is intensely social and human.

Gadamer concludes that his analysis of phronesis can serve as a model for hermeneutic understanding. This hermeneutic understanding refers not only to addressing the question of the tension between the general and specific; it is also a matter of application (Anwendung, anvendelse). Just as with phronesis, understanding is neither something that happens occasionally or by coincidence, but understanding and learning are from the very start a much more comprehensive and complex process – one based on tradition, prejudices and active participation of the actors involved.

From the discussion thus far on Gadamer’s hermeneutics we can see that the experiences the students get through a PBL arrangement where they work on problems, is very similar to the learning process or form of knowledge that Gadamer and Aristotle refer to as techne. Acquiring techne demands some form of apprenticeship wherein the apprentice becomes acquainted with the traditions of the craft in question. Learning a craft produces useful and applicable knowledge. It is about being able to analyse a specific problem situation and then find the right tools, remedies and knowledge to address and solve such problems. But it is even more than that, because there is more than techne to the university education. If it was only techne then it would run the risk of only being training to specific jobs – the academic bildung would be missing. This learning also involved knowledge of right and wrong within the tradition in question. Being “Gebilded” is about knowing the do’s and don’ts of the trade – it is about ethics. Further it is also about phronesis, that is, how to have academic bildung, how to behave as a qualified academic, and how to enact and learn to live one’s identity as an academic.

Comparing all this to the banking model demonstrates in no uncertain terms that when it comes to the learning processes of PBL, hermeneutics offers us a much more comprehensive body of knowledge with which to address the learning processes involved. If PBL only involved applying epistemic classroom and textbook knowledge, then there would be no reason for including a practicum component in any university programme. Why bother with all the hassle if the classroom model suffices? But as we can see from Gadamer’s analysis, applying knowledge is a much more complex and interesting process. If we want to be able to more adequately understand what PBL is and how students learn and do within such arrangements, then we also need to consider phronesis, bildung, tradition and students’ abilities to analyse a situation and produce relevant knowledge.

**Problems and problems solving**

In the description above of the hermeneutic understanding of application, we see that to know is not enough. The qualified university graduate also has to be able to ethically choose and apply the right kind of knowledge and produce the new knowledge necessary in the situation required. This is application of knowledge, production of knowledge and this is also what makes the distinction between employability and academic bildung obsolete. If the qualified academic is “gebilded” in this way and is able to produce and apply new knowledge then chances of being employed are far greater. Thus far I have equalled employability with problem solving and the ability to apply knowledge. In this last section I will take this further and show how problems and problem solving are essential for the application of knowledge and for employability and how this is learned through PBL and practicum arrangements.

Problems are necessary in a PBL context as it is the problems that are the starting point and guidelines for the whole learning process. A problem takes on a specific meaning here. Problems are not, as in our everyday language understood as something that should be avoided. In a PBL setting problems should be understood as an interesting challenge that it is worthwhile to take on. And dealing with problems in the world outside the university offers excellent opportunities for finding interesting challenges – problems – that can initiate the learning process.

Praxis, practicum, internship and relations to the world outside the schools and universities as pedagogical devices are nothing new; Dewey, Freire, Lave and Wenger, Kolb and others have stressed the importance of combining classroom teaching with some kind of praxis, internship or doing/acting in general. These protagonists of ‘praxis as pedagogical device’ are often, rightly, attacking traditional classroom teaching for its shortcomings and promoting PBL as a better alternative or as a necessary complement. No matter what the intention, the practicum elements are introduced so the students can learn how to apply what is learned. As said, application could also be seen as problem solving. If the students were able to solve problems with the help of the theories and methods learned at the university, then they would be able to apply the knowledge learned. So in the following I will analyse the concept of problem, as it is important to the discussion of PBL and PBL’s ability to secure both academic bildung and employability. As we saw above traditional teacher centred, lecture based teaching has no remedy for application and could therefore cause problems for problem solving and consequently employability.

The question is now; what is a problem? Or what would be a problem in PBL learning context? And how would that problem secure both bildung and employability simultainously? Following Nørreklit (1991), Nørreklit (1978, 1987) (See also Henriksen et.al. 2004) several problems exist. Nørreklit deals with theoretical problems, practical problems and real problems.

At universities a very common approach to research and teaching is *theoretical problems*. Here the researcher (and the students) will start his or her project by outlining the theoretical state of the art within his or her field. This theory is then confronted with some facts from real life. This is often called empirical findings or data. Theory and findings are compared and in most cases some discrepancies are found. For most researchers this poses a theoretical problem and the way out is theoretical refinement or in some rare cases theory development.

This conception of problems is not sufficient for the kind of PBL I am looking for. Theoretical problems are characterised by their splendid isolation in the ivory tower and even if it might lead to some theoretical refinement, and some interesting discussions at the university, it is still reproduction of epistemic knowledge and not neccesarily something that is able to solve real life problems. It is still not securing the application of the knowledge learned and it is not giving the students the problem solving skills that secures employability. They might secure some academic bildung, but problem solving is still left to the students own imagination.

It is often said that instead of just fumbling with theory one should confront practical problems as they are found outside the university – the study programmes and the curricula are too theoretical. This is *practical problems*. Practical problems are given in advance. They are just there and ready to be solved. The problem solving process is just a matter of finding the right tools for solving them. This could be a new IT tool, a theory, a new organisation development programme just waiting to be used. A practical problem is linked to everyday operations.

For PBL and practicum this would cause problems for the academic bildung. If learning is only about applying known knowledge, it could be rather instrumentalist in the sense that what is learned is only learned in order to be applied. This could be learning “to do” without a proper understanding of what lies behind “the doing”, a kind of training of “a skill to the job”. This could be student’s learning how to operate a specific soft ware tool, without learning the principles that lay behind soft ware tools in general. Application is certainly important but what about the academic bildung in such a case? If students were only trained to perform specific tasks, then they would not necessarily be able to understand what they are doing. Consequently the learning is superficial and not in accordance with the aims of the university.

But problems are not only theoretical or practical, there is also what Nørreklit calls *real problems*. Real problems are problems that call for proper analyses as we do not know what to do about them. There is no tool or theory that is able to frame the problem and we do not know what to do as we do not possess the language nessecary to even talk about them. Before we can do that, we need to make a proper problem analysis and a workable problem statement. In this way problems are part of a process, where the problem is constantly re-formulated or conceptualised. One of the most challenging things for students in a PBL setting is the problem statement. In PBL projects the point of departure could be a problem experienced in the world outside the university, a practical problem. It could be problems due to global warming, a problem in a production company, problems of any kind where the subject studied could be able to say anything meaningfull about the problem (accountants do accounting, lawyers solve law problems, engineers solve engineering problems etc.).

In order to solve these problems the students will start out with the knowledge they already have - the tradition thay have been introduced to. They will seek new knowledge and try to (re)formulate the problem and always try to relate the new conceptualisation to the symtom that will make it a real problem. Finding and formulating a real problem therefore is a continuos process of conceptualising different symptoms into real problems. This process of conceptualising real problems could look like this:

The process will start out with a symptom of something being wrong (a practical problem), with a new opportunity for development or some other vague notion of threats or opportunities. This could then lead to a fact-finding mission and conceptualisation process. Here the students will find information about the practical problems and they will negotiate a problem statement linking the different symptoms and simultaneously creating a language that will describe the real problem and its related purpose, its goals, resources and methods.

The problem and its conceptualisation are constantly connected to — compared to — the real world not to an ivory tower or to some hypothesised expectations - theories. Even if theories play an important part in this as theories can be very useful in the conceptualisation process. Therefore the process will hopefully not loose track of the problems and symptoms it was intended to solve. If this should happen — it sometimes does — the next fact finding mission makes sure that the conceptualisation process is brought back on track.

Back on track means constantly addressing the symptoms that initiated the process in the first place. Addressing means trying to go beyond the symptoms, so this point is another fact-finding mission.

And the next point is then another round of conceptualisation. This circular process is in principle endless, but most conceptualisation projects will eventually find its end. The symptoms have disappeared. The initial problem has found a satisfying solution.

Through such a process the students are learning to analyse a problem, how to make a proper problem statemennt, how to find methods and theories, and finnally use theories and methods to analyse and solve the problem.

The question is now, what kind of learning that is the result of the process and how the learning process will secure both acdemic bildung and employability.

First of all it is important to stress the student’s responsibility for the success of the process. The students are put in the driver’s seat – this is no longer teacher centred teaching, but student centred learning. This is important as this is also motivating the students and the problem orientation increases the likelihood of a learning process which is far more relevant and interesting.

The problem orientation also has another effect on the learning process and therefore also on the students. While the banking model is very much concerned with the reproduction of existing theory, the PBL model will put a much stronger emphasis on method. Theories are still important, even indispensable, but theories and methods are tool for problem solving and thereby means to an end. They are not “ends” in themselves that should be reproduced for the sake of reproduction and disciplining. Therefore discussions of methods and science theory becomes important to the students, because if they have to be able to discuss, evaluate and choose theories and methods relevant to the problems in question, they have to be able to engage in such discussions in a qualified manner.

Finally the PBL models secure the disciplin nessecary in the learning process. But they do so in a different manner compared to the banking model. In the banking model the disciplin is secured through the teacher and through centuries teachers have developed an arsenal of disciplining devises – threads, violence etc. are all well known. In a PBL setting this is different. Groupwork and working together with people outside the university put pressure on the sudents. It involves certain obligations in the form of deadlines, promisses etc. And these promisess and obligtions make the students work hard in order to satisfy all involved in the project.

**Conclusions**

“Alles Rechtes Verstehen ist Anwendung”. If so, application should be part of any university education, study programme or curriculum. Without application students would never get to the point where they really understand their field of study. It should be clear by now that the problem solving skills learned through PBL are usefull in terms of employability, but equally inportant for academic bildung. The ability to learn teories and methods and the ability to understand and use theories and methods are far greater when application is part of the university curriculum. This is not to say that problem and practice based learning curricula are without problems and would solve all the universities’ problems once and for all, but the chances of securing both employability and academic bildung are far grater when practice, problem solving and application is part of the curricula.

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