

Transversal knowledge formations in Professional Bachelor Education employing Problem Based Learning (PBL)

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ABSTRACT

This paper describes the principles underlying how various knowledge areas blend into transversal formations in two educational contexts employing PBL. Such ‘transversality’ has often been referred to as inter- cross- or trans-disciplinarity. However, these terms are ambiguous, especially in relation to Problem Based Learning. There is a growing need for stronger language to express underlying principles of knowledge formations and the constitution of such. The term transversality suggests that knowledge formations are not based on a relationship between strong independent disciplines, but rather on a number of subject areas that are combined during students’ PBL-studies. As such, the curriculum organized knowledge, as well as students’ reflections of various types at the level of teaching and learning, constitute certain ‘modalities’ of transversal knowledge formations. Two institutional case studies - Nursing and the Constructing Architect education - have been researched, compared and contrasted in order to demonstrate how institutional practices demonstrate different modalities of transversal knowledge in their PBL-courses. For the purpose of this paper Nursing Education will be abbreviated as NE and Constructing Architect as CAE.

RESEARCH BACKGROUND AND EMPIRICAL CONTEXT

The empirical field for my research is a separate sector of higher education in Denmark called “Professional Bachelor Education”, with degree programs lasting 3½ year duration each with their own judicial framework within higher education as well as their own structure within institutions deemed ‘University Colleges’. Examples of such programs include: Teacher, Nurse, Social Work, Social Education, Constructing Architect, and Diploma Engineer. In

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general, these courses of study are neither entirely academic nor vocational, but a combination of both. The concept ‘Professional Bachelor Education’, which covers technical fields such as Diploma Engineers and Constructing Architects, grew out of the increasing demand for ‘technicians’ in the rapidly developing industrial society of the 1950s and 60s. In the early 2000s they became known as ‘Professional Bachelor Education’ as a result of the Bologna process which also raised demands relating to academic skills. However many Professional Bachelor Educations still retain strong links to vocational fields, resulting in growing tension between academic and practical-based orientation during recent years. What is considered as ‘knowledge’ has never been more political and power related. This article highlights the constraints, opportunities and challenges that develop when organizing knowledge in such educational contexts. The actual empirical studies are conducted in two separate institutional contexts in Denmark, Nursing education and Constructing Architect which also represent two very different cultures, but within the same educational sector. Both institutions have agreed to the use of gathered data for Ph.D.-research and publishing on the condition that the institutions and all persons related to them remain anonymous.

TRANSVERSAL KNOWLEDGE – IS IT JUST ANOTHER NEW WORD?

Why use the term ‘transversality’ instead of multi-, inter- or trans-disciplinary? Existing terms suggest various forms of inter-relationships among disciplines (Klein 2010). However, I argue that these terms make no sense if disciplines are not also included in a curriculum. My analysis shows that in each of the two institutional cases ‘disciplines’ no longer exist as fields of knowledge distinct from each other.

Over recent years ‘disciplinarity’, understood to be the preservation of the traditional independence of subject disciplines... has been a hot issue in the Danish educational debate, with increasing criticism of “soft” pedagogies, for example, project work and problem/case based study work. It has been argued that such pedagogies do not facilitate learners in acquiring disciplinary understanding. The closest related term to ‘disciplinarity’ in Danish is ‘faglighed,’ a term which has different meanings arising from at least two different semantic fields (Krogh 2005). It can refer to the skills, norms, and attitudes one needs to possess in order to perform in a certain profession, but it can also refer to educational disciplines/subjects and the acquiring of such within the educational system (Fink 2003) (Jensen 2007). It is often unclear whether reference is made to one or the other field, which is why it can be argued that these ‘disciplinarity-terms’ poorly characterize educational knowledge formations in PBL-pedagogies. My argument is inspired by the work of S. Stavrou who related the term ‘transversality’ to changing processes in higher education (Stavrou 2011). I use the same term to refer to similar change processes, which I will describe in further detail in this article.

THEORY AND METHODOLOGY

I have taken a sociological and discursive perspective to carry out curriculum analysis with my main inspiration coming from B. Bernstein and N. Fairclough. I combine their two approaches in order to examine the current understanding of knowledge and the transformation of such knowledge at different levels in the educational system. Combining Fairclough's and Bernstein's methods allows us to examine discursive formations properly in the field of professional bachelor education (Fairclough 2002).

Fairclough offers socio-linguistic tools to draw up discourses of "what counts as knowledge and learning," while Bernstein's theoretical framework provides the means of analyzing transformative processes of knowledge from outside academia into curricular and pedagogical practice. Bernstein's work has often been used to analyse power relations in organizing and structuring knowledge in curriculum. In my work I also apply recent developments within the Bernsteinian tradition by applying the Legitimation code theory (LCT) of Karl Maton. Fig. 1 shows an analytical model for dividing up transmission fields (Maton 2012 – forthcoming)¹.

A key concept in transformation processes of knowledge is Bernstein's term of 'recontextualization', which emphasizes that a discipline within education is different from its origin outside academia (Bernstein 2001).

On its way from its primary production field into academia knowledge is 'pedagogized' so it becomes suited to learning. This is done through various recontextualization processes at various levels (Maton 2013, forthcoming) where all 'educationalist' involved... planners lecturers etc., select and organize knowledge for the curriculum and for reproduction in pedagogical interaction. Together with this term of recontextualization Maton's specialization codes for 'epistemic relation' ER and 'social relation' SR within knowledge fields are used to examine historical changes in the way knowledge is transformed from outside to within academia (Bernstein 2000s. 28-39). These concepts and codes – which will be further developed later - demonstrate how disciplinary content and boundaries between disciplines have gradually 'blurred' over a period of decades, and that power and control over the disciplinary content have been decentralized to lower recontextualization levels (Fig. 3), which eventually gave rise to new pedagogical approaches such as PBL.

The analytical approach therefore also gives an understanding of the contemporary organization of knowledge within the curriculum, as a more or less fragmented formation of disciplines/subjects. Such 'knowledge organization' can be seen as creating a new 'federation'... a term inspired by J. Muller, who related the concept to the term, 'region', previously developed by Bernstein (Muller 2011b)(Muller 2011b) . A 'region' or 'regionalization' meant that individual disciplines are recontextualized into larger units for the

purpose of moving closer to the external interests of the practice field involved. In other words increased market orientation (Bernstein 2000s. 52) (Barnett 1994).

This tendency of ‘regionalization’ has influenced education on a large scale and results from changing political orientations at macro level. Modulising and professionalizing educational programs in higher education is an example of regionalization (Stavrou 2009). Here I use the term ‘federation’ for smaller units where disciplines/subjects are brought together in for example PBL-cases or projects within an educational program. The point is that such ‘federations’, require some kind of inter-disciplinary – or transversal - interaction.

My findings in the two cases show, that PBL has become an important factor in establishing a pedagogical framework around the ‘federations’ of weakened disciplines/subjects for creating transversal knowledge formations. New spaces for the student’s to link and build arguments between the various subjects and theories within the federation of subjects arise. One of my main points considers the basis for PBL in the two educational contexts, and thereby the current conditions for transversal knowledge formations, is established through the historical developments in curriculum. Therefore I also argue that transversal knowledge formations need to be understood as a result of both formal and enacted curriculum. In the Bernsteinian tradition this involves two different types of ‘fields’ shown in the figure below: The ‘field of recontextualisation’ and field of ‘reproduction’ (Bernstein 2000s. 36)(Maton, 2013, forthcoming) Transversal knowledge formations are ‘products’ of both planners/lecturers who recontextualize the knowledge from the fields of production and processes of reproduction, i.e. teaching and learning. Understanding transversal knowledge in PBL means understanding the transformation processes in the two fields.

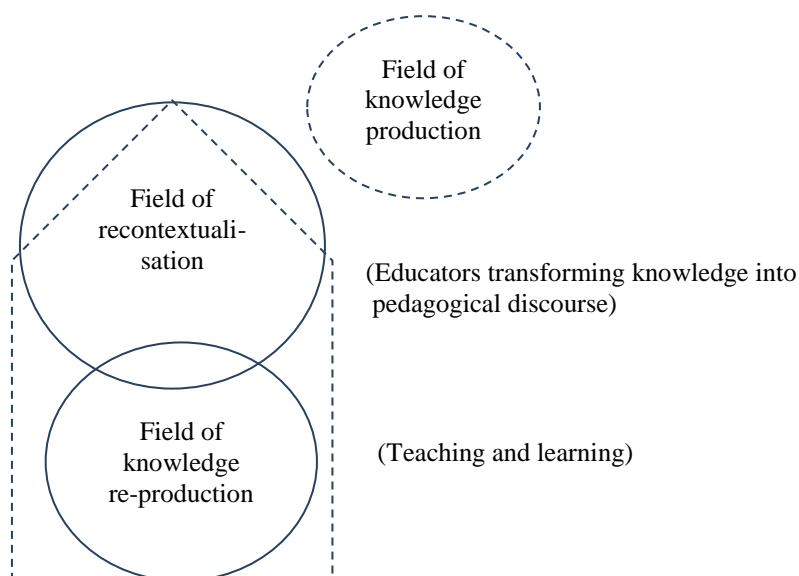


Fig. 1: Fields involved in transversal knowledge formation, inspired by K. Matonⁱⁱ

THE 'RIGHT KIND OF' KNOWLEDGE... WHAT IS IT? – DISCOURSES ABOUT KNOWLEDGE AND LEARNING

The first step in researching knowledge transformation was analyzing curriculum design processes for the two institutional case studies, Nursing and Constructing Architect educations, where focus was on discourses about knowledge and learning in order to identify the forces driving the changes towards the formation of federations. Various levels of documentation; directives, circulars, syllabuses etc., as well as statements from educational planners and lecturers, have been examined in order to identify dominant discourses of “knowledge and learning”. Here I have drawn on N. Fairclough’s theories and analytical tools (Fairclough 2002). His key concept, ‘interdiscursivity,’ expresses ‘discursive formations’ of struggling knowledge discourses where alliances and hegemony can be identified (Foucault 1986 s. 115-117) (Winther Jørgensen, Phillips 2000).

A struggle emerges in the case of nursing education (NE), between two different sets of values concerning knowledge and learning... an academic discourse and a ‘practice’ discourse. Educators at the NE- institution attempt to include both. As one lecturer states:

“Fifty years ago you could say we were the doctor’s ‘right and ‘left’ hand. We did what the doctor told us to and that was it. On ward rounds we were the ‘back row’ holding the soap dish and the towel for the doctor – it was a virtue. This is not what we teach the students today. So from being an assisting discipline – doing what we were told to do – today we are more an independent profession with our own professional field – our own area- and even developing our own theories on their own basis. This gives us something to argue with and act on” (lecturer LK)”

In the other case, CAE, there is more skepticism about theorization and academic thinking. A younger lecturer reflects:

“I think there is a limit.. and this limit is defined by the fact that we are a professional bachelor education. The industry expects that the students we ‘let out’ - in one way or another - are capable of carrying out the work from day one. If you instead come from a traditional university then everyone knows that at least the first year and a half will pass before one has found out what exactly to do. You don’t know “anything at all”, (edit.) about what to use your knowledge for. So I think there is a risk by pushing them too much to the academic world” (lecturer DE 654)

As these quotes indicate, the nursing education has tried to find a balance between orientation towards the academic world and the field of practice, whereas the constructing architect education relates mostly to the practice or ‘craft’ discourse with less emphasis on developing the profession through academic virtues.

TRANSFORMATIONS OF CURRICULUM DISCIPLINES

The next step involved conducting research on changes in the curriculum disciplines especially with regards to the introduction of new reforms. K. Maton's concepts of 'epistemic relation' (ER) and 'social relation' (SR) have been powerful in this analysis. The concepts are a further development of Bernstein's codes of classification and framing and they express structuring principles of knowledge. The main argument here is that every knowledge practice has a 'knowledge structure' and a 'knower structure' but with different strengths expressed by the strength of 'epistemic relation' and 'social relation', ER+/-, SR+/- . Thus a strong 'knowledge code' is annotated, ER+/SR- and a strong 'knower code', ER-/SR+ (Maton 2008). For a knowledge area such as a curriculum discipline 'Epistemic relation', ER, represents the statements, propositions, procedures and techniques that are distinct from the individual knower. 'Social relation, (SR) represents the subjective dispositions specific for each individual knower such as class, gender, personal style, experience, preferences etc. (Maton 2008).

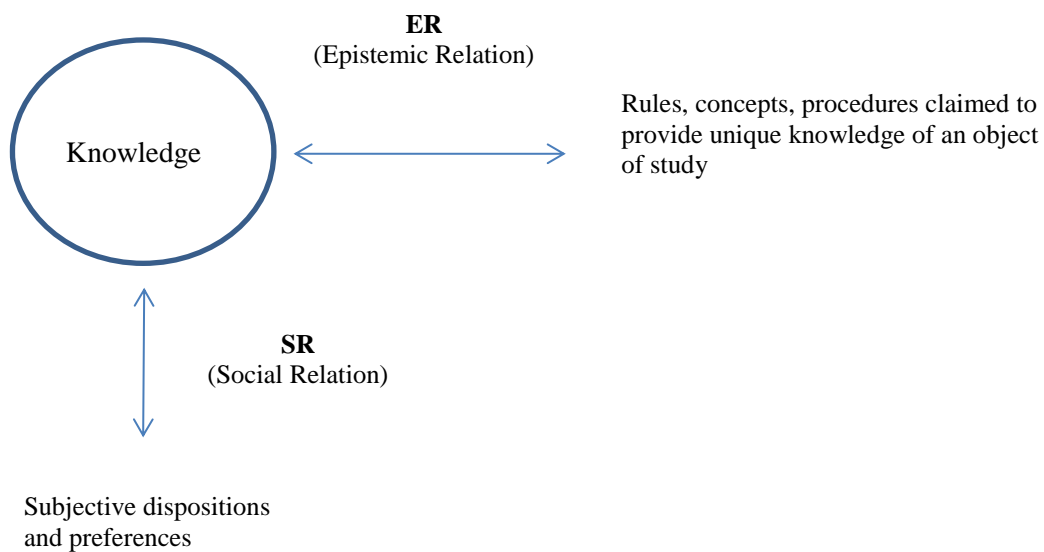


Fig. 2: Epistemic relation and social relation of knowledge (Maton 2000a) – My modification

These concepts can help to understand those changes within curriculums where there has been a shift in the code for the individual disciplines in curriculum from relatively strong to relatively weaker 'epistemic relations' (ER+↓-). At the same time there has been a shift from relatively weak 'social relation' to relatively stronger 'social relation' (SR-↑+).

The research process leading to this statement is based on interviews and document research including directives, syllabuses, study programs etc. over several decades. Changes in 'epistemic relation' (ER) have been examined on the basis of the degree to which content (theories, methods etc.) and assessment criteria within each discipline were made explicit in the documents. Changes in 'social relation' (SR) have been examined on the basis of the degree to which student's preferences, judgments and experiences are allowed for or expected.

This research shows that the content and assessment criterion within each discipline has become less explicit over time. This is particularly evident in CAE. However, these changes must be considered along with the 'displacements' of recontextualization. Some decisions about disciplines previously made at the top level in the educational system (State/Ministry) have gradually been pushed down to the institutional levels (see fig 3). Such displacements are due to modernization processes in the public sector through the 80s and 90s in general. It is what some sociologists have called a double 'counter-movement': Decentralization and centralization (Sørensen 2001).

An important point here is that descriptions of disciplines do not disappear, but are moved to lower recontextualization fields, where planners and lecturers are responsible for specifying content. In CAE the disciplines are only explicitly described in the student's time-table. As a result they still operate in the classrooms, but no longer have their legitimate basis from legislation in terms of the resources previously defined in directives in terms such as teaching units and external exams etc. The 'materiality' of 'single disciplinarity-discourse' has eroded (Neumann 2001).

Fig. 3 illustrates the main changes. Arrows indicate how decisions about the organization of knowledge are pushed down through the recontextualization fields. The contemporary syllabuses describe the learning objectives and knowledge content in general terms. Disciplinary content is today more often termed as 'subjects' or 'themes'. The changes are most significant in CAE.

In NE there remains a division of disciplines, but the boundaries between them are unclear. It is worth noting that NE includes disciplines from both human and science cultures, so there is a difference. Humanity disciplines such as 'Nursing', 'Ethics, Philosophy and Religion' etc.' are less demarcated than the science disciplines: 'Anatomy and physiology' and 'Pharmacology', the latter still being an independent course unit. This corresponds to the insight about knowledge structures developed by Bernstein and expanded upon more recently by K. Maton and J. Muller (Bernstein 2001) (Muller 2011a) (Maton 2011a). They argue that scientific cultures have hierarchical knowledge structures and humanist cultures have horizontal knowledge structures (Maton 2008s. 92).

These curriculum changes have generated higher complexity in the educational system up to a point, where it had to be dealt with... one way or another (Gleerup 1997). Attempting to reinforce ‘epistemic relations’ in the disciplines, could well be an attempt to return to the past, but this is probably not possible. Other countermoves need to be made. The question then becomes: How can a weak ‘knowledge code’ for each discipline be met? Problem Based Learning (PBL) seems to have emerged as one of the answers, not “redeeming” each discipline, but by legitimizing the strong ‘knower code’ (ER-/SR+) , as PBL-pedagogical aims to emphasize student involvement and more active engagement in what and how to learn. In the CAE-case PBL was introduced in the late 1990s and in the NE-case about 2008.


		From approx. 1960 – 2012				
		Period 1	Period 2	Period 3	Period 4	Period 5
Recontextualization fields	State/Ministry	 Code change for single disciplines: ER+/SR- towards ER-/SR+				
	Institutional Curriculum planning				↓	↓
	Teams and Individual lecturers				↓	↓

Fig. 3: Diagram for analyzing curriculum changes in the two cases

Notes: The period division marks new reforms. Vertically the various levels in recontextualization are shown

To stress the overall point: Over the years there has been a change in curriculum from a collection of separate and relatively clearly defined disciplines, towards an integration of subjects (Bernstein 1971) where each discipline tends to loose explicit specifications of objects and content. The weakening of the ‘knowledge code’ (ER+/SR-) for each discipline should be “compensated” for and it seems this has been done by strengthening the ‘knower code’ (ER-/SR+) through greater student involvement boosted by PBL-pedagogy, where it is up to the students to combine the more fragmented knowledge pieces together in this more open pedagogical approach. Students are encouraged to actively try to establish links between the disciplines with greater emphasis on subjective dispositions (SR+). PBL in professional education in DK has proved to be a strong concept of learning, but it has also been challenged by criticism of being unclear about the “disciplinary quality”. My analysis show that such

quality can no longer be found in each of the disciplines, but must be found in the way that students transverse them when they actively engage in PBL-work.

PBL AS PART OF A REGIONALIZATION PROCESS - GATHERING THE REMAINS OF THE SUBJECTS IN 'FEDERATIONS'

In NE and CAE, PBL is used in two very different ways and each institution has their own motives for implementing this pedagogical concept. However, for both institutions PBL functions as a response to the changes outlined in the previous section. PBL is a new 'frame' that is being used to tackle the 'didactical uncertainties' following the curriculum changes. PBL tackles this difficult task with very different results in each of the two cases. The following illustration simplifies the main movements in the curriculum history as a regionalization towards 'federal' constellations. It is important to note that the three movements (in fig 4.) must not be understood as causal relationships, rather as main processes in a complex curriculum history.

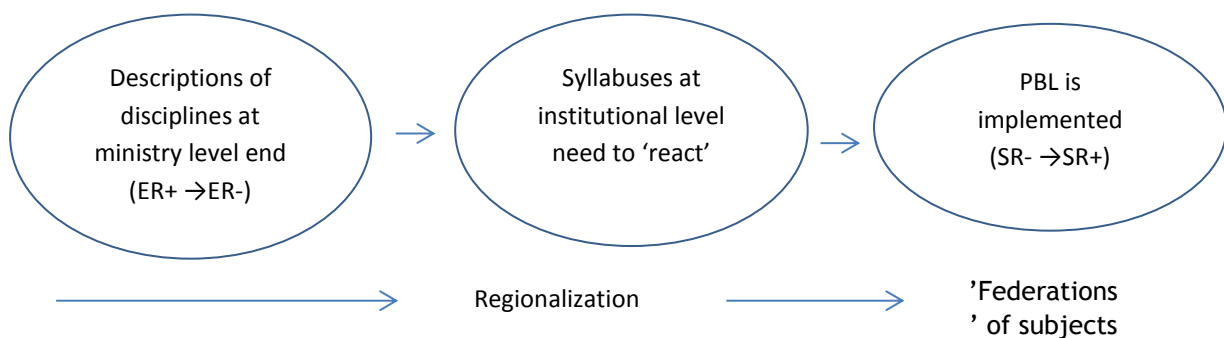


Fig. 4: Curriculum change processes

I will not go further into all of the principles of PBL here, only emphasize that 'problem-orientation' assigns another function to the curriculum disciplines. The students need to learn from the disciplines what is relevant to solve or interpret the problem in the PBL-program. They need to apply knowledge. The student's considerations of applicability and relevance of the disciplines within the 'federation' are therefore equally, if not more, important. The two institutional cases are exceptional examples of how knowledge organization is no longer represented by single disciplines with explicit specifications of content and assessment criteria. In that sense 'disciplinarity' "has gone". The PBL-programs are new federations of subjects. As the term inter-disciplinarity depends on single disciplinarity, it does not make sense to use it in this context. Transversality is a more accurate term, which has previously been used in higher education research to describe similar processes (Stavrou 2011, Stavrou 2009). As Bernstein argues, regionalization can be both orientated to the intellectual fields

and the practice fields. If the selection of content, study methods etc. is driven by the academic way of thinking it can be termed 'introjection' (Bernstein 1996)(Sarakinoti, Tsatsaroni & Stamelos 2011). If instead the orientation is related to the values of the fields of practice (market) it is termed 'projection'. The two cases exhibit quite different orientations, as will be discussed further in the following sections.

PBL IN CONSTRUCTING ARCHITECT EDUCATION (CAE): "A TIGHT FEDERATION"

PBL as project work

Here the PBL idea is linked to project-work. Each project runs for a semester (½ year) and is carried out in groups of 3-4 students. The projects relate to technical building design and have a new theme each semester. Projects are introduced by a brief case description about client demands and site conditions etc. The project work is the main curriculum unit which all other activities relate to. Teachers both lecture and supervise in the same room where students work on projects.

Curriculum modalities

With regards to 'epistemic relation' (ER) in each discipline, the curriculum analysis shows a considerable weakening during the period 1967 - 2012. Syllabuses contain increasingly fewer descriptions of content and assessment criteria for each discipline/subject. Rather, the clarification of course content and assessment criteria is done in cooperation among lecturers and through each lecturer's preparation of course lectures.

A curriculum based on single disciplines can therefore not be sustainable. As I have argued, countermoves must be made. One way to act is to implement more open pedagogies such as PBL, which can cope with this. The "old disciplines" are now recontextualised into a 'federation', where content can legitimately be selected for the purpose of the PBL-work, and elements can be left out if they do not have strong enough relation hereto. Legitimizing knowledge now depends more on the involvement of students, their norms, experiences and choices etc. (Maton 2000b), and also how they transverse the subjects in the federation. This federation has then gained more strength in social relation (SR+) and justified the 'knower code' through PBL-pedagogy, as this claims to promote learning which is more suited to the external world.

CAE forms its educational identity strongly through orientation towards the field of practice. Bernstein refers to this as 'projection' (P). The project work is literally close projections of the way students would carry out projects in working life. On the other hand, in the CAE there is, and has always been, a weak orientation towards the intellectual field, correspondingly termed as 'introjection' (I). There is little interest in developing academic knowledge. Focus is put on the practical application of theories (Sarakinoti, Tsatsaroni &

Stamelos 2011). Consequently, the changing modalityⁱⁱⁱ of this new federation can be summed up as:

Change specialization codes (single disciplines):	From: ER+/SR-	to: ER-/SR+
Orientation: Introjection/projection:	From: I-/P+	to: I-↓/P+↑

Arrows up and down indicate strengthening respectively weakening. As it can be seen, increasing orientation towards practice (P+↑) does not seem to be contradictory to stronger ‘knower code’.

Criticism has been raised to the loss of “epistemic strength” in PBL-work with such strong projection interests. It has been claimed that the knowledge is locked into a specific context and thus not being ‘problem portable’ (Moore 2011). I will not go further into this discussion here, but in this case it does not seem to be a problem, at least not for the employers of Constructing Architects in the external world.

Transversal knowledge formations in PBL-projects (CAE)

This curriculum modality will then be further transformed in reproduction where the challenge is to make transversal connections between the knowledge fragments. This research is still in progress, but I will highlight some main characteristics of the transversal formations. Here, CAE shows interesting features. During the preparation of teaching, lecturers coordinate lessons from various subjects (Statics, Building Services, Building Design etc.) so that the lessons fit well with the student’s project work. Lecturers put the knowledge pieces into position, close aligned, while at the same time leaving ‘room’ for students to put the pieces together. This could in some ways indicate that lecturers take stronger control over content and communication than the above modality has first indicated. However, interviews and classroom analysis shows a more differentiated picture. In the process of acquiring/reproducing knowledge, there is room for student’s reasoning and reflections.

The subjects in CAE share common roots in the sciences, mainly physics and chemistry. As pointed out earlier, science is characterized through a hierarchical knowledge structure (Bernstein 1996). This means that most subjects in the federation can easily integrate in a common language. This is not the case with Nursing Education, which is partially rooted in human knowledge areas. In these areas there is a segmented structure where theories have their own special perspectives and languages.

In CAE the subjects like Statics, ‘Building Services’ and Building design “speak to one another”. Theories and methods can be connected across and almost synthesized without deeper reflection about their relevance, and it is up to the students to put the pieces of the ‘jigsaw puzzle’ together (Fig. 6). But to do so requires understanding of the relationship

between theory and empirical representations. This is crucial for the students in order to link or put together the different pieces of the puzzle from the subjects involved.

Although problem orientation is supposed to be the main principle in the PBL-project work, the problems are not ill-structured. The PBL-project work is about making a product... design a well-functioning building. Thus the task is not to identify what theories to use, but how to apply known theories to the actual type of building, that has to be designed. The students need to acquire factual and procedural knowledge from the subjects and implement it to the actual context.

In developing systemic learning theory from works of G. Bateson L. Qvortrup has termed this as 'first and second order knowledge'. Another theorist, M. Hermansen, conceptualizes it as 'learning levels' which refers to what is reflected in the process (Bateson 1964)(Hermansen 2005)(Qvortrup 2004).

However, applying all the possible theories, methods and techniques from the subjects would cause work overload for the students, so they need to select. This answers the question of what characterizes the strengthening of 'social relation', (SR)? Legitimate knowledge in these projects is not produced purely by mastering methods, procedures and techniques. The project work involves a biographic component. Students define their learning priorities based on what will be beneficial to their study or career perspective. The students justify their choices in a portfolio.

"So I may write in my portfolio, that I will work more with 'statics' in advance of 'technical installations', but I cannot exclude this entirely. The most important things should be there – for the authorities etc. but I can focus more on one thing than another. In that way you direct yourself through the study how much weight to put on this and that and in what area to specialize"

(student 3. semester 1 269)

It would appear from the above quote that these considerations cannot be purely personal or biographically orientated, because the student must be able to justify the choice 'technically' or "professionally" to some extent... "the most important things should be there". However, reflection on a higher level about the relevance of theories/methods used to analyze empirical problems is not stimulated in this PBL-model, because the 'problem' is not embedded in an ill-structured societal context. "Building a house in reality" requires building a model of a house as an independent technical reality.

In a sense, connecting various theories and models from the 'federation' of subject "completes" the recontextualization processes, where the students alone are in command of producing the 'theory' of house design. The knowledge gathered from specialized fields is

closely aligned by planners and lecturers, but ultimately it is the students who finally connect them through their learning process. Two types of reflection are dominant: one about the application of theories, and the other about subjective meaning within a career perspective.

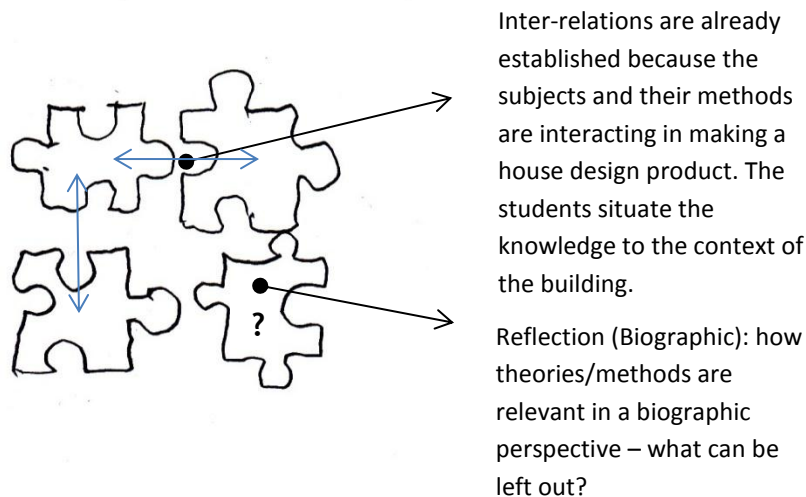


Fig. 5: A 'tight' federation in project work (CAE)

Notes: The "puzzle pieces" represent knowledge from various subjects that have to be integrated to produce a final independent product, i.e. an 'integrated' design project

PBL IN NURSING EDUCATION (NE): "A LOOSE FEDERATION"

PBL as case story

A typical PBL-unit in NE lasts for a few weeks. This unit is then followed by a new and similar one. The PBL-units involve a cluster of disciplines/subjects with 'Nursing Care' being the central discipline. Humanist subjects such as 'Ethics', 'Philosophy and Religion' and so on, are 'supplementary' subjects. In addition, science subjects such as 'Anatomy and physiology' are also included. Each PBL-unit is introduced by the lecturers. They present a study plan and a case story about a patient. Groups of students then work with the recommended texts and receive lessons in the various subject areas. The case work finishes with an oral presentation for the tutor/ lecturer.

Curriculum modalities

Explanation of learning goals and assessment criteria are currently aimed at the federation of subjects rather than at any single subject. As in the case of CAE, the 'knowledge code' for each discipline has gradually become weaker, but it is worth noticing that the science disciplines have kept their epistemic strength through the analyzed period. Today there are

still explicit learning goals and assessment criteria, although they are only found in study plans at lower recontextualization levels.

Although NE's orientation towards the academic field has increased, it still includes both introjection (I+) and projection interests (P+). The following quotes stress this:

“You might say that it is simply stated in the directives; fundamentally ‘Nursing’ has two legs: one is orientated to the profession and the other to academic training. It says (directives ed.) that we are supposed to give them that because a bachelor in nursing should have access to academic studies” (lecturer LK 1 171)

(Lecturer KN in another interview about PBL):

“It has to do with the professional basis, because in problem based learning you work with problems. And this corresponds well to the understandings of the Nursing profession. We have lots of nursing-problems to examine and to solve and at the same time – when you think ‘problem based’ – you reach out for the practical field, get hold of specific authentic cases and by that you can link theory and practice together in a way that we could not before” (1 367)

As in CAE the weakened ‘epistemic relation’ (ER-) in NE requires countermove. Similarly this also comes from strengthening ‘social relation’ (SR+). Students are required to discuss various theories in relation to the case story, thereby challenging their own norms, feelings and experiences. The changing modality can be summed up as:

Change specialization codes:

for humanist areas:	From: ER+/SR-	to: ER-/SR+
for science areas:	From: ER+/SR-	to: ER+/SR-↑
Orientation: Introjection/projection:	From: I-/P+	to: I+/P+

Transversal knowledge formations in PBL-cases (NE)

As in the CAE-case this modality is also transformed in the reproduction processes of PBL-case work. As previously stated, humanist subjects have a more segmented structure as science disciplines. This means that the theories chosen by the team of lecturers often have alternative views to the same problem and the theories do not necessarily “speak together”. Furthermore, theories in the nursing field are less instructive and more interpretive. As a consequence, the federation of subjects in NE is more loosely associated than in CAE.

In a PBL case the relationship between theory and empirical representations are of a different nature than in the design projects in CAE. The problem must be subdivided and interpreted: Not only in how theory X can explain problem P1, in the case must be taken into

consideration, but also in how theory X differs from theory Y in explaining P1. Thus, the pedagogical discourse opens for reflections at various levels. However, a ‘biographic reflection’ as in CAE does not seem to have any significant place in the student’s work with the PBL case stories. The following sequence is from a PBL-group’s meeting with their tutor (GB):

GB: ”..so it means that these tutor lessons should be used to discuss how we can understand Orem more specifically. How can we develop the concepts so they become understandable for you?

S1,S2: yes!

GB:..and how we can transfer the theory and use it in relation to exactly this case story?

S2: I would really like if we could do this with all three theorists

GB: Both in relation to...? =>

S2: both with Henderson and Travelbee and Orem. Well, when I read Orem I felt it related a bit to this Henderson

GB: it really does =>

S2: then I would really like a kind of “table” for myself to use at the exam; this is the difference between him and her and...so when you get the case can find out which one to use, what is relevant and how they are different”

(2. semester line 25 -38)

Even though the lecturers have selected books, articles and other texts, the links between these sources are far from obvious to the students. They are not “pieces” which can easily be put together to reveal a complete picture. The above sequence illustrates that the students seek to understand this relationship. They want clarification about how the various theoretical sources are linked.

The different reflection processes that the students engage in are the kind of “glue” between the knowledge fragments. How such higher order reflections actually occur is the next question. Will those reflections be based on feelings, norms and tacit experiences as a further strengthening of social relations (SR+)? Or, is it possible for the students to build new epistemic relations between the theories and models and higher order concepts by strengthening of epistemic relations (ER+)?

My current research on this particular matter indicates that the student’s tacit knowledge and norms are more dominant than explicit epistemic reasoning. However further analysis is needed to shed more light on this.

To sum up, PBL in NE is part of a regionalization process where a federation of subjects is organized and whose relation to one other is up to the students to identify. Here, the

constellation of theories, methods, and principles is segmented due to the application of various scientific perspectives and traditions.

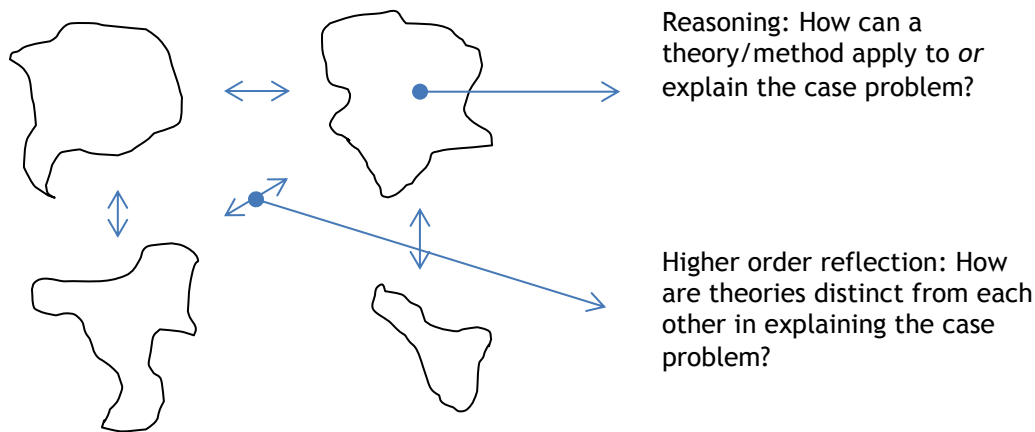


Fig 6: A 'loose' federation in PBL-cases about nursing

Notes: the "pieces" represents knowledge from various subjects or different theories within the same subject. Their relevance to the case-problem must be considered, and then their inter-relations which results in a further level of 'interpretative' reflection than in CAE-case

CONCLUSION AND FUTURE DIRECTIONS

In this paper I have focused on the foundation for 'Transversal knowledge formations' in PBL-work.

The research behind this is based on two institutional cases, 'Nursing' and 'Constructing Architect' educations.

The term transversality has been introduced as an alternative to disciplinarity-terms like multi, inter- and trans-disciplinarity. I have argued that our conception of 'disciplinarity' needs to change because disciplines no longer can be seen as such, due to code changes towards a strong knower code (ER-/SR+). This code change and regionalization are to sides of the same coin. Regionalization processes have generally taken place in higher education over the past several years and 'functionalized' disciplines in regards to demands of the practice fields. However academic demands have also increased for profession bachelor education in the same period and pulled them in the other direction. To meet such different movements and changes PBL has been introduced as a pedagogical framework to embrace those demands. In such a framework, based on constructivist learning ideals, the disciplines can legitimately

'give up' their independence and enter into federal constellations with a relatively strong knower code focusing on ways of knowing rather than states of knowledge (Bernstein 1971s. 60). In the specific NE case, and also generally in Nursing education in DK, educators have attempted to bridge the academic and practice fields while simultaneously striving to achieve a higher academic standing, whereas the CAE education has kept its main orientation within the practice fields.

One important point to note is that PBL is not the main cause of the emergence of this pedagogical environment. In both institutional cases, PBL operates more or less under the conditions of the regionalization which had already taken place before PBL was introduced in either case. Anyhow it leaves room open for new possibilities. Transversal knowledge formations are created through connections made between the federal constellations of subjects in the PBL-courses.

As I have argued, these processes are quite different in each of the two cases. The student's project work in CAE is based on a 'tight federation' whereas in NE the subjects are more loosely related. As I have discussed in the last part of the article, the knowledge cultures in CAE and NE offer different possibilities for reasoning, reflections and abstractions for the students. However these processes need more research into the topic of knowledge building in PBL-work (Maton 2011b)(Muller 2011b). This topic is currently in progress in my Ph.D-project. This article has emphasized the curricular foundation for such knowledge to be built upon.

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ⁱ Maton, Karl: "THE EPISTEMIC--PEDAGOGIC DEVICE: BREAKS AND CONTINUITIES IN THE SOCIAL SCIENCES AND MATHEMATICS¹", 2012 (Forthcoming book section)

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ⁱⁱⁱ Plusses and minuses are relative according to the historical transformation