Phenomenography and Networked Learning

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Phenomenological Enquiry into Manager Learning Orientation and Study Approach When Learning with Technology

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ABSTRACT

This paper reports on a phenomenographic study which aimed to understand the technology-supported learning experience of 20 managers. A brief review of the relevant literature is presented including learning orientations; study approaches and management learning before findings from the interview are discussed. The findings from the interview reveal three different categorisations of learners' experience: instrumental compliance, speculative opportunism and reflective learning. The categorisations are considered relevant as they are supported by considerable detail from the interviews and resonate with prior studies and literatures. Also interesting is the commercial context in which they emerged, which differs from the academic setting of most prior work.

Keywords

Phenomenography, educational orientation, study approach, managers experience.

INTRODUCTION

The study presented here is an example of phenomenographic enquiry at work, in that it follows the approach of the Phenomenography Research Group at the University of Gothenberg, who first identified individual student's approach to study in terms of surface and deep approaches to learning (Marton and Saljo 1976).

The study described here differs to the majority of reported research, which to date has tended to focus on studying students in fairly

traditional academic environments. This paper describes findings from a study with adult learners working in managerial level positions. These individuals were asked to describe their experience of technology-supported learning within the commercial settings in which they worked.

It may perhaps be anticipated that within commercial, as with academic environments, deep learning is desired, based on the belief that it is more likely to result in longer term understanding and applicability to the individual. This said and despite the fact that organisations have increasingly put their faith in technology to deliver learning, we still know little about the learners experience with technology supported teaching and learning methods. It is this gap which the paper seeks to address. In outlining its findings it reflects that certain descriptions of learning which emerge here are similar to those already outlined in the literature notably: Batesons's work (1972) on levels of learning; educational orientation and learning approach (Taylor, 1983, Biggs, 1976) and surface and deep learning (Marton et al 1984).

Section 1

This first section of the paper will deal briefly with underpinning theories relevant to this study. It will start with types and levels of learning, before moving on to describe Ference Marton's notions of surface and deep learning and related work into educational orientation and study approach.

Adult/Managerial Learning

Much has been written about how managers learn - although a commonly accepted theory has not emerged. In the space available in this paper it is only possible to point out some key landmarks within the vast terrain. Key to understanding some of the conclusions reported here is the work of Burgoyne, (1975). He reviewed learning theories and their relevance to management learning and in so doing, identified seven schools of thought: conditioning; trait modification; information transfer; cybernetics; cognitive theory experiential and social influence. In arriving at his schools of learning he identified three as being at the core: conditioning; cognitive and experiential.

Burgoyne (1976) has described what is included in each of these categories:

1) Basic data and information - facts appertaining to specific work environment, relevant professional knowledge such as legislation, production processes and sources of finance;

2) Situation specific skills and response tendencies - perceptiveness and data getting skills, analytical, problem solving, decision and judgement making skill, social skills and abilities;

3) Qualities for self-development - creativity, mental agility, balanced learning, habits and self-learning.

In describing these three categories Burgoyne acknowledges the contribution made by Bateson (1972), who describes three levels of learning in the following way:

Level 1

hierarchy of orders of learning - concerned with simple internalisation of information into knowledge;

Level 2

hierarchy of contexts of learning - builds on learning from level 1, concerned with how this leads to new ways of responding and behaviour;

Level 3

hierarchy of meta phenomena which we may expect to find within the inner self. How, as a result of learning in level 2, the individual expects their world to be structured in one way rather than another, based on their previous experience;

Whilst current ideas about learning frequently take a more socio and/or relational perspective we feel that within the context of this study Bateson's work continues to offer a useful perspective for considering learning at the level of the individual.

Surface and deep learning and the work of Ference Marton

We shall begin by recapping briefly on the work of Ference Marton and his colleagues (Marton and Saljo 1976) who were the first to advance the notions of surface and deep approaches to learning

The starting point of Marton et. al.'s research was an initial study of 30 female under-graduates and their approach to learning from reading articles. What emerged from this study was the identification of two main approaches to learning, surface and deep:

Deep approach to learning

Learners start with the intention of understanding the meaning of the article, they question the author's arguments and relate them both to previous knowledge and to personal experience, seeking to determine the extent to which the author's conclusions seem to be justified by the evidence presented. Therefore, whether reading an article or engaging in another learning activity, a deep learning approach will involve the learner in looking for meaning and relating new knowledge to old, rather than merely engaging in rote memorisation. Marton and Saljo found that the deep approach was associated with better understanding and recall after a five week interval.

Surface approach to learning

The intent of learners is to memorise those parts of the article which they consider to be important in view of the types of assessment/examination questions they anticipate afterwards. Their focus of attention is thus limited to specific facts or pieces of disconnected information which are rote learned. These students also tend to be conscious of the conditions of the learning experiment and to be anxious about them. Anxiety therefore emerges as a factor likely to induce surface learning (Marton & Saljo, 1976).

Later work by UK and Australian researchers led to the identification of an additional category – 'the STRATEGIC APPROACH' in which the intention is to achieve the highest possible grades by using organised study methods and good time management (Ramsden and Entwistle 1981). Strategic approaches to learning have been reported to include: monitoring ones study effectiveness (Entwistle, McCune and Walker, 2000) and an alertness to the assessment process, aspects, which are akin to metacognitive alertness and regulation (Vermunt 1998). Interviews with students suggest that they have two specific focuses of concern – the academic content of the system (which is fairly typical of a deep approach), coupled with the demands of the assessment system (usually associated with a surface approach).

Related work – learning approaches and educational orientations

As already mentioned, work being done in both the UK and Australia at the same time as that of the Gothenburg group was establishing similar kinds of findings. For example Biggs (see 1976, 1978) identified three kinds or orientation to learning in his research.

a) personal meaning

b) reproducing

c) achieving

At a similar time UK authors such as Taylor (1983) and Gibbs, Morgan & Taylor (1984) explored orientations and approaches to learning. They defined educational orientation as the personal context for study - the student's aims, values and purposes for study. ' They saw a student's orientation as contributing to the total 'world view' of a student's experience of learning, in conjunction with the organisational context. According to Taylor's research learners are likely to have one or more of the following four educational orientations:

vocational - engaged in study/learning for purpose of job

academic - engaged in learning for purpose of learning per se

personal - engaged in learning for self-development, holistic approach

social - engaged in study/learning in order to have a good time.

Study orientation, on the other hand has been described not so much the personal aims and goals with which a student comes to their studies but the particular ways they have of studying, including the strategies they adopt and skills they use and the motives behind these strategies and skills. Gibbs, Morgan & Taylor (1984) describe how they see a relationship between orientation and approach to learning:

"Orientation does not set out to type students, rather it sets out to identify and therefore to describe the types of orientation and to show the implication of these different types of orientation for the approach a student takes to learning." (Underscore added here by authors).

The context of learning

The importance of context was quickly established as an important aspect of students learning approach, and orientation to education/study. Entwistle (1981, p 103) suggested that a main limitation of describing the different learning styles and approaches was the tendency to concentrate exclusively on the characteristics of the individual. By relying on general questions about typical approaches to studying it was easy to overlook the importance of the content and context of learning.

"The approach adopted by the student depends not just on his or her own attitudes and personality, but also on the demands made by the staff or the institution. Students are rarely free to learn what they like when they like or how they like ... we must therefore try to broaden

our view of studying to incorporate aspects of the social setting in which learning takes place." (Entwistle, p 103- 104)

It seemed to us that for this study, the organisational framework of the learning and how it was handled or managed, must similarly impact on both the learning experience and adopted learning approach and hence also on the learning outcome. Something which has been confirmed in the context of higher education (see for example, Nuy (1991), Dart & Clarke (1991).

Seeking to integrate the theories

Links between the work of the Gothenburg group and the later work in both the UK and Australia into study orientations are now more or less accepted with the suggestion being made that a relationship exists between study orientation (Biggs, 1978) and learning approach (Ramsden and Entwistle, 1981) and between educational orientation and learning approach (Taylor 1983 and Taylor et al 1981).

Figure 2 below attempts to explain how the various different theoretical models may be linked in some way.

Figure 2: Linking Orientation, Approach and Surface and Deep Learning

Also relevant to this study is Burgoyne and Hodgson (1983) who related Bateson's levels of learning which were described earlier, to the views of Argyris and Schon (1974). Argyris and Schon have distinguished between shallow "single loop" learning and deeper "double loop" learning. They claim that managers generally exhibit only single loop learning (equitable to levels one and two), whereas double loop learning is equitable with level three.

Burgoyne and Hodgson do not see the impossibility of level three learning amongst managers but state that level two predominates. They also suggest (1983) that without any evidence of level three learning, the potential for new level two learning will eventually be exhausted and the managers' actions will become habitual and instinctive. It is within level three learning that there is the implication of learning to learn, which has become increasingly in focus in management education and also where we may see parallels to deep learning achieved through personal sense-making as described by Marton et. al.

Section 2 - Searching for the Holy Grail of a Deep Learning 'Recipe'

Deep learning can be perceived as the 'Holy Grail' of learning and development interventions, consequently this section briefly questions whether or not it is something that can be manufactured?

Orientation and approach as discussed in this paper, should not be viewed as fixed attributes of the individual but as variable depending upon context and situation The assumption here is that learning is not a thing - a concrete object, but an individual experience, influenced by the context in which it occurs and the way the individual experiences and interprets their world.

So where does this leave designers of learning experiences and the managers within organisation who sponsor them?

Although educationalists have sought to identify and promote the methods and contexts which lead to deep learning, it is 'a fragile and hunting for its 'recipe' rather like alchemy. However, numerous authors have documented the practices that encourage surface learning, such as Marton, Hounsell and Entwistle 1997. These practices include: overload of work, assessment processes requiring and rewarding reproduction of content, poor teaching, poor student-teacher interpersonal relationships and lack of opportunity for self management, Dart and Clarke (1991).

Section 3: This Study

The study described here sought to follow the original lines upon which phenomenographic enquiry were premised. A useful and short overview of this provided by Saljo (1988), in which he reinforces the view that Marton's phenomenography systematically focuses on the second-order perspective towards learning, dealing explicitly with the problem of analysing the meaning people ascribe to the world:

"The essential reason for paying an interest in people's conception of the world is a commitment to an epistemological position where the existence of a 'real' reality, common to all and available through 'unbiased' observation of the world is not recognised. There is always a

filter through which the world is seen if it is to be meaningful. The interest in this filter - the conceptions of reality that we have acquired as participants in human communication - is what characterises phenomenography as a scientific understanding." Saljo (1988 in Ramsden p 37).

The study comprises in-depth interviews, following a phenomenographic style with 20 learners in two different contexts: one a global professional services firm using technology to support the delivery of a common business education curriculum and one a retail bank, utilising technology to support 'soft skill' development.

The interviews yielded a wealth of rich data, to which was applied a qualitative 'emergent category' technique. By focusing on the differences which emerged between the descriptions of the learning experience that were articulated by the managers it was possible to identify certain groupings of learners).

Three groupings of learners emerged and are grounded in the findings from the interviews - there is not space here to capture all the data from which they derive. The summary below refers to the categories of description, or constructs, which appear to differentiate between the groupings across both organisational contexts.

Overview of the three groupings of learners

Grouping 1) Instrumental compliance

Categories of description emerging from interviews with this group included: company specific concerns and recommendations; fear of failure; appropriateness of the technology and the mix of media; organisational and administration issues. The following quote is illustrative of this group:

Company A learner 8 expresses fears about wanting to get things right.

"I think I seem to remember working quite hard to try to get the answers right, but this was quite hard ... that first bit ... did all ticks and crosses, tried to do it properly and on occasions didn't get involved, just watching and trying to log everything in head."

The group was concerned with facts and rote learning, which would suggest that these learners are most likely to adopt a surface approach to their learning. This purpose for learning appears to be to comply with organisational requirements. Other learners in this group make reference to the idea that extrinsic motivation is necessary for learning (similarly equated with a surface approach).

Grouping 2) *Speculative Opportunism*

Learners in this group were more likely to communicate about their learning through 'I' statements. They also relate the role-plays to the real world and appear to relate all learning to their current or future job role, as the following quotes illustrate:

learner 1:

"the last part about the car plant was interesting: real factories, real managers, real problems."

"can identify with them and think I am going to have the same role in the future."

The learners in this grouping appear to display some characteristics of deep learning, but relate this to their current job role. Their purpose for learning can perhaps best be described as strategic or instrumental. They relate most closely to the 'strategic' or 'achieving' orientation which Entwistle (1991) has described as being compatible with deep learning in some cases.

Grouping 3) Reflective learning

These learners talked about their own learning and the differences between technology supported learning and traditional courses as well as motivational issues; timing & flexibility and report frustration over the rigidity of the system and its use of questioning.

The quotes below are indicative:

Learner 11 comments on the relevance of prior knowledge and experience

"I think a lot of people will really find that quite stimulating ... they are essentially trying to prompt you into using your own experiences through the use of video and written material."

Learner 16 is one the most expressive about his/her own learning and makes comments which relate to learning with technology:

"we'll try to fool you into thinking you're having a good time whilst really what we're doing is making you work - it didn't seem like that

and it doesn't seem like that now, although when thinking back at it, that is the effect it had - in fact you were thinking quite a lot".

These learners appear to reflect a 'meaning' study orientation and as a result are likely to achieve deep learning outcomes. Their purpose for learning appears to be around self-reflection and self-development.

Summary of findings

This section provides a summary discussion and discusses in more detail the thinking between the suggested 'categories of experience' associated with each of the three groupings of learners. It would appear that the groupings are differentiated in terms of what we shall call learning orientation and learning approach. Orientation appears to concur with the notion of orientation introduced earlier, i.e. as being the personal context for learning. Learning approach appears to describe something akin to the study strategies being deployed.

It appeared that in the context of this study two dimensions were important in the learners descriptions of their experience, one was educational orientation and the other approach to learning.

In terms of educational orientation it was possible to identify to categories in the learners' descriptions of experience, a 'personal' orientation and an 'organisational' orientation. The organisational orientation has much in common with the 'vocational' orientation revealed from interviews in many academic settings (Gibbs, Morgan and Taylor, 1984). Given that the learners and context of this study are managerial, as opposed to academic, it was felt that the different context of these managerial learners warranted different terminology.

It would appear that an *organisational orientation* in this research is one in which the learners seem to have an interest in learning only in terms of how it relates to his or her work environment. It is an orientation which will only lead to the internalisation of knowledge if the learner also has an open conception or approach to learning (as described in the next paragraph). It is therefore rather similar to a 'strategic' or 'achieving' orientation (Biggs, 1976, 1978).

On the other hand a *personal orientation* is one in which the learner is able to make sense of material in his or her own terms and internalises this.

The second dimension of 'approach to learning' is not dissimilar in idea to Saljo's work on conceptions of learning (1979a & b) as he explains:

'for some learning was something which could be explicitly talked about, discussed, consciously planned & analysed. For others it was taken for granted.'

In this study the approach to learning dimension was manifested in terms of differences between learners who displayed a tendency to talk explicitly about their learning and to analyse it, as opposed to those who appeared to take it for granted and did not discuss it explicitly. The differences are best described in terms of whether the learners appear to have an *approach to learning* which is open or closed

It would appear that Group one contains learners who may be described as having an orientation which is organisational and an approach which is closed. Group two similarly contains learners who have an open approach, but combine this with an organisational orientation. This is different to Group three, who are best described as having a personal orientation and an open approach.

The three Groupings are reflected in figure 3 below, which also seeks to capture the key themes reported in the interviews and the likely learning outcome in terms of surface and deep learning.

Figure 3 – Groupings Emerging from the Interviews

Table 1 below presents an overview of the findings from this study. It lists the groups by both their number and their suggested identifier and matches these to the reported study orientations, study approaches and surface and deep learning outcomes. In addition it links these

to Bateson's (1972) levels of learning and also suggests a possible 'name' or identifier for each grouping.

Table 1: Summary – showing orientation, study approach and link to levels of learning.

Grouping/ Category	*Study Orientation*	*Study Approach*	*Probable Learning Outcome*	*Link to Burgoyne and Hodgson /Bateson's 3 levels of learning*
1 **'Instrumental compliance'**	• ***Organisational***	*Reproducing*	*Surface*	*Level 1 - the manager simply takes in factual information or data which has immediate relevance but no long- term effect on their view of the world.*
2 ***'Speculative opportunism'***	*Organisational*	*Strategic*	*Surface or Deep*	*Level 2 - the manager learns something which is transferable from the present situation to another - indicating a change in his or her conception about a particular aspect of his or her view of the world (i.e., situation specific).*
3 ***'Reflective learning '***	*Personal*	*Meaning*	• ***Deep***	*Level 3 - the manager seems to learn, or become conscious of his conceptions of the world in general, how they were formed and how they may be changed.*

Section 4 - Discussion and Conclusions

This section concludes and suggests some possible applications for practitioners responsible for supporting learning within organisations.

Findings from these two managerial contexts suggest that learners do indeed report their experience of learning with technology differently and this may be described in terms of their study orientation and learning approach. The paper presents three different groupings of learners which emerged from this research (summarised in table 1 above) and links this to Bateson's (1972) levels of learning, which Burgoyne and Hodgson (1983) have already described based on manager's descriptions of their own learning experiences.

With the exception of researchers such as Burgoyne & Hodgson (1983 & 1984) who have applied the approach to managerial learners, the majority of the earlier work investigating learning orientations and approaches has been conducted within the context of educational institutions and generally with undergraduates. It might be argued that in commercial environments the concerns, interests, fears and beliefs are of a different order and level to those of learners within an academic context.

Possible lessons for management education and development

If the aim of companies is to facilitate such deep learning for their employees, then it makes sense to suppose that organisations will seek to support the achievement of this.

However earlier work (Laurillard 1979) has suggested that learners do not always exhibit the same learning approach. By careful management and facilitation, companies may be able to provide learning experiences within a framework which is likely to be more conducive for facilitating deep learning.

Findings from this study support the idea that a personal orientation or an open organisational orientation is more likely to be conducive to established notions of deep learning.

We will briefly explore/suggest ways this may be achieved, however we do so in the full awareness of the unsuccessful experiments by Marton and others to try to induce deep-level processing through different types of test questions and content-oriented guidance:

"every form of disruption of the continuous contact between the reader and the content of the text has negative effects on the outcome of the learning. There is no short cut to deep-level processing." (Fransson, 1977.)

If deep learning cannot be constructed and if searching looking for it is akin to alchemy then perhaps the challenge for organisations is to mediate or seek to eradicate those factors which appear to drive a surface learning outcome. Consequently in Table 2 we summarise ways or features that are more likely to encourage learners to adopt a personal orientation or an open organisational approach and feature that appear to more likely be associated with a closed organisational approach

	Positive Features – may support deep learning	Negative Features – likely to drive surface learning

Design of environments	• Role plays, 'real-ness', allowing learning to relate to the learning content	• Reliance on multiple-choice questions, which may make the learner feel foolish or frustrated.
Facilitation and Interaction	• Being able to interact with someone, before, during or after the learning. • A 'blended' approach	• Working alone and only through technology
Organisation and Management	• Ease of access; whether to physical or virtual resources • Release in terms of time	• Technology that does not work • Managers not valuing/ supporting/positioning the learning

Conclusions

This paper has sought to report on the learning experience as described by 20 managers in two large organisations, who had recently used multimedia technologies as a part of their company-based education and development. What has emerged is recognition of differences in both the orientation of management learners and in their approach to learning - both of which appear to contribute towards learning outcome in terms of deep and surface learning. Drawing on this description and the use of examples, three tentative descriptions of learners experience have been suggested (although there is in no way a claim that they are universal). At the same time possible lessons have been suggested for management educators when designing technology supported learning courses, situations or events. Included in these proposals is the importance of ensuring there are opportunities for interaction whether it be with other learners or with a facilitator or indeed both.

It is important to reiterate that these orientations and approaches discussed here are not perceived to be permanent or inherent traits which will always be applied by learners in every learning situation. However by recognising these differences in orientation and approach and understanding something of the conditions which either facilitate or inhibit deep learning, it is believed that organisations may be better able to meet the training and education needs of their employees.

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Opening the variation in web-

based discussion: an empirical study

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Abstract

This paper takes up the issue of web-based discussion in a problem-solving session in distance education, and describes the analysis of one such discussion in phenomenographic terms of discernment, simultaneity and dimensions of variation.

Keywords

Learning, phenomenography, problem-solving, web-based discussions, computer mediated communication

Introduction

This paper concerns the analysis of group discussions that took place in a distance course for engineers at a major vehicle manufacturing company in Sweden. The discussions became interesting because of the apparent lack of substance, until one was found that appeared more substantial, an extract from which is shown above. Analysis showed that it could be related to learning in a phenomenographic perspective, which we will now reveal step by step. But first some background.

The course

Vehicle design and manufacture is an area of rapid change, above all because of the advances in mobile communication and sensor technology, and demands being made for safety, economy and a cleaner environment. When a multi-company, multi-national vehicle concern is introducing electronics more and more into the design of all aspects of their products, the engineering staff at all levels need to become more knowledgeable about, and more insightful into, the field. A reasonable move is to commission a programme of education that can be made available to employees, accessible on Internet, and related to practice. Such is part of the background to this paper.

A three level web-based course was designed in a collaboration between a branch of the company and Chalmers University of Technology, with a media company taking care of the actual production and maintenance. A learning management system, Luvit, was used as a platform, and the program that was developed had elements of text, voice, pictures and videos, animations and simulations and multiple-choice quizzes. Participants could take it in two different ways (each of which was charged to their department's competence development account): either as a free-standing course which they took at their own pace or as a collaborative course in which groups were formed to tackle two on-line seminars. Only the second of these modes was rewarded with a certificate.

Here we focus on students of level 1, particularly those who took part in the collaborative form of the course.

The problem to be solved

The first level comprised seven chapters, each on a theme of vehicle electronics and systems design: Vehicle electronics; Components and systems; Design of control systems; Programming; Distributed computer systems & communication; Real-time systems; and Distributed information systems. The first of the two non-compulsory web-based seminars comprised brain-storming on the alternative uses sensors already built into cars could be put to. The second was a problem to solve collaboratively in groups, on developing an automatic driving system (Figure 1).

It is seen in Figure 1 that three deadlines have been set over a period of two months, most time being allocated to the central issue of producing a user interface for the automatic driving system. The requirements are simple: the car must be able to navigate for itself from A to B, it must conform to normal safety standards, and it must be handleable by a normal driver.

It is the transcripts of discussions from this problem-solving task that are in focus in this paper.

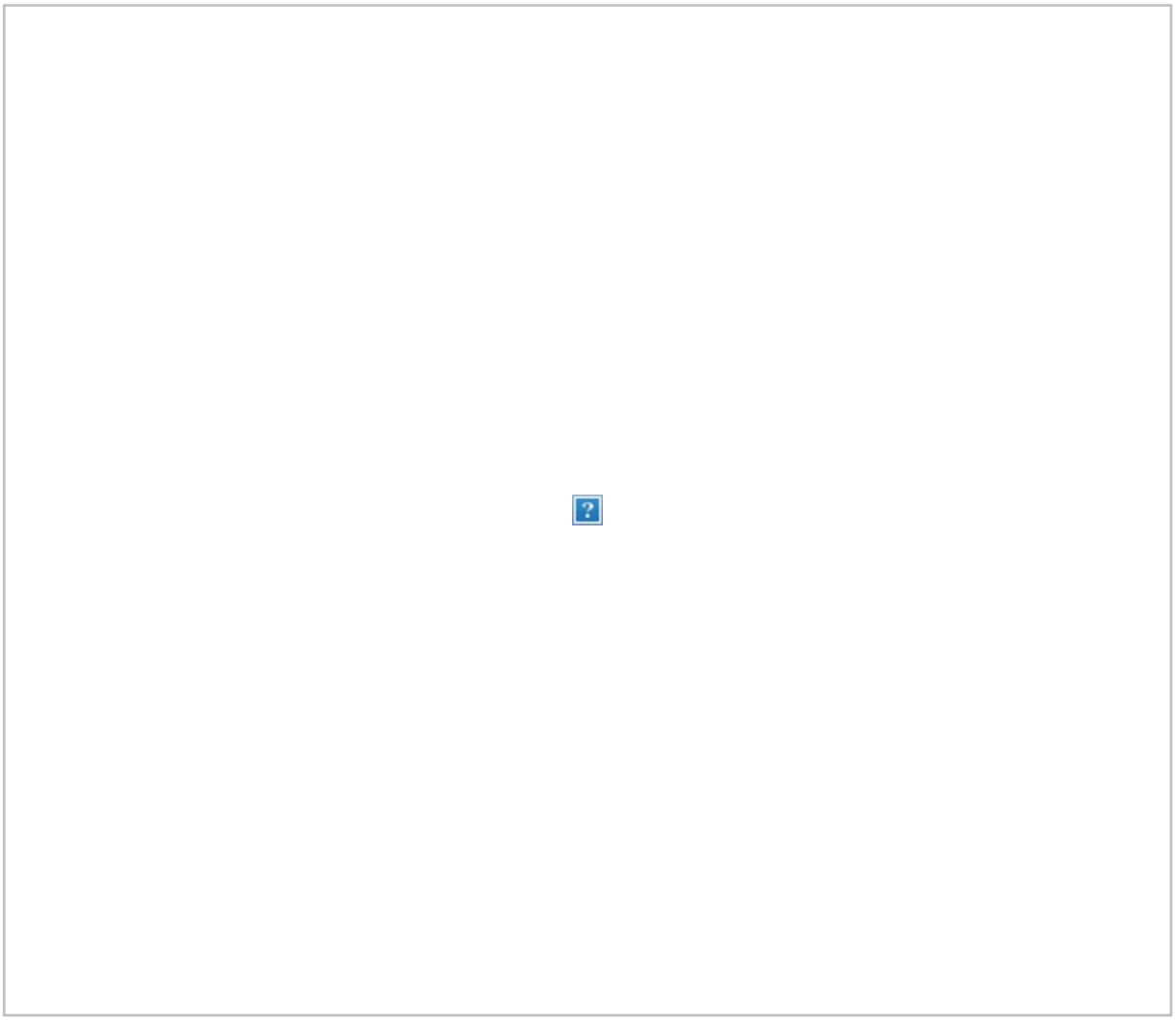

Figure 1. The problem posed for collaborative solution towards the end of Level 1 (our italics for clarity)

Phenomenography and learning

The study has been influenced and informed by the phenomenographic tradition (Marton et al. 1997; Marton & Booth, 1997). We have elsewhere described the group work as activity systems, and there attempt to describe aspects of the activity system as experienced by the actors in the system (Hultén and Booth, 2002), taking a second-order perspective on the object of study – striving to see it as others see it. To this end we have carried out empirical phenomenographic studies, and have interviewed participants in the distance course to reach an understanding of various aspects of their experience. In this paper, however, the only data we have are the archived group discussions that took place in the single problem-solving challenge.

Out of more than 20 years of empirical studies in the emergent phenomenographic tradition there has grown a theoretical framework for approaching learning, which will be described briefly here. First, learning is seen as a *qualitative change* in the way that some phenomenon is experienced by the learner.

> The learning in question means that the learner has developed a capability to experience a certain phenomenon when it appears in a novel situation in a particular way (which goes beyond the other ways in which she has been capable of experiencing the phenomenon), which in turn means that the relationship between the learner and the phenomenon has changed. The learner has become capable of discerning aspects of the phenomenon other than those she had been capable of discerning before, and she had become capable of being simultaneously and focally aware of other aspects or more aspects of the phenomenon than was previously the case. This is the kind of learning that has previously been referred to "as a change in the eyes through which we see the world" (Marton, Dahlgren, Svensson & Säljö, 1977, p 23, our translation). (Marton & Booth, 1997, p 142)

This is in contrast to learning in the sense of acquiring more and more of the same sort of information (such as French vocabulary, or programming in yet another imperative language). It is more fundamental, and implies understanding, sense-making, and seeing things in new ways.

We can take this a stage further, and describe seeing things in a certain way – let us say in a way compatible with a professional or a scientific way – as being aware of certain critical aspects of a phenomenon:

> In order to experience something *as* something we must be able to discern it from and relate it to a context, and be able to discern its parts and relate them to each other and to the whole. But we discern wholes, parts and relationships in terms of aspects that define wholes, parts and relationships. … These aspects correspond to *dimensions of variation*. That which we observe in a specific situation we tacitly experience as values in those dimensions. A certain way of experiencing something can thus be understood in terms of the dimensions of variation that are discerned and are simultaneously focal in awareness, and in terms of the relationships between the different dimensions. (Marton & Booth, 1997, p108)

To summarise, the empirically grounded perspective on learning has moved into a phase of theory development, aimed at identifying the aspects of the learning situation, and thus the teaching approaches that afford such learning (e.g. Bowden & Marton, 1998). The three essential terms here are variation, discernment and simultaneity. "Variation" is an essential aspect of learning in this sense: that learning occurs (things are seen in distinctly new ways) when a dimension of variation opens around a phenomenon or aspect of a phenomenon that once was taken for granted. "Discernment" is the act of seeing this no-longer-taken-for-granted phenomenon or aspect of a phenomenon in a new light, and "simultaneity" of seeing both the once-taken-for-granted and the no-longer-taken-for-granted is demanded for the dimension of variation to open. Lack of understanding is thus linked with being unaware of the potential for variation – seeing only that which is taken for granted. Instruction can be designed to reinforce such taken-for-grantedness or, preferably, to challenge it, to open the dimension to deliberate reflection. The task of the researcher is to delve into the ways the learners experience critical aspects of the learning situation and describe the variation in order to problematise the taken-for-grantedness.

> We need to consider what it means to see something in a certain way. An effective way of seeing a situation means that all the aspects of the situation which are necessary for handling it effectively are discerned and are taken into consideration. … To discern an aspect is to differentiate among the various aspects and focus on the one that is most relevant to the situation. Without variation there is no discernment. We do not think in a conscious way about breathing until we get a virus or walk into a smoke-filled room. Learning in terms of changes in or widening our ways of seeing the world can be understood in terms of discernment, simultaneity and variation. Thanks to the variation., we experience and discern critical aspects of the situations of phenomena we have to handle and, to the extent that these critical aspects are focused on simultaneously, a pattern emerges. (Bowden & Marton, 1998, pp6-7)

Now let us turn our focus from learning to the *conditions* for learning. Most often in educational situations it is a teacher who creates situations that (are intended to) afford learning, but here it is the group in discussion with themselves around a scenario that a teacher has challenged them with. If they are to learn anything about vehicle electronics and system design from solving this problem about automatic driving vehicles, they will now be developing their own learning situations since the tutors are only peripherally involved.

The learner is aware of a phenomenon, then, in some way which implies that particular aspects of the phenomenon in question, and the relations between these aspects, are apparent to them. The dimensions of variation that go to define these aspects are present to awareness. What does it take, then, to see the phenomenon in a qualitatively new way? Why, new dimensions of variation have to be opened, new aspects of the phenomenon and relations between these, need to be revealed.

> …there can be a difference in which dimensions of variation that is opened. When critical aspects of the content taught is focused, sometimes a variation of that aspect is opened, sometimes it is not.
>
> However, there is not just a difference in which aspects that can vary. There is also a difference in respect to if they vary at the same time or not. A closer look shows that, sometimes, several dimensions of variation are opened simultaneously. (Runesson, 1999)

As described above, learning of this sort is essentially an individual business. It is the individual and the individual alone that develops the capability to experience something in a new way. When speaking of the phenomenon in focus, the individual directs his or her awareness towards the phenomenon, or towards some aspect of it, or towards the situation in which the phenomenon is perceived, or towards his or her own relation with the phenomenon in a reflective mode; the locus of learning is identical with the individual learner. In group discussions, however, the locus of learning is less clear; in the transcripts of discussions utterances are directed to one another or to the collective solution that is under way rather than to oneself, and the locus of learning is distributed over the group situation.

What I am suggesting in the analysis that follows is that dimensions of variation can be opened in discussion, affording learning. This is not to say that learning takes place, neither in an individual nor in the group; but it can be said that the conditions for learning are present to the group and to the problem-solving process. But first, let us look at the discussions in general terms and return to a phenomenographic perspective in due course.

The group discussions, A and D

Two of the group problem-solving discussions have been analysed, they being the most substantial of the five. Group A comprised 18 contributions from 3 participants and the tutor; Group D comprised 32 contributions from 6 participants (three of whom came over from less active groups) and the tutor. Here the participants from groups A and D have been given fictitious names starting, respectively with A and D, while the Tutor has been called Tom. The complete transcripts can be read at www.pedu.chalmers.se/shirley/NL2002/GpX.pdf where X

Figure 2. Groups A and D, frequency per week, weeks 1-9.
Series 1 = Group A, Series 2 = Group D

is replaced by A or D (and parts are in Swedish). The remaining three discussions comprised only the tutor and one participant; one group died out altogether and the participants from the other two moved over to group D.

Group A waited several weeks before getting going, coming in towards the end of the second phase, while group D started at once and communicated fairly regularly throughout the period, as seen in Figure 2. The only Group A contribution of substance in Session A came from Adam, with a header "The easy way again"; he directed everyone to a futuristic web-site where features of automatic driving were taken up, where the solution might be found. The tutor responded "If you use the information here, maybe combined with some additional thoughts, you will have a nice start for this project. However the important thing is to discuss the different features" and the discussion dried up for three weeks. In the sixth week Arnold and Albert, new members or late starters, turn up, and a dialogue ensues in which they, with a reappearance of Adam, rapidly put together a requirement specification, the task for Session B. They continue immediately to a user specification, and prompted by the Tutor they post their solution on time.

Group D started their discussion at once, with four members corresponding in Session A. In the third week, the first of Session B, Group D exchanged 9 substantial contributions, with a new member, Dorothy, also "checking in" and Tom the Tutor making a short remark of encouragement. Here they are hammering out what such an automatic driving vehicle should be able to cope with, and this forms the basis of the analysis below. Dorothy has come from another group which folded at once, and she contributes what that group had discussed. Denny returns from holiday in the fourth week and promises to get into the project but never reappears. There is more social contribution than in Group A, which went directly from a long silence to an attack on the problem. When new members ask to enter group D, Dick asks them to present themselves to the group, and they get responses in return.

Analysis

In the introduction to this paper there is a quote, taken from Group D, the 14th contribution in sequence, which, we see an example of a single statement where variation around critical aspects of the phenomenon – city traffic and highway traffic – are brought into simultaneous awareness at the group level, and thus can be seen as affording learning at the group level. How did this arise?

Earlier in the discussion, after welcoming one another and some new members, Daniel joins the group, having left another moribund group:

> 8
> Daniel. Title: Auto pilot Content: Hi all
> I don't know if this will satisfy the course requirements, but I have thought of two situations where we would be able to benefit from "autopilot" in a truck. The vehicles will not be running in inner city traffic, obeying traffic rules, such as traffic lights, give way signs, pedestrians' etc. PLEASE COMMENT
> Scenario 1
> A truck is carrying iron ore from a mining site to the processing plant 100km. away. A driver derives the truck once and the truck then memorises the trip and will be able to run on autopilot again and again.
> Later when the dugout move slightly, a driver run the first trip again.
> * We must be able to stop if there are obstacles in front of the truck
> * The process should be monitored
> * We should be able to adjust the speed according to driving conditions
> * The truck should be driven in the most cost effective way possible
> Scenario 2
> A truck is driven from Perth in Australia to the eastern seaboard. Here you will cross the Nullarbor Plain, approximately 2000km. of dead straight road with hardly any traffic. The driver should be able to start his autopilot and go to sleep in the back of the cab.
> * We would need to deal with oncoming traffic
> * We may have to overtake slow or stopped vehicles
> * Other than that we would just have to stay on the road surface.
> * or ???

This, apart from the first contribution which threw some ideas into the ring, is the first substantial contribution to the problem, and offers two scenarios for the automatic vehicle to drive on highways in wide-open, desert spaces. The encouragement to "PLEASE COMMENT" achieves its goal and Doug replies the same day, criticising both of Daniel's scenarios, the first because of potential hazards in changes to routes, even in remote areas, and the second because of its limited applicability. Daniel replies the next day, elaborating on his suggestions, promoting the idea of looking into inner city traffic, and promising to think about it and get back.

9
Doug. Title: RE:Auto pilot Content: Hi Daniel,
About the autopilot. I don't think that the implementation where the driver learns his truck the way from point A to point B is very good. What happens if there are some kind of road work or similar and the traffic gets redirected? I think the best way to solve the problem is to let the truck/car know where it is and calculate the best way to the target with help of maps and traffic information.
About the second scenario... do you mean that when you transfer to autopilot on the straight road the truck only goes straight forward? In this example the truck does not know from where it came and not its destination either. This kind of autopilot would only be useful in a very limited number of applications.
So to summarize my discussion: For the "autopilot" to be useful I think it need to know the vehicle's current location and it's destination. It also needs acces to applicable maps and traffic information
best regards
/Doug

10
Daniel. Title: RE:Auto pilot Content: Hi Donald
The thought behind the truck memorising the trip was that sensors are expensive and software is cheap, so if the ABS sensors could measure distance we could guide the truck from A to B, turning when necessary by applying the brakes slightly to just one front wheel at the time. Another advantage was that it would be easy to change the route. We would need other guiding as well.
As for the truck running from Perth to, say Adelaide. The driver could go to sleep while the truck found its own way in this very remote area, and as such he would be able to make this run a lot faster than if he could only drive 8 hours per day. Naturally we would have to guide the truck through road curves and past other traffic. Again I understand that we would need some form of guiding system to do this in a safe manor.
But I think that we have decided to go with the scenario of a vehicle running in inner city traffic, and see how far we can get with this. I will think about it for a day or two and get back to the project as soon as possible.
BR//Daniel

Dick, who tends to take the role of moderator (while denying the need for a project leader) says, bringing attention back to his interpretation of the demands of the task:

13
Dick. Title: RE:Sensors Content: Hi Daniel,
I get the impression from the requirements that the car should be able to run in inner city traffic. Should we try with that to begin with and lower the ambition if it turns out to be too difficult?

And then comes the pivotal statement from Doug:

Doug. Title: RE:Sensors Content: Hi there,
I think we should specify our system to work in city traffic as well as highway traffic. The only difference, really, from city traffic and out-of-city traffic, is that there are more cars more curves and more traffic lights in the city.
/Doug

What happens there, and why are they selected as important? In the first sentence he brings together two threads that have been running through the debate: whether to start from the requirements of city traffic or highway (desert) traffic in making the specification. And in the second he brings them into juxtaposition. Thus this single statement opens a dimension of variation, the space for learning about the range of functions the vehicle must have. This might not be remarkable if it were not followed the same day by Daniel's specification for one kind of traffic – neither of the kinds he proposed in his first contribution but the promised consideration of city traffic.

15
Daniel. Title: Requirements Content: Hi all
Can I suggest that we start listing things to be consider when running a vehicle through inner city traffic, and then later we can start looking at what is required to do so?
1 we must be able to start, stop and to find right speed.
2 we must be able to sense traffic in front of us, and not confuse these with oncoming traffic or parked vehicles
3 we must identify the location where we are and where we want to end up
4 we should stop for pedestrians (kids playing in the streets?)
5 we should recognise traffic conditions such as rain, snow and fog
6 we would have to use indicators when turning
7 we should all the time stay in our own lane, but must be able to change lane if someone has perked his car up in front of us
8 we should be able to overtake a very slow vehicle
9 we should be able to deal with round abouts, intersections with more than 4 roads, merging lanes, road works (re-routing traffic), speed bumps, traffic lights and much much more.
BR//Daniel

The phenomenographic view of learning is that variation is a necessary condition for coming to discern new aspects of a phenomenon. To take a simple example, if the only colour in the world were green we would not even have a concept of "colour" – greenness would be taken for granted as the state of things. Only when a red object appears before our eyes do we problematise the greenness of all else. But variation as such is not sufficient, it must be in a dimension that covers some critical aspect of the phenomenon. Here, the critical aspect was in answer to the question, "what functions must an automatically controlled vehicle have?". The dimension was opened by Daniel suggesting a simplification of the specification (based on his experience of many years in Australia) followed by other group members disagreeing, reaching a synthesis in Doug's observation. Neither city traffic, nor highway traffic can now be taken for granted: they are both in the arena and the specification must take account of both.

There are other dimensions of variation opened in Group D's discussion, which we will not go into in such detail here. The group assumes

a designer perspective on the car until, in week 5, Donald opens a contribution with

> 21
> *Donald Title: How we should drive the car* Content: Hi all, we haven't talked about we should drive the car, but I have a few ideas. When we entered the car we have a plastic smart card where all your data is, Who you are etc. Then in the car we have like a harddisc where we put this card. Now we can start the engine, after that we must consider were we want to go ……

And he continues with a description of what it would be like to drive such a car. The dimension "designer–driver" is thus opened and reveals important functions that have not been considered hitherto.

A third dimension opened to variation, also in week 3, is that of positioning via GPS and locating through sensors, which runs in parallel with the desert-traffic–city-traffic discussion. The contribution from Daniel, that narrowed the problem down to desert traffic that only needs to know where it is and where it is bound for, implied positioning through GPS. Dick, disagreeing with the principle of considering only desert traffic, elaborated on the spec by adding that the auto-pilot would need a map and information about traffic – still positioning in focus. Daniel then justifies the economics of auto-piloting and brings sensors into the discussion as relatively expensive hardware; but now there is an implication that some sensors would also be needed. Then Donald, changing the thread title from "auto-pilot" to "sensors", starts to differentiate between what sensors are needed for (fine detail navigation, around obstacles etc) and what GPS can accomplish (positioning on a large scale).

> 11
> *Donald. Title: Sensors* Content: Hi all, I'm just sitting here and reading about our equipment and I can see that we must have several of different sensors. If the car should drive self we must have sensors which feels of different thing like other car, people on the road. I think the car must feel off all this from at least 10m. My point is that the GPS navigator feels of all cars etc from a bigger area and send signals to the engine and slowdown the speed and then the sensors is feeling when you come clooser to other things, the other car is sending a signal to my car that we are pretty close too each other and my car send a new signal to the engine to slow down moore or stoop and wait. … … // Donald

This is another refinement of the specification, brought about through the juxtaposition of sensors and GPS as principles for automatic steering, opening a dimension of variation.

Discussion

Analysis from other perspectives

Another possibility would be to look at the two groups through the sort of analysis model developed by Gunnel Wännman-Toresson (2002), based on three models to be found in the literature and related to a socio-cultural perspective on learning. The first looks at complexity and potential complexity in terms of interactivity and the potential for interactivity, and she attributes its origin to the influence of Bakhtin, and in particular Lotman. The second is based on the five dimensions that France Henri distinguishes: participatory, interactive, social, cognitive and metacognitive, but in Wännman-Toresson's model these are restricted to a content-related dimension and a social dimension. The third is based on five stages of social development and perspective-taking according to Selman, developed by Häkkinen and Järvelä to be egocentric, subjective, mutual perspective-taking (acceptance), common perspective-seeking (consensus) and societal symbolic perspective-taking (at a higher level).

This would be to relate the group discussions to a socio-cultural and developmental frame of reference in which learning is characterised as occurring in interactivity with others through language and other mediating artefacts. Subject matter and the way that the discussion relates to it, takes a relatively minor role in such an analysis. Without carrying out a detailed analysis at this stage, it can be seen that the interactivity is greater in Group D than in Group A, though group A appears to get going shortly before the end of the task. Both groups focus much more on the content of the problem than on social communication, though there is relatively more social communication in group D and almost none in Group A. And the notion of reaching consensus is taken for granted in the production of a joint specification, and that dominates the sparse communication of Group A while being more a question of productive argument in Group D.

One clear point for further investigation is the relation between activity and interactivity. Wännman-Toresson's work indicated convincingly that activity is a prerequisite for interactivity: the greater the activity in a group the proportionally greater the interactivity she measured. This is corroborated in Group D's intensive activity of Week 3, where two of the sequences that opened dimensions of variation occurred.

Taking the phenomenographic starting point, seeing the data with phenomenographic eyes, has led to our analysis, which is, in keeping with phenomenographic work in general, inductive in character. The first stage of analysis was to try and see the interaction that occurred within the group – who invited others to communicate, and who responded? Then it became apparent that certain statements were pivotal – and thus Doug's statement came into focus. Only then was it seen that this could be interpreted in terms of learning in a phenomenographic sense. looking for pivotal events has the advantage of maintaining the subject matter of the course in focus, which is more accessible to the designers and tutors than pedagogical theory.

This sort of learning stands in stark contrast to the learning that is reported in, for example, Wilson & Whitelock (1998), where students were found to get help and give help in their group discussion fora, spurred on because they were dealing with novices like themselves. In the present study the actors were actually in some senses experts, though in different areas of vehicle electronics and system design, and

possibly lacking formal qualifications. The group discussions reported actually draw much more on experience than they do on the content of the course, and could well have acted as an introductory task rather than a final task.

The design of the course and the role of the tutor

Finally, what can we say about the potential for instructional design? This form of collaborative problem-solving discussion offers better potential for opening dimensions of variation around the aspects of the problem, than, say, the getting and giving help sort of discussion referred to above. The existence of a deadline appeared to encourage the dynamic of the group discussion, increasing intense interactivity, as seen in week 3 of group D's discussion.

One can speculate about the role of the Tutor – did Adam feel put down by his comment and left feeling that he had been backed into a corner? After all, with no discussion partners he could hardly "discuss the different features". Should the tutor have taken a more active part in getting the group members to start working on their projects in time? Should he have chased up Arnold and Albert, and got their interactive discussion going earlier? The tutor in this case interpreted that his role should be to remind of deadlines and answer direct questions, and group dynamics was not included.

Should Denny have been encouraged to take part despite his late arrival on the scene? Wegerif (1998) lists factors which affect "crossing the threshold" from being a newcomer to becoming a member of the working group. One is that of not feeling that you are making a useful contribution, and that might be what Adam felt after finding a highly technical specification which he could not possibly achieve alone. Another reason given by Wegerif is the use of language, which is not negligible here. All the participants were expected to use English since the course was open to employees all over the world. Denny in fact came from South America and was on secondment to Sweden, so his language difficulties might have been one degree worse that his fellow group members. Daniel, who was a constant contributor, had lived in US and Australia for many years and commanded both English and Scandinavian languages. A third reason is getting into the "in group", which Dorothy and Denny might both have felt, finding in the archive that the others in Group D had been discussing with one another for some weeks.

It is to offer advice to tutors in similar positions that is one of the long-term aims of this project. A second long-term aim is to propose design and evaluation criteria with learning in focus. From the discussions in group D it is seen that a wide enough subject matter is needed if alternative perspectives are to be brought to bear on the important phenomena of the course: systems design with navigation, sensors, user-needs, and so on. From the discussions in group A it is seen that such an argumentary (in a productive meaning) discussion is not likely to arise from only two or three people talking to one another and trying to find a solution; nor is it likely to arise quickly: interactivity demands activity and time. Encouraging participants to compare and contrast – rather than ask for and give help – can also lead to the sort of comparison statements identified here.

This particular discussion came at the end of the course, but strangely, made no demand to make use of the course content; it rather called on the experience of work practice. It could be a useful start to such an experience-related course, opening questions which are later addressed in the course, and then the tutor could make more use of his or her pre-knowledge of the course content and open long-term dimensions of variation.

Conclusion

The study is limited in extent, and the analysis is at a preliminary stage. Nevertheless, this, we submit, is a fruitful way to proceed with analysis and understanding of group discussions, oral as well as written, where the subject matter, and the ways in which group members relate to it, are kept in focus.

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Considering context for networked learning in a phenomenographic perspective

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ABSTRACT

A theoretical model for learning in distance education is being developed. The model has its base in phenomenography and is extended, through a socio-cultural perspective (activity theory), to take the situation that arises through engagement with such a course into account. The theory is exemplified through a case study of a web-based course for engineers in industry. Implications for learning and design/tutoring are discussed.

Keywords

Phenomenography, activity systems, socio-cultural perspective, distance education

INTRODUCTION

This paper develops a theoretical model for learning in distance education, grounded in empirical studies of networked learning for post-university engineering, professional development at a vehicle manufacturer. The model is developed with on the one hand a phenomenographic perspective on learning in the individual sense, and on the other hand a socio-cultural perspective on the situation that arises through engagement with such a course. Lets start with a background of the course studied.

The course

This paper concerns learning in a web-based, wholly distance course for the engineers working at a multi-national vehicle manufacturing company. It was initiated to spread the knowledge of advanced techniques that are being built into today's cars and trucks, mostly based on mobile communication and computer-related electronic devices. The course provided for the engineers is entirely web-based, i.e. they never meet physically except for those cases where two or more course participants come from the same department of the company. Engineers from a wide spread of locations around the world participated in the course.

The web-based course material includes text, pictures, sound, animations, simulations, hyperlinks and quizzes. All of this is built in a platform ("learning management system") that also facilitates chat sessions, discussion groups, personal home pages and email communication.

The actual course material are sequentially ordered "chapters" for study, each of which takes up a separate topic, for example Programming and Distributed information systems. The chapters have a certain element of lectures, in that text is presented on the screen and at the same time a man speaking the text is heard. Students are expected to work through these at their own pace, in the order they wish to, and there is a multiple choice "quiz" at the end of each chapter for self-assessment. At the start of the course, a chat session is launched in order for the course participants to socialize before the course tasks are launched. The first task, called seminar, is launched on the topic of making use of the sensors in a car for novel purposes, in which small groups of participants exchange ideas and comments on one another's suggestions. The seminar is moderated by a group of "web-trainers" who are teacher/researchers from a university, who also answer course-related questions from the participants via e-mail. A little later in the course a project is launched, in which the same groups of students are set the task of designing a vehicle that is capable of guiding itself round a town, and designing the necessary gadgets that the town needs to cope with it.

The empirical study

The study we are describing here aims to analyse and describe the experience of learning for the participants in the course. This is seen as an example of a practice-related distance educated course, aimed at post-undergraduate professional engineers who need or wish to extend their field of competence. The term "post-undergraduate" is used to indicate that the students have experience of higher education, though they may have left to enter the workplace, or studied while working.

The empirical study has an overriding phenomenographic perspective on learning – number of participants were interviewed with a design aimed at revealing the variation in how certain phenomena covered in the course and certain aspects of the context for learning were experienced. The interviews have not yet been analysed as a phenomenographic pool of meaning, but have been analysed individually to get a better picture of which features of the learning context were important, and their potential significance for learning

The first group of participants we have studied began the course on its second run, in the spring of 2001. Of 40 that started the course, we interviewed 5, and one of them twice.

A phenomenographic (Marton & Booth, 1997) approach is to say we are aiming to analyse, and describe analytically, the variation in ways in which phenomena the students met were experienced, across the group. The aim of the interviews was, therefore, to reveal ways in which the interviewees related to what we considered to be interesting aspects of the learning content and the learning context. To this end we designed an interview that would enable the participants to engage in telling us about their intentions, their study habits, what they had been finding difficult, interesting and important, and so on. The object of study – vehicle electronics or one of its features in the course, was taken up in a non-specific way in this first set of interviews. The interviewees were asked if they met anything really difficulty in the course so far, when they just couldn't get it, and then asked how they had gone about handling it, or how they might have gone about it if such a situation had arisen. Our intention was to reveal the sorts of resources that they made use of. They were asked what had been interesting in the course, so far, and what had been important for them, and asked to elaborate on these themes, in order for the interviewer and the interviewee to reach a mutual understanding of how they had been working and learning the content of the course.

The context of study was taken up in the interviews under the influence of the notion of context as an activity system (see below). In particular we tried to bring out what the participants felt to be rules governing their study – which might have been company policy or the influence of previous study habits, for example – and how they related to features we saw to be rule-like – such as the quizzes and participation in the seminar. We also took up the question of the influence of other people in the context – the community to which the student turned or related – and the intellectual and physical tools they were able and/or expected to use.

Apart from the interviews we were able to collect the transcripts of the seminar sessions and the project discussions, but chat sessions and private emails were not available. The seminar and project transcripts are analysed in a separate study (Booth and Hultén, 2002).

Theoretical background

In order to relate the notion of context to a well-grounded theoretical framework, the learning context was initially conceptualised as an activity system. Activity system thinking has its roots in the work of Vygotsky and his school of developmental psychology, and is most commonly used to describe the dynamics of activity in social settings.

In our study, we have tried to redescribe the activity system in a phenomenographic spirit, in the sense of seeing it as it is experienced by its participants. Before elaborating more on the theoretical framework, let us look at the theories we are drawing upon more carefully.

Learning in a phenomenographic perspective

Phenomenography (Marton & Booth, 1997) has its roots in empirical research aimed to reveal the variation of qualitatively distinct ways

in which people of a particular sort (typically a cohort of students) experience (or conceptualise, or see, or perceive) a phenomenon of some significance. Out of the body of empirical studies has been developed a theoretical and analytical description of learning, learning being characterised as coming to understand something in a new way, or becoming competent to do something that one could not do previously. This study is making use of phenomenography both as an empirical research approach *and* as a theoretical perspective on learning.

Phenomenography posits a non-dualist epistemology: the knower/person is in an indissoluble relation with the known/phenomenon. It is this relation that is the subject of study, and the results can be seen from either pole of the relation. Seen from the phenomenon-pole we are finding ways in which the phenomenon is experienced (or conceptualised, seen or perceived, as above) by the sort of people; seen from the person-pole we are finding ways in which the sort of people experience the phenomenon. The person/knower has an intention towards the phenomenon/known: he or she simultaneously distinguishes it from a background and sees within what is distinguished certain aspects and relations between aspects.

As an empirical research approach, phenomenography can be said to work at a *collective* level. That is to say, the data that is collected is abstracted from the individual who, in some sort of engagement with the researcher and the research question, provided the data. Analysis is carried out on the collected data as a whole, seeking qualitative distinct ways in which the phenomenon of interest is spoken of and/or handled. If we take the data as being in textual form, for instance transcribed interviews, a process of decontextualisation of extracts from the original texts and recontextualisation in new collections of meaning (Adawi et al., 2001) takes place. The researcher seeks to take the second-order perspective on the question through the data – see the phenomenon as others see it – and describe it in a set of categories of description which are internally logically related and externally empirically related.

The theoretical and analytical perspective on learning enables the results of a phenomenographic empirical study to be turned towards theoretical individuals and analysed for critical aspects for learning. Now we are working at an individual level, and it is important to make this distinction: empirical studies are at a collective level and theoretical development can be at an individual level. In this theoretical perspective, learning is driven by what relevance structure is experienced – that which gives the learner a sense of direction for the act of learning – and it is fired by variation – that which enables the learner to more precisely discern the object of learning from its various backgrounds and the parts of the object from one another as well as discern the relation between parts and whole.

The variation that is experienced is what enables aspects of a phenomenon to be discerned from what has hitherto been taken for granted. But this variation cannot be of just any kind if it is to support learning – it has to be variation around some *critical* aspect of the phenomenon, an aspect that is essential for understanding. The teacher's job – or the designer's and the tutor's job in the case of distance education – is to provide openings for such variation in critical dimensions

There is a third aspect of phenomenography that is also relevant here: phenomenography as a perspective in practical pedagogy. Now phenomenographic results are related to an educational goal, and as such take on a normative dimension: the categories of description can be seen as offering lesser or greater power in the field of study, as being less or more complex and complete. In the case of pedagogy in a professional setting it is reasonable to add professional practice as such to goals that are more school-related.

The present empirical study aims to collect data that can be analysed to illuminate how the participants in the web-based course experience both the content of the course (or certain interesting aspects of it) and important features of the context for learning. The theoretical framework supports this aim by offering conceptual tools for analysing what is sometimes insufficient data for a rigorous phenomenographic analysis.

Context in an activity system perspective

As we stated earlier, the learning context was initially conceptualised as an activity system (Engeström, 1999), largely in order to relate the notion of context to a well-grounded theoretical framework. Activity system thinking has its roots in the work of Vygotsky (Vygotsky, 1986) and his school of developmental psychology, and is most commonly used to describe the dynamics of activity in social settings, such as hospitals (Engeström, 1993) or collaborative computer usage (Holland and Reeves, 1996). It has a materialistic philosophical foundation, and an essentially externalist research perspective. That is to say that the social systems are seen as the fundamental feature of and influence on human existence, and that the researcher's role is to stand outside it and observe, describe, analyse and theorise what he or she sees there.

The following description of an activity system has been adapted to our study, and is formulated in the terms we have come to establish within the study. The *subject* (student) is in relation to the *object* of study (which can be the course as a whole in some situations, or a particular concept or principle in others), as described in the previous section. The student directs his or her attention to the object of study (which might be the course as a whole, or a particular part of it, or a specific item. In directing attention to it, activity theory says that the object is transformed in some way, but here we are saying that the relation between subject and object is transformed – and this is the outcome of the person's intention towards the object. This intentional act is mediated by *tools* of various types – intellectual tools such as language or animations or previous knowledge, and artefactual tools such as texts and the computer. This is our adaptation of Vygotsky's original activity system: subject-object-mediating tools.

Now let us extend the triad by adding a layer of social factors, as Engeström has done to describe what he calls "learning by expansion".

Central to this layer is the *community* that the individual relates to – possibly work-mates and/or fellow students, and/or teachers, and/or even the family – in such a way to affect the subject-object relationship. Relations to the community are directed in some way by *rules*, rules that are everyday rules of computer communication, possibly, or rules that are imposed by the course. And relations to the community are also directed by the *division of labour*, whether deliberate or accidental. This describes the diagram shown in Figure 1.

Figure 1. An adapted activity system: a framework for examining the context of learning in networked leanring.

In our study we have made a major reformulation of the activity system described so far. We have attempted to use the interviews to describe the experience of the context in terms of the ways of experiencing the nodes of the activity triangle. And this leads to a certain re-interpretation of the "division of labour" node, to be an experience of one's own role in the system and the roles of others, including responsibility and collaboration.

The only arrow in this diagram is that joining subject and object, in line with the non-dualistic assumption of the phenomenographic view of learning. In classic activity system of this kind, all nodes are joined by two-headed arrows, indicating the inseparability and the inter-relatedness of the nodes in a normally functioning system, and to enable the breakdown in such relationships to be identified and problematised. Here, however, we wish to emphasise the meanings of the nodes rather then the system as such, as our assumption is that these nodes are significant aspects of the experienced learning context, but we wish to remain open on the relations that are experienced between them.

Considering context for learning in a phenomenographic perspective

There are many ways one could go about studying the context of learning in a phenomenographic manner. We have chosen to take an adapted activity system as a starting point for data collection and analysis, and it has also functioned as a framework for discussion in coming to understand the data we have worked with.

> Figure 2. The activity system showing the extended relationships between subject and object (a) mediated by tools and (b) constricted by rules

What tools are present in the learning situation, and in what ways are tools experienced by the course participants? What rules are imposed by the course, what rules are read into the course by the participants, how are these tools experienced? How are these tools and rules related to the notion of relevance structure, and what in the system might afford experience of variation? Such are the questions that this characterisation of the context for learning has led to. In Figure 2 we attempt to show the extended relation between subject and object – knower and known, person and phenomenon – extended through mediating tools in (a) and constricted by imposed and experienced rules in (b).

Similar figures can be produced in which the subject-object relationship is extended through community – both imposed and experienced – and through roles that are taken on and developed. We will return to the significance of this in our discussion.

Empirical analysis, Exemplifying the theory: tools and rules

There are many mediating tools available to the students in the course: text, films, animations and simulations, and calculations. And there are implicit rules for using these. The tool, or potential tool, that we have seen most closely coupled with rules is the "quiz" that ends many of the modules in the course. These quizzes are multiple choice questions that are arranged to test various aspects of the module's content, and they are totally voluntary. Passing the course only involves having taken part in certain activities and having covered 75% of the course material. However, the quizzes are experienced as of some importance:

B sees the tests as a confirmation of learning when he says:

> I: But then all the things like the "Test yourself" section?
>
> B: That is very good. I think the way it is set up is very good. There is a lot of information there, but there is not too much, you know, you do not have more there than you can read through it without getting, I would say bored, you know, without losing too much concentration you can read through the information there and certainly, if you answer your quiz at the end there, I would say that you have learnt something from that material there, I think it’s a very good material.

A uses the quiz to guide his study, trying to test his memory or understanding of the material by addressing the relevant questions. He claims that 60% of the test has to be correct, though we have found no evidence of that in the instructions.

> I: Mmm, can you describe how you arrange your studies, when you start on a section... how do you work with the course?
>
> A: Well, what should I say?? No, its divided into quite short parts, each section, with questions at the end,

> so I, I did these parts... read through them, I have a notebook that I take notes in because... at the beginning I just read...(…) and then I go to the questions and try to answer them without looking (laugh) at my notes, 'cause it feels like its only yourself that your tricking, I think, 'cause not much fastens in your head... so that...so now I didn't get these. You have to get 60%, right I mean, and I haven't got that lately, so now I'm reading it all again, and I hope I'll get them right now, that's how I've arranged it. So I don't go on when I, if I haven't got them right... the questions.
>
> I: So you don't just do the tests again, but?
>
> A: No, I try to read it again, but then you have, when you read it again, you have the questions in you head anyway, and try to find the right answer.

C, in contrast, feels that if he hasn't managed to answer a question it might be that the question is a bad one, or trickily worded.

> C …Then at the end of each section there is a sort of quiz where you have to tick in A, B, C, something like that, and that's a bit, there are some trick questions I think, quite a lot actually, so that, I don't know... its like the old driving test, there were quite a lot of trick questions there too.
>
> I: Trick questions, in what way?
>
> C: Yes, but, I mean, like you could write the same thing three times but maybe change the order of two words, or like, change the word order a bit, so it means something else and so, it can be hard to see some things, even if you know the right answer, its, I think that some of those questions are a bit silly. Then it could be that I haven't read them properly

A also finds the questions tricky, but assigns that to the language rather than deliberate or accidental cunning.

> A …There are four alternatives and it can be, if I couldn't understand the alternatives properly I could understand what I had read anyway. I felt that I understood in general and then I got to the four alternative answers and I didn't understand them properly, then its had to give the right answers if you don't understand the questions. I thought that I had difficulties with the language, that I have a learning deficiency

Thus these "quizzes" play different roles for the different students, there appear to be qualitatively different ways in which they are experienced as mediating tools for learning. Further data is needed to take this notion further, and in coming interviews we will focus not only on tests but on the mediating tools to be found in the modules as a whole.

One of the set rules related to the quiz as mediating tool has already been referred to – the rule that a certain amount of the course has to be covered for a certificate to be awarded appears to have been interpreted by A to imply that a percentage of the test has to be right in order to continue.

discussion

In this study we have taken an overridingly phenomenographic perspective on learning. We are interested in the outcomes for individuals – how they go about their distance learning, what they learn in so doing, and how they relate their learning to their practice. But the situation in which they learn in is undeniably not individual. They are working in groups: groups constituted of their fellow students and groups constituted of their colleagues at work. Further, they have a history of studying, if not of studying in distance education, which might have an influnce on this new situation. Therefore we have chosen to turn to the socio-cultural perspectives on learning to enrich our theoretical framework.

As we have already described, it is the activity system, formulated by Engeström in his works (Engeström, 1999) that we have taken as our starting point, and our goal is to describe learning from the perspective of the learner in terms of the features of an activity system. In this paper we have focused on rules and tools, as two poles which appear from the interviews to be important for directing students' attention to the object of learning. The intellectual tools they encounter – animations and simulations for example – draw attention to significant aspects of the object of learning, while the rules they experience – completing a quiz or network etiquette – can be seen as both restricting and supporting their learning. However, our prime goal is still to describe individual learning, maintaining the content of the course as the object of learning.

We have made use of the notions associated with an activity system to inform our interviews, and as a result we have found variation in the ways the activity systems were experienced. We can draw inferences as to how these varied experinces contribute to (or detract from) the experience and outcomes of learning. For example, the student who sees a quiz as a number of trick questions (to take an extreme interpretation of C above) might not take the same degree of care over tackling them as does the student who sees them as a check of understanding. (We can leave on one side the issue of whether or not the quizzes did indeed test understanding, which is somewhat dubious). This is the sort of advice we need to be able to offer designers and tutors in distance education of this sort: they cannot take for granted what ways the test questions, or other devices, are treated, and should be prepared for a variation in response.

Staying with the notion of "rules", we can see that these rules also functioned as tools in various ways: the quizzes were – or potentially were – supports for learning, in that the students could find confirmation or consternation there. The tools-rules side of the activity triangle, thus, can be seen as a tension within the learner as they approach the object of learning. What is now a rule for studying – a quiz that has to be answered – then becomes a tool for learning – a prod to return to the text to find more on the subject, or a confirmation that one has grasped a point. Being able to see the intended tools and/or rules of the course in this two-sided way is important for tutors on the one hand – that they can be encouraged to clarify and emphasise their function – and for the students on the other hand – so that they can understand their purpose.

There are other tool-rule pairs that we are investigating. For example, the tutor can be seen as a tool for learning, a mediating and helping member of the system. At the same time, one student expresses an uncertainty about how to communicate with the tutor – a tool has rules associated with it that have not been made explicit. Another example is the group project that finishes the course, which is taken for granted as a tool for learning and the only rules concern deadlines for posting solutions. Here, too, there are different rules being applied by the different groups and by the individuals in a group (see Booth & Hultén, 2002) without them being formally acknowledged. One group waits until the last minute to discuss solutions while another enters intensive discussion early on; one group makes some social contact with new members while the other does not.

There are other potential socio-cultural perspectives that could support our search for understanding learning in these situations. For example, Hung and Chen (Hung and Chen, 2001) have drawn on Vygotskian thought in terms of "zone of proximal development, the general law of cultural development and the mediational nature of signs and tools" and situated cognition as developed by Lave and Wenger, where "the activities of person and environment are parts of a mutually contructed whole". As a result of reasoning on these and related frameworks, they arrive at four factors for "contributing to a vibrant and sustaining community": situatedness, commonality, interdependency and infra-structure. From these they derive design principles for e-learning on Internet which are normative in character. But similar reasoning could support further understanding of our situation.

Hung and Chen take the self for granted in their exposition, while Tu and Corry (Tu and Corry, 2001) focus on the "on-line self, on-line self-presentation, on-line social presence" in forming communities in e-learning. It can be argued that a group engaged in distance education activities come to form a community of sorts, though in our case the groups were somewhat fluid and short-lived. An intention was expressed by one of the designers of the course that communities of enlightened practice would be formed throughout the concern because f the course, but this was not taken up in course documentation or by any of our interviewees. In the long term, such notions as these can be brought into the study, taking into account Tu and Corry's concerns with the research design.

conclusions

This is work in progress, and here we have outlined the theoretical stand we have taken and some of the results that are forming. We see both theoretical and practical developments being made. The introduction of activity systems to describe interactions within a learning group is one innovation to the phenomenographic context that is being developed further. The design of distance education courses for such practice-related further education and support for tutors in such courses is also being developed, offering the possibility to identify what is being taken for granted that should be brought into focus – the phenomenographic project for educational development.

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