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Counting or Caring: Examining a Nursing Aide's Third Eye Using Bourdieu's Concept of Habitus

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Abstract

This article is derived from analysis of observations and an interview with, Anita, a nursing aide, who was followed in her work in a semi-emergency unit in Sweden. Based on an analysis of this information, it is suggested that the process of going from school to a workplace can be viewed as a transition between different mathematical activities, which involve and require learning. Although it is easy to see transitions occurring between different contexts, they may also occur within the boundaries of a workplace and be connected to critical moments in the execution of work tasks. Adopting a social critical perspective, this article initiates a discussion about the transitions between potentially mathematical activities in work and how the values given to these different activities can be understood. It is further suggested there is difficulty in recognizing some activities in work, because, often, they are over-shadowed by other competences and components needed in work, such as caring.

Key words: workplace mathematics; capital; habitus; transition; nursing aide

Introduction

Adults' mathematics learning takes place in a wide range of settings throughout life. Notwithstanding this, many of us have school mathematics as a reference for learning mathematics. The focus on mathematics within the context of schooling may make it difficult for one to detect and understand what mathematics may become in other spheres in life. In this article, I investigate potentially mathematical activities in a nursing aide's work using Bourdieu's (1992, 2000) concept of habitus[11], while taking into account that my previous experience as a vocational teacher of mathematics has influenced what I am able to see and understand.

The feeling of having a limited understanding of mathematics in workplaces, and a curiosity to learn more about this has been the driving force for my work. I became aware of my limited understanding of workplace mathematics when I worked as a mathematics teacher in vocational education and prepared tasks on intravenous drips. The students were to become nursing aides

[11] Habitus is at its most basic definition human's dispositions to act in the social world.

and I produced tasks on different drip speed, drip size, and concentrations of active substances. Having received help from a nurse, the tasks seemed realistic, with proper substances and so on. I was very happy with the tasks, until the students reacted with stress, anxiety and fear. Almost crying, they asked me if tasks such as these were really the responsibility of nursing aides'. I tried to calm them down and apologized several times for giving them inappropriate tasks, but I was left with a feeling of how limited I was in understanding the practice they were heading for.

Furthermore, I became more and more in doubt about school mathematics as being useful outside of school, although its relevance is often justified in this way (Dowling, 2005). The differences between mathematics taught in schools compared to mathematics in workplaces may have consequences for how adults' competence in workplaces is regarded (Gustafsson & Mouwitz, 2008, see also Björklund Boistrup & Gustafsson, in press). In addition, Wake (2013) suggests that workers sometimes do not even consider that what they are doing is related to mathematics, but rather to a goal-directed, workplace activity.

It is obvious that the use of mathematics in the work of nursing aides is situated in a certain context, influenced by many factors, such as the workplace organization, the well-being of patients, and possibly also the relationships that humans have with mathematics. Trying not to diminish these important aspects of the work situation, while remaining focused on the potentially mathematical activities, my aim is to consider how the transitions between different potentially mathematical activities can be understood through Bourdieu's, concepts of *habitus* and *capital* (Bourdieu, 1992, 1996, 2000, 2004). In so doing, I ventured to investigate if it is possible to do two things: (1) capture the mathematical knowledge frequently labelled as tacit, and (2) identify what may be gained and lost in different transitions humans make when moving between contexts.

Mathematics in work

Activities involving mathematics in workplaces are not easily described, as they are often connected to the use of the technology and routines (e.g. FitzSimons, 2013; Hoyles, Noss, Kent, & Bakker, 2010; Jorgensen Zevenbergen, 2010; Wake &Williams, 2007; Wedege, 2000, 2004a). Consequently, the mathematics in these activities has been discussed as being *"black-boxed"*, both socially and technically (Wake & Williams, 2007). By this, they mean that the use of technology and automation has created a distinct genre of mathematics. With the increased use of technology, mathematics becomes more implicit, and hence technically black-boxed. Moreover, different groups and staff members in the workplace have different norms and rules, and this division of labour creates a social black-boxing. The notion of black-box derives from Latour (1993), and his networks of people, objects and ideas seemingly function as a whole, in which certain parts become invisible. Mathematics in work has also been labelled as tacit, with the possibilities for making it explicit considered difficult although not impossible (FitzSimons, 2002).These difficulties in identifying the mathematics may lead to a gap between adult learners' perspectives on learning mathematics, compared to those of education policy makers and employers (Evans, Wedege, & Yasukawa, 2013). FitzSimons (in press) found that curriculum and vocational numeracy education mostly was about content knowledge, and hence based on narrow assumption of what vocational students may need. Instead if perceiving simple operations as sufficient for those students, FitzSimons further suggests that there is a need for a more holistic approach. With this approach not only the conceptual understanding is considered but also the creativity required in the workplace, and she notes:

> However, in the workplace, as elsewhere in society, problems are ever-evolving and the development of new knowledge – locally new if not universally new – is an essential requirement

> for completing the task at hand within constraints of time and/or money, so workers often find themselves in 'unthinkable' territory, creating new knowledge. (FitzSimons, in press, p.1)

Hence, there is a complexity surrounding the mathematics involved in workplace activities. Another complexity is that researchers use both mathematics and numeracy to describe activities in the workplace. In this article I avoid this sometimes value-based distinction. Instead I use the term mathematics in a wide sense when focusing on the transitions between different potentially-mathematical activities of nursing aides.

Mathematics for nurses

Similar to the case with other workplaces, previous studies have shown that the mathematics used by nurses is strongly interwoven with the practice of nursing, its routines and other important considerations (Coben, 2010; Pozzi, Noss, & Hoyles 1998). Consequently, there may be differences for nurses in what they learnt in their formal education and what they actually do. For example, Pozzi, et al. (1998) described how nurses considered that "knowing the drug" was a better safeguard against errors, than using an algorithmic calculation suggested in teaching text for nurses. The safety of patients is crucial in this kind of work, and mistakes in an emergency unit can have serious and fatal consequences (Coben, 2010). In such a context, numeracy is about being confident, competent, and comfortable in deciding whether to use mathematics and how (Coben, 2010).

Although the work of nurses has some similarities to that of a nursing aide, the fact that nursing aides do not have medical responsibility indicates that there are also some differences. For example, there are differences in the social and historical conditions around these professions and the division of labour involved. These kinds of differences are important because they may have an impact on Williams and Wake's (2007) social black-boxing. Evertsson (1995) claims that the history of the profession of nursing aides is, to a large extent, neglected and over-shadowed by a focus on nurses. Caring institutions and hospitals reflect the power structures in society and in the educational system, with regard to class and gender, for example (Evertsson, 1995).

A sociomathematical approach and Bourdieu's concepts of habitus

In the sociomathematical approach (Wedege, 2004b), mathematics is related to more than mathematics as an academic discipline, and also it takes into account mathematics as a social phenomenon and school subject (Wedege, 2004b). Examples of sociomathematical research interests are peoples' relation to mathematics, and the function of mathematics education in society (Wedege, 2004b). Both humans and general structures are in focus in this approach, and in particular the interplay between *general* structures and *subjective* meaning is highlighted. The tension between humans and societal structures is captured by Wedege (2004b, 2010), who makes a distinction between *demands* made on humans, for example in school or as requirements for getting a job, and the mathematics *developed* by humans in certain practices.

Following Wedege's (2004b, 2010) suggestion, I consider general structures of the workplace as having certain mathematical demands on nursing aides, but also that the nursing aides themselves develop their own mathematical competence. This individual creativity may be crucial when facing difficult tasks or demanding tasks (FitzSimons, in press). By this, I do not mean that official demands made on workers are necessarily more or less important than the developed competences, rather they are complementary. One example of a study accounting for both the demanded mathematics and what is developed by workers, could be given by the findings of Pozzi, et al. (1998). They compare the common algorithmic procedures and formulas suggested for drug administration in teaching texts for nurses, with what nurses actually do. The formal and assumed calculations in the teaching texts for nurses are examples of the demanded mathematics. The authors further observed how the nurses instead used the specific concentration and more for each drug as the basis for their calculations. One example of such a calculation was *"doubling it and put an extra zero"*, which was the calculation used for a certain drug (Pozzi, et al.,1998, p.110).

This way of finding alternative arithmetic methods by "knowing the drug", as described by Pozzi, et al. was also the safeguard against errors. This provides an illustration of the developed mathematics. In this article my focus is the transition between the demanded and the developed mathematics. The urge to capture the knowing to be found in those transitions has also guided my theoretical choice. In the framework of Bourdieu the mutual interplay between humans and society is captured in the concepts of *habitus*. Habitus is a system of dispositions, defined by Bourdieu (1992) as:

> The conditions associated with a particular class of conditions of existence produce habitus, systems of durable, transposable dispositions, structured structures predisposed to function as structuring structures, that is, as principles which generate and organize practices and representations that can be objectively adapted to their outcomes without presupposing a conscious aiming at ends or an express mastery of the operations necessary in order to attain them. Objectively 'regulated' and 'regular' without being in any way the product of obedience to rules, they can be collectively orchestrated without being the product of the organizing action of a conductor. (p. 53)

Thus, the habitus is to be found firstly in the conditions of existence, which commit humans to the social structures, sometimes without objective and conscious goal orientation. Moreover, habitus is a complex system of dispositions for acting in the social world, transposable but at the same time durable and carrying collective features. In Wedege's (1999) research, a woman's habitus was shown to have influenced her dispositions towards mathematics, and her dispositions for seeing herself as mathematically competent. The woman was born in a saddler's family in Denmark at the beginning of the previous century, and failed in school mathematics. This outcome was seen as normal for a girl at this time. Later success in mathematics and involvement in mathematics at work and during leisure time, could not completely overcome how the woman perceived herself with regard to mathematics. With this case Wedege provides an example of the complexity of habitus carrying features of both class and gender, not as stereotypical labels but rather inscribed in the person as natural features in a specific context. It is also clear in this woman's case how habitus is durable yet transposable or changeable, as she never fully ceased to see her failures in mathematics. If mathematics is the foundation of the sociomathematical approach (Wedege; 2004b, 2010), then, as discussed in the next section, Bourdieu's different *capitals* act as the link between humans beings and social structures in a framework via habitus.

Bourdieu's concepts of capital in relation to habitus

Bourdieu (1992, 1996, 2000, 2004), described different forms of capital, such as economic, cultural, and symbolic and saw them as the link between the individual and the social world. Humans act in the social world to convert one form of capital to another, according to which form is valued in the particular social space (Broady, 1998). Cultural capital has to do with education, as a consideration of both upbringing and the educational system. How the cultural capital is valued may differ according to different cultures and school systems. In Bourdieu's work, the French system was in focus, and so his discussion of the impact of cultural capital may not be valid in another context or at different points in time. However, as Williams (2012) notes that this kind of capital has an exchange value. By this, he means that a particular mark or degree in school mathematics becomes an entrance ticket to certain jobs or further education. Consequently, cultural capital can be considered the formal education for nursing aides in mathematics. Social capital is the social relations or contacts and can also give humans a kind of interest rate on their educational capital. The symbolic capital refers to what is valued in a certain social space. This kind of capital can grow into the body and become part of our habitus, sometimes unconscious and invisible, even to ourselves. For example, when we just know what to do in a given situation, often out an obvious necessity and make use of our embodied symbolic capital (Bourdieu, 2000). Corporal mechanisms and mental schemata in a person's habitus can even erase the distinction between the physical and the spiritual world (Wacquant, 2004).

In this study, the focus will be on habitus, cultural capital, and symbolic capital. The concepts of Bourdieu have also been used for earlier studies concerning mathematics in work, and were found to be useful tools for the theorization of the world of work, and how mathematical dispositions may promote or hinder workers (Zevenbergen Jorgensen, 2010). The concepts of Bourdieu were in this study useful for understanding the younger workers' skills, instead of seeing the young workers as having limited numeracy. Zevenbergen Jorgensen found significant differences in habitus, and also how these differences created tensions between old and young workers based on their ways of seeing and enacting numeracy. The younger generations' habitus were to a larger extent influenced by digital technology, while the older had more manual arithmetic frames of reference.

Bourdieu does not explicitly mention mathematics as a form of capital. In his later work, he did emphasise how there was a shift from Latin to mathematics as a selection tool in the educational system (Williams, 2012). The importance given to mathematics in the education system influences its value. What is considered as important and relevant with regard to mathematics also changes over time as shown by Zevenbergen Jorgensen (2010). Therefore, it is likely that different mathematical activities are valued differently and hence hold various amounts and forms of capital. This is important in a study about nursing aides, where the hierarchical workplace organisation as a practical and rational matter, may conceal other power relations (Evertsson, 1995). These relations affect the valuing and attention paid to certain activities. The focus in this article is potentially mathematical activities, and when nursing aide may need to make *transitions* between these in critical situations.

Transitions

In transitioning from school to work, for example, it is important to recognise the transformation and creation of new relations between knowledge and social activities, and how this could contribute to an understanding of mathematics in the workplace (Wake, 2013). Meaney and Lange (2013) see transitions between contexts as always involving learning, with contexts being defined as systems of knowledge enacted in social practices. The notion of transition could also be seen as a way around the issue of transfer (Beach, 1999). Beach claims that transfer derives from educational psychology and refers to cognitive matters. From a purely cognitive approach, transfer is seen as relatively unproblematic (Evans, 1999). Evans notes that from a situated perspective, transfer instead should be considered impossible. Beach (1999) suggested an alternative stance from a sociocultural viewpoint, namely that of consequential transitions, which means transitions that are reflected upon from a sociocultural perspective. Thus, the social and historical context of the activity is taken into account as well as the artefacts involved. Beach also identifies several forms of transition. In this article, I make use of

Beach's lateral and encompassing transitions. The former occurs when individuals move between contexts such as school and work, and the latter when change occurs within the boundaries of a social activity.

Encompassing transitions I suggest can be related to the moving between the demanded and developed mathematics in the sociomathematical approach. By this I mean that the official ways to handle a work task are related to the demanded mathematics. Workers also develop complementary ways of completing the potentially mathematical tasks. In other words it is likely that workers in general, and nursing aides in particular, need to make transitions between what is demanded and what they develop. I find it important to shed light on the dichotomy between developed and demanded, as the transition between these has and holds learning opportunities. I suggest that this can be done by understanding different ways of being engaged in potentially mathematical activities, the transitions between them, and the value the activities are given.

For this purpose I have chosen the concept of habitus (Bourdieu,1992, 2000), firstly because of its possibility to grasp the interplay between individuals and structures. Secondly, my reason for choosing habitus and capital is the fact that habitus has a clear corporal component and different capitals can grow into the body. Hence, there is a possibility that the body becomes itself a black box. It is important to try to understand the significance of the bodily understanding when people transition between the demanded mathematics and the developed. This I see as crucial for reducing the gap between adult learners' perspectives on learning mathematics and those of education policy makers and employers. The incorporation of capitals is also connected to learning. Bourdieu (2000) describes learning as a durable bodily change (see also Wacquant, 2004). Habitus as a theoretical choice calls for methodological explanation and justification.

Methodology

My intention with this small scale case study (Bryman, 2008) is not to produce a truth, but rather to understand and construe the transitions made within the boundaries of a workplace not familiar to me. This is done through my interpretation of the work of Anita (a pseudonym). As a matter of reflexivity (Hammersly & Atkinson, 1995; Malterud, 2001), my lack of previous experience was used as an advantage. What was obvious for a person with Anita's long experience was not at all evident to me. This made it possible to pinpoint tacit knowing. Anita is a nursing aide, with more than twenty years of experience, both in her home country in Eastern Europe and in Sweden. The empirical part of the study was conducted with inspiration from ethnography (Hammersly & Atkinson, 1995). However, in a study of this format it is not possible to provide the descriptive thickness normally associated with ethnography. In addition, there is the ethical dilemma of construing another person's habitus. Bourdieu (2000, p. 128) writes: "Even among specialists of the social sciences, there will always be those who will deny the right to objectify another subject and to produce its objective truth."

Access was facilitated by a research team member having personal contact with a nurse. From this contact we were introduced to a physician, also head of the ward. He gave us permission to enter the ward with a video-camera. On the ward the nursing aide in charge picked a colleague for us to follow. First our intention was to follow the nursing aide in charge, but she wanted, as she said, to give this opportunity to a colleague of hers. This she told us was because the nursing aides were so rarely paid attention. Two video-recorded visits were made in a hospital in Sweden 2012, each lasting for about an hour. These were then transcribed. After an initial analysis, an informal interview was held with Anita. Having in mind that that mathematics in the workplace might be black-boxed, both technically and socially, the topics of the interview were to a large extent introduced by Anita. She talked much about how the profession of nursing aides had developed from formerly being about assisting nurses to nowadays being what she called "its own profession". This is aligned with Evertsson's (1995) historical analysis of the profession overshadowed by a focus on nurses.

The interview was tape-recorded and partly transcribed. The sound was of good quality except a short part which was difficult to hear as Anita and I watched the video together. In qualitative research the reliability is often referred to as dependability (Bryman, 2008), and the data loss when we watched the video was compensated by what was gained by Anita explaining what had happened during the observation. As the interview was conducted a couple of months after the observation, looking at the video were also crucial for refreshing our memory. Another way of ensuring dependability was to look at the video together with researchers in the team before conducting the interview. From the individual case of Anita alone it is not possible to make any generalisations, frequently labelled as transferability in qualitative research (Bryman, 2008; Malterud, 2001). With the concepts of Bourdieu it is, however, possible to connect the individual case to the social structures in society. This is aligned with the methodology proposed by Salling Olesen (2012). He notes that workers or groups of workers invest their body and soul, knowledge and commitment when entering a workplace, but they do so against the background of a life history that is a part of a wider societal context (Salling Olesen, 2008, 2012). About, using an individual case Salling Olesen (2012) claims:

> It is to use this individual case to theorize learning as an aspect of the social practice, a moment in a subjective life history embedded in the symbolic and social environment, and contributing to societal processes of reproduction as well as innovations. (p. 5)

This methodological view – taking the connection between individuals and society into account – is aligned with the framework of Bourdieu. The possibility for including the bodily manifestation of habitus was facilitated by the use of video and the opportunity to watch it several times. Thereafter, it was possible to raise questions about issues not understandable by the observation alone. My intention with carrying out firstly observations and then the interview was to grasp the complexity of habitus, in which my own habitus, with its own connection to mathematics education, was also considered. Therefore, I have tried to be attentive to and reflect on my own relation to mathematics, and to school. School mathematics will have influenced our perceptions of mathematics; both regarding what should be included as mathematics, and also as a personal relation and experience of it. Thus, our understanding of mathematics and emotions related to it are likely to be connected to the school mathematics incorporated into our habitus (Lundin, 2008).

The analysis makes use of the sociomathematical concepts of demanded and developed mathematics. By this, I refer to the demanded mathematics as what is required in this kind of work, in relation to the mathematical activities that are developed in work. I start with a description of the observation, then I analyse what could be seen as demanded. Then the interview with Anita is described. The analysis is supported by the concepts of habitus and capital, and the notion transition.

Visiting Anita at work

The first meeting with Anita was made at the semi-emergency unit where she works. To blend in with the environment, those of us in the research team had to wear the same white clothes as the staff. I followed and observed Anita, while a research colleague was video-recording. This made it possible for me to ask questions in order to understand what was going on, which had to be done in a manner that did not disturb the work.

During this first visit, Anita was monitoring patients or *"tog kontroller"* (which means "took controls" in English) on the patients, as said it is described on the ward. The patients were connected to digital supervision monitors. Controls, she told us, were made every four hours and included collection of the physiological parameters: respiratory rate, heart rate, blood pressure, temperature, urine output, and alertness. Different values of these parameters were given colours and scores on a chart. The chart (see Figure 1) was coloured outwards, from green in the middle (0), then yellow (1), orange (2), and, finally, red (3) at either end. The red columns indicated the most critical values. A total score ≥ 5 required immediate attentions from a doctor and the emergency team. There is also an additional text in the chart, which says that deep concerns about a patient or acute deterioration are other reasons for contacting the doctor and the emergency team.

During the control of one patient, a doctor was summoned to take a blood sample for a blood gas analysis. The blood gases are connected to several of the physiological parameters in the chart, but give another kind of description of the patient's condition. The doctor arrived quickly and took a blood sample and disappeared after a few minutes. Anita then took the sample to a digital laboratory where the analysis was performed and automatically transferred onto digital patient records. In the digital laboratory, Anita said: "This will take a minute, but one minute is a long time so I can do other things instead, so I will not wait for the test results". After this, Anita returned to other patients to encourage, console and chat, while further controls were made. None of the controls were apparent to an observer, but these were explained by Anita afterwards. The observation clearly noted that Anita was devoted to caring and comforting.

Figure 1. The coloured chart, with normal and critical values.

After having collected the values from the patients Anita took out a piece of scrap paper from her pocket (Figure 2) and typed in values in the patients' digital hospital record. The scrap paper shows the data collected from two patients.

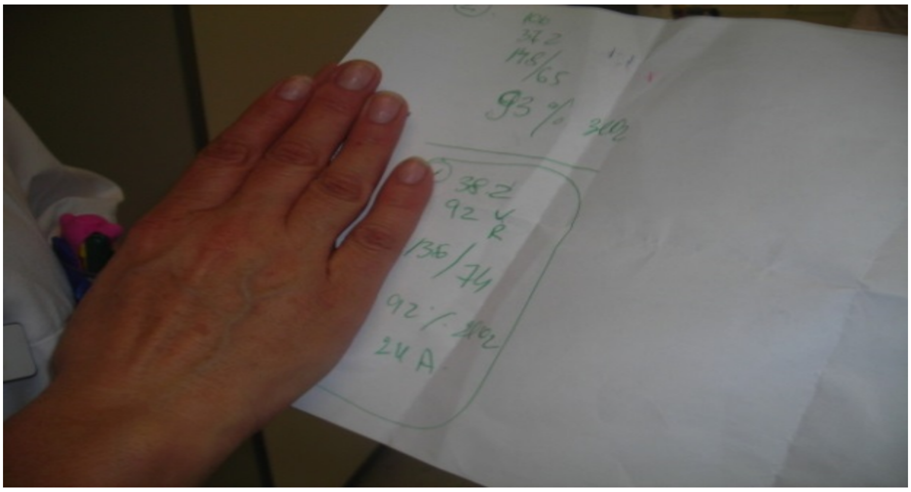

Figure 2. Anita’s scrap paper showing one patient’s values are circled.

While these routines appear to be very structured, and even have numerical and mathematical content, the nursing aides on the ward did not seem to have these perceptions. On several occasions, they said "you know" or "you feel" or even "it's the third eye". We were told, during the observation, that the *“third eye”* was an important characteristic of the nursing aides’ skills. During the interview, Anita told me more about the third eye. She said that “everybody can have it, but not from the beginning,” suggesting that it develops from experience. There also seemed to be a tension between the rational chart, based on numeric values, and the more elusive feeling of just knowing. This feeling is discussed later in more detail.

While the observation clearly noted that Anita was devoted to caring and comforting, it was not noted that she also, for instance, counted breaths minute. This became clear during the interview, when she gave an example of how she is counting breaths. It was also visible on her paper, which she showed us after she had taken the controls. The respiratory rate or breaths per minute is noted as “24 A” on the paper in Figure 2. Otherwise, the explicit use of numerical values seemed absent, as these were probably not very interesting for the patients. Only once did Anita explicitly talk about values, and it was to convince a patient about her recovery: "Your values are much better today than they were yesterday, so much better".

Analysis of the demands

After having visited Anita at work, and also interviewing her, it was obvious that taking the controls on the patients was one of her regular and important work tasks. The coloured chart with its columns and scores can be considered as part of the explicit and demanded mathematics. So, from the sociomathematical viewpoint, handling the chart can be seen as one mathematical requirement for nursing aides. The coloured chart was used for facilitating the judgment of a patient’s condition, and to identify patients at risk of catastrophic deterioration. In order to take the different parameters measured into account, these are given different scores, and a total score of five or more is defined as a risk, which needs attention from a doctor. Understood in mathematical terms, nursing aides need skills in:

- Reading a chart
- Understanding distribution of values, facilitated by colours
- Comparing values

- Adding values

This could be considered as basic mathematics by for example a mathematics teacher. By giving the values different scores which need to be added, it can be reduced to simple calculations. This work can be considered as needing only a limited amount of cultural capital, or education.

The interview with Anita makes clear that "17 is not always 17"

When I met Anita we had a conversation about working as a nursing aide. With her many years of experience, also in different countries, she had a lot to tell. Due to her experience and by having a mother tongue other than Swedish she also volunteers as an interpreter on the ward. This she told me has a certain value for doctors and of course for patients, in a semi-emergency unit where quick decisions are crucial. Over and above this she talked about her presence as having a calming influence on immigrant patients because they felt confident with her. She had difficulties in explaining this but phrased it as: "She is like us". The conversation also covered much about workplace education but did not turn to mathematics, which I wanted to understand more about it in relation to this workplace. (The Swedish original transcript is given in brackets)

> **Maria:** *I was thinking about this technical, technical education, and such. All the things you do with the tests, reading the monitors, using the charts, and so on. To me it seems somehow like mathematics.* (Jag tänkte på det där, det där med teknisk utbildning och sånt. Alla saker du gör med tester, avläsa monitorer, använda tabeller och sånt. För mig verkar det på något sätt som matematik.)
>
> **Anita:** *Yes, it is!* (Ja, det är det!)
>
> **Maria:** *But I don't know… if I think about school… how could school provide this education?(* Men jag vet inte… om jag tänker på skolan… hur skulle skolan kunna utbilda för detta?)
>
> **Anita**: *Ah, okay you mean like that … one should have basic mathematical skills, absolutely, like percentages, one should have the basic knowledge but nobody will ask about sine and cosine, nobody will … but I have learnt it and everybody has but for our profession I mean that we need the basic stuff. It has to do with percentages, addition and subtraction. That is necessary but I take for granted that everybody knows that.* (Ah, okej, du menar så… man ska ha, man ska ha grundläggande matematiska kunskaper, absolut, som procent, man ska ha grundläggande kunskap men ingen kommer att fråga efter sinus och cosinus, det kommer ingen att göra, men jag kan det och alla kan det men för vårt yrke är det vi behöver det grundläggande. Det har att göra med procent, addition och subtraktion. Detta är nödvändigt men det tar jag för givet att alla kan.)

It worth noting that Anita considered trigonometry as something that everybody has learnt. As I perceived that there was something, from my own school mathematical habitus "vaguely mathematical" in her work, I tried to find out more about it:

> **Maria:** *It is difficult to explain, but all the judgments you make and all the priorities you have, and the fact that you do it differently…like when you read from the monitor and taking the pulse manually.* (Det är svårt att förklara men alla bedömningar du gör och alla prioriteringar, och just det att du gör det annorlunda…till exempel när du avläste monitorn och tog pulsen samtidigt.)
> **Anita:** *I think it is normal and obvious. Such thing cannot be learnt in school.* (Jag tycker att det är normalt och självklart. Sånt kan man inte lära sig i skolan.)
>
> **Maria:** *For you it is obvious but for me coming from school it is very interesting.* (För dig är det självklart men för mig som kommer från skolan är det väldigt intressant.)
>
> **Anita:** *For example I count the respiratory rate. All people breathe differently and when they are ill even more differently. Such things you don't learn … so I count the respiratory rate of one*

patient and get 17 … let's say 17 but I have learnt that this patient has 17 because s/he is ill. I can judge that, I can judge that the other has 17 because s/he really doesn't feel well, yet another has 17 because s/he is hyperventilating, and that one has 17 by pretending in order to get more morphine than s/he has already got, and that one has 17 because… (Till exempel så räknar jag andningsfrekvensen. Alla människor andas olika och när de är sjuka ännu mer annorlunda. Såna saker lär du inte dig i skolan…så jag räknar andningsfrekvensen hos en patient och får 17, säg 17, men jag har lärt mig att hon har 17 därför att hon är sjuk. Jag kan avgöra det. Jag kan avgöra att en annan har 17 därför att han eller hon verkligen inte mår bra, och en annan har 17 för att han eller hon hyperventilerar, och den har 17 för att den låtsas för att få mer morfin än den redan har fått, och den har 17 för att…)

Maria: *I think it is really interesting that 17 can mean so many things compared to school, where it means 17.* (Jag tycker verkligen att det är intressant att 17 kan betyda så olika för i skolan betyder det ju 17.)

Anita: *This is something completely different, and everybody here would have told you exactly the same.* (Detta är något helt annat och vem du än skulle fråga så skulle du få samma svar.)

Being a bit confused by 17 not being 17, I return to this issue again:

Maria: *This I find really interesting ... even this you are saying about the respiratory rate. Because you mean that we have different lungs and you cannot know how much oxygen a breath contains neither measure the volume of the lungs, so this is replaced by a feeling…that you feel what 17 means in this case.*(Det här är ju verkligen intressant…även detta du säger med andningsfrekvensen. För att du menar att vi har olika lungor och du kan inte veta hur mycket syre varje andetag innehåller eller mäta lungornas volym, så detta ersätter du med en känsla, att du ser och känner vad som menas med 17 för just den patienten.)

Anita: *Yes, it is the same as with the woman I just looked after. On our ward we have a machine that is connected to the patient and from that I have learnt to read how much air that is getting into the lungs.* (Ja, det är samma som med den kvinnan jag nyss tittade till. På vår avdelning har vi en maskin som kopplas till patienten och där vi har lärt oss att avläsa hur mycket luft som kommer in i lungorna.)

Maria: *Aha…* (Aha…)

Anita: *Such things are learnt here in work* (Såna saker lär man sig här på arbetet.)

Maria: *This machine…now I must try to understand…this machine can measure what you have a feel for?* (Alltså den här maskinen…nu måste jag försöka förstå…den här maskinen mäter det du känner på dig?)

Anita: *Yes, something like that.* (Ja, någonting sånt.)

Maria: *It is actually quite…* (Det är ju faktiskt ganska….)

Anita: *Yes, something like that...* (Ja, någonting sånt...)

This extract of the interview with Anita suggests that there is more going on than merely the collection of the patients' values and comparison of these with the values on the coloured chart. Instead, Anita has developed an experienced-based abstract feeling for the patients' condition – a third eye. As an example of this feeling she takes 17 breaths per minute to illustrate what differences in meaning an isolated and discrete figure can have.

Analysis of the developed mathematics and the "third eye"

Taking the respiratory rate as an example, the chart gives concrete and decontextualized values. This I suggest is in contrast to what Anita says about counting to 17, as an abstract value related to many other parameters as, for example, the depth of each breath, or about a patient's simulation of illness. When the rate of breaths is connected to, for example, the volume of lungs, the depth and the pressure, it is closer to a function of oxygen saturation of the blood than to discrete and concrete values. Anita's explanation of counting to 17 does not explicitly refer to mathematics, although many different parameters and the relations between them are taken into account. Instead I suggest that it refers to "the feeling" the nursing aides have, which they also label as "the third eye".

I interpret the "third eye" as what is developed from a sociomathematical perspective. So, having the third eye could be seen as a symbolic and also embodied capital shared by competent nursing aides, a disposition to understand the patients' conditions and act accordingly. In critical situations there is no time for reasoning. Instead, having the habitus of a skilled nursing aide involves the corporal or sensual component of the "third eye", allowing for judgements and decisions. Furthermore, relating the respiratory rate to many different parameters requires a higher level of abstraction than just calculating a total sum of 5. By this I do not mean that one form of knowing is preferable to the other, but rather how both forms of knowledge can be seen as complementary.

What is, instead, interesting to note is the transition between the explicitly demanded mathematics on the chart and the developed but elusive feeling. This transition I suggest requires a habitus with the "third eye," but also the demanded mathematics as cultural capital, and hence formal education. Moreover, it requires confidence and some power to, if needed, go against the coloured chart. The mathematics demanded in this case is rather basic, but facilitates the workplace routines and probably increases patient security. However, it seems crucial to be competent, confident, and comfortable about how to and when to use mathematics, as Coben (2010) suggests in her definition of numeracy for nurses. I suggest that the skill of making these transitions should be paid more attention, and also the connection to reasoning and to being critical in general.

Discussion

Although mathematics in work is different from school, it could be relevant to consider the similarities between the mathematics demanded in work, such as the coloured chart, and school mathematics. In doing so it is also necessary to pay attention to the transitions that have to be made in critical situations. An example of this is when Anita compared her capacity, or her "third eye," to a number on the chart. Therefore, it would be a mistake to consider the explicit demanded mathematics as what is needed purely in terms of school mathematics. In connection to this it is also worth mentioning the limitation that my school mathematical habitus places on understanding what is actually going on. My focus when doing observations was on the chart and technical tools. It was not until I had the conversation with Anita that I became aware of what else was going on.

It would be naïve to believe that this activity can easily be contextualized in school mathematical tasks. Furthermore, the development of a "third eye" could not possibly happen in school, as Anita noted. A third-eye is certainly not gained from so-called real world problems. A misplaced contextualization can even make the task less accessible for several reasons. It may be that it makes students worried because it is not in line with the work they are heading for, as was the case with my intravenous drip task. Another risk is that the contextualization restricts or overshadows the mathematical content, which gets less space and probably becomes insufficient for vocational students. Therefore, the benefit of contextualized tasks should be further investigated, although it is still important to take into account the complexity in work and influencing factors others than mathematics.

Viewing learning as a bodily change (Bourdieu 2000, Wacquant, 2004) the embodied knowledge that Anita developed as a feeling of what 17 means in a particular case is, to some extent, related to mathematics and a crucial competence in Anita's work. The symbolic capital of the "third eye" grows into and becomes a part of the body and senses and thus a part of habitus, as a form of bodily knowing. However, it is less likely to be acknowledged than the explicit use of mathematics found in the demands and in the chart. So, ironically, in this work transitioning from a lower level of abstraction to a higher leads to a loss of the visible need for cultural capital. The embodied knowledge is rendered invisible as it becomes a part of an experienced nursing aide's habitus with the "third eye" as an important characteristic. The third eye is consistent with what Wacquant (2004) writes about corporal and mental schemata of habitus erasing the distinction between the physical and the spiritual world. The difficulties in detecting this knowing, together with the historical subordination of nursing aides, may lead to an assumption that abstractions or mathematical reasoning are neither needed nor used by nursing aides.

When observing the semi-emergency unit with a video camera, I could not by any means perceive that Anita was focusing on counting breaths per minute and judging the rate in relation to other conditions. What I perceived was, instead, how she cared for the patients and gave them comfort. I suggest that this could also be seen as an example of the black-boxing, mentioned by Williams and Wake (2007). She was apparently doing both caring and counting simultaneously in order to make the patient feel comfortable while she was counting. This is also aligned with common requirements in a workplace where conceptual knowledge and creativity are mutually dependant when completing work tasks (FitzSimons, in press).

Making the assumption about the profession of nursing aides as being mostly about caring is misleading. Instead, I see a need to further investigate the kind of knowing that is frequently labelled as tacit, or as being black-boxed either technically or socially. It is important to take into account how the profession of nursing aides has been viewed in the past, how it has developed and is viewed in our current society. Certainly, the transitions between the chart and the "third eye" require a particular competence and experience. From a sociomathematical viewpoint, it is an act of balancing between the demanded mathematics and the developed. Seen as a reflected transition these acts of balancing require learning. If vocational students are provided with short courses, or restricted curricula, it will have serious consequences. These will not only affect the possibilities of gaining access to higher education, but may also lead to the presumption that the work force is easily educated and replaceable. This is just the opposite of what Anita explains about her work

What is happening in the transition between the demanded mathematics and the developed in terms of corporal understanding needs to be further researched. I believe that it is also highly relevant to consider the transitions adult learners have undertaken, such as, for example, moving from school to work, or moving between other kinds of contexts such as different countries. An example is when Anita refers to trigonometry as something that everyone knows, but which is different to how I view it. It seems as if this cultural capital gets lost in her transition to a new country. This could also be seen in relation to how Anita volunteers as interpreter on the ward. Whether she knows trigonometry, or not, is not of interest in this work. Instead, she had made use of her language skills, and probably gained a position on the ward through doing so. There also seem to be parts of her habitus shared by immigrant patients who feel comfortable and secure with Anita.

The question of whether it is common or rare to know trigonometry is however hanging in the air. It is not possible to know retrospectively if this knowledge could have been an advantage in the Swedish education system. Some parts of habitus or certain capitals may be lost or rendered invisible in different transitions, and others may instead be rendered visible. The question is who benefits from what is gained and lost in these transitions, and the overall question that I think needs further investigation is: What can we learn from the different transitions learners make, and how can these be related to mathematics? For this purpose, the concepts of capital and habitus, and, more specifically, the changes habitus undergoes in transitions, could be useful as analytical tools. An underlying question is if the label tacit knowledge is more relevant for work than for school, or if it could be that certain forms of knowing are silenced?

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