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Ethnomathematics and mathematical literacy:
People knowing mathematics in society

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Ethnomathematics and mathematical literacy are two central notions about knowing mathematics in the world. While ethnomathematics stresses people's competence developed in different cultural groups in their everyday life, the idea of mathematical literacy mainly focuses on the mathematical and societal requirements to people's competencies. Starting with a critical and constructive view on ethnomathematics and on mathematical literacy, I suggest sociomathematics as an analytical concept for a subject field (people's cognitive, affective and social relationships with mathematics in society) and a research field in mathematics education encompassing the study of the two competences.

What does it mean to know mathematics? The mathematics teacher may find answers to this fundamental question in the curriculum and at the same time her/his personal beliefs about mathematics involve a response to this problem and to others like, what does it mean to learn mathematics and why teach mathematics. The researcher in mathematics education also needs answers to these fundamental questions and a series of scholars have replied by defining mathematical knowledge (capability, capacity, competence, proficiency) (e.g. Ernest, 2004; Kilpatrick, 2001; Niss, 2003; Skovsmose, 1990). Starting from a broad sociocultural perspective on mathematics education, it is obvious that any definition is value based and related to a specific cultural and societal context. This is evident when it comes to two of the central notions about people's mathematical competences in and for a culture respectively a society: ethnomathematics and mathematical literacy. In this paper my focus is on *knowing mathematics in the world*, which is a broad and slippery expression that I use to cover a wide spectre of notions and ideas about what it means to know, to develop and to use mathematics in different cultural and societal contexts and situations. Through a critical analysis of a series of these notions, I aim at a terminological clarification illustrating some decisive differences between conceptual constructions of ethnomathematics and of mathematical literacy. Against this background, the analytical concept of sociomathematics which combine complementary aspects of the two concepts is presented and briefly discussed.

First observation: Functionality and contextuality

Under the heading *Mathematical literacy*, Jablonka (2003) includes a long series of notions and concepts about knowing mathematics in the world – among which are ethnomathematics and mathematical literacy – in her chapter of the Second International Handbook of Mathematics Education. Her aim is to investigate different perspectives on mathematical literacy that vary with the values and rationales of the stakeholders (e.g. politicians or researchers in different cultural and societal contexts). Jablonka argues that every conception of mathematical literacy promotes a particular social practice – implicitly or explicitly. In the paragraph introducing the section "Defining mathematical literacies", she points out some problems following from the very idea of knowing mathematics in the world:

> Any attempt at defining 'mathematical literacy' faces the problem that it cannot be conceptualised exclusively in terms of mathematical knowledge, because it is about an individual's capacity to *use* and *apply* this knowledge. Thus it has to be conceived of **in functional terms as applicable to the situations** in which this knowledge is to be used. (Jablonka, 2003, p. 78 [my emphasis])

My first observation is that knowing mathematics in the world is about *functional* mathematical knowledge in different situations in domains like education, economy, culture, science, democracy, etc. This is not a trivial assertion as Skovsmose (1990) bases the distinction between mathematical knowledge as such and technological mathematical knowledge, which is knowledge about how to build and how to use mathematical models, on a thesis stating that by learning mathematics (understood as a specialised academic discipline) you do not automatically learn how to use it. Or, in other words functional mathematical knowledge cannot be reduced to "pure" mathematical knowledge. Neither does one learn to evaluate other people's use of mathematics in mathematical models. This is the reason for Skovsmose's distinction of a third type of mathematical knowledege: reflective knowledge. In table 1, I have collected a series of terms used in the literature to describe different notions and conceptions of functional mathematical knowledge.

When mathematical knowledge is claimed to be functional it is necessary to determine where (in school or everyday life) and for whom (society or individuals) (Johansen, 2004). In PISA (OECD, 2003), mathematical literacy is defined in functional terms and it is claimed that young people's readiness to meet the challenges of the future (mathematical literacy) is measured by means of mathematical tasks with so-called "real world" contexts. According to PISA, the example shown in figure 1 is using content of the overarching mathematical idea "quantity" and is set in an occupational situation of a carpenter. However, the situation described does not have any similarity with the working situation of a carpenter. In order to give the correct answer to this task (A: Yes, B: No, C: Yes, C: Yes) one has to forget everything about timber, (to be continued next page)

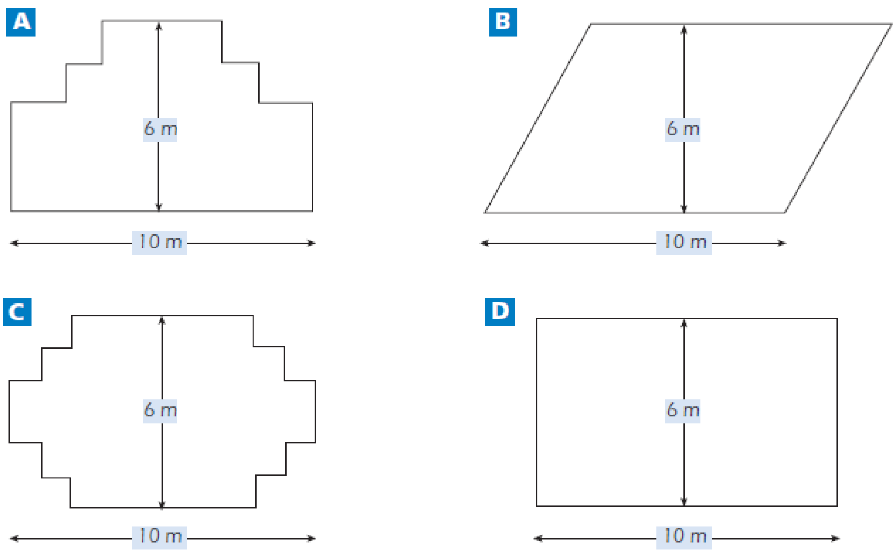
Table 1: Terms about knowing mathematics in the world

folk mathematics		ethnomathematics
	quantitative literacy	
numeracy		techno-mathematical literacy
	street mathematics	
worker's mathematics-containing competences		mathematical proficiency
	mathematical literacy	mathematical competencies
mathemacy	adult numeracy	

Figure 1: Sample question from PISA (OECD, 2009, p. 111)

QUESTION 10.1

A carpenter has 32 metres of timber and wants to make a border around a garden bed. He is considering the following designs for the garden bed.



Circle either "Yes" or "No" for each design to indicate whether the garden bed can be made with 32 metres of timber.

Garden bed design	Using this design, can the garden bed be made with 32 metres of timber?
Design A	Yes / No
Design B	Yes / No
Design C	Yes / No
Design D	Yes / No

which has a physical extent in three dimensions, and think only of the mathematical object: the straight line and about transformations of areas that leave the circumference unchanged. The situation-context where the young people solve this task is in school within a special situation of participating in an international comparative test. The task-context is school mathematics (some basic geometry) though it is claimed to be a "real world" context.

Both functionality and contextuality of "knowing mathematics in the world" is stressed in the following definition of numeracy, which is the term often applied when it comes to adults:

> *Numeracy* consists of functional mathematical skills and understanding that in principle all people need to have. Numeracy changes in time and space along with social change and technological development (Lindenskov & Wedege, 2001, p. 5)

Functionality and contextuality are opening the discussion to one of the key issues in mathematics education and in research: the relationship between school mathematics and out-of-school mathematics when people are learning and knowing (see for example Harris, 1991; Hoyles, Noss, & Pozzi, 2001; Jablonka, 2009; Lave, Murtaugh, & de la Rocha, 1984; Nunes, Schliemann, & Carraher, 1993; Wedege, 2002).

Second observation: Knowledge developed or wanted in everyday life

Functionality is a common feature of the notions about knowing mathematics in the world represented by the terms in table 1. In this and the following section, I will discuss some distinctive traits starting from the same paragraph on some key problems related to defining "mathematical literacy" as quoted above from Jablonka:

> Any attempt at defining 'mathematical literacy' faces the problem that it cannot be conceptualised exclusively in terms of mathematical knowledge, because it is about an individual's capacity to *use* and *apply* this knowledge. Thus it has to be conceived of in functional terms as applicable to **the situations in which this knowledge is [to be] used.** (Jablonka, 2003, p. 78 [my emphasis and parentheses])

My second observation is that any notion about knowing mathematics in the world is based – implicitly or explicitly – on one of two meanings of the term *everyday knowledge* [1]:

- Knowledge **developed** in everyday life, i.e. knowledge that the individual has acquired in her/his everyday practice.
- Knowledge **wanted** in everyday life, i.e. knowledge that is supposed to be necessary/useful in people's everyday practice.

In the emphasized part of the paragraph from Jablonka ("situations in which this knowledge is to be used") it seems that she only includes the second meaning of "mathematical literacy" as knowledge wanted in everyday life. I have put parentheses around "to be" to open for the first meaning. Moreover, I suggest that another verb, "developed", is inserted: situations in which this knowledge is used and developed.

In mathematics education research and in international surveys, we find different concept constructions of knowing mathematics in the world. We have seen that they vary with the approaches, values and rationales of the researchers and the stakeholders (Jablonka, 2003). Furthermore, implicitly or explicity, they are based on different notions of mathematics and of human knowledge and learning (Wedege, 2003). As a first step, I have tried to distinguish between a series of concepts based on the meaning of everyday knowledge developed (type 1) and another series based on the meaning of everyday knowledge wanted (type 2) (see table 2).

Table 2: Concepts about knowing mathematics in the world

Type 1 (developed in everyday life)	**Type 2** (wanted in everyday life)
Ethnomathematics (D'Ambrosio; Bishop) *Folk mathematics* (Mellin-Olsen) *Street mathematics* (Nunes et al.) *Critical ethnomathematics* (Knijnik) *Worker's mathematics-containing competences* (Wedege) *Adult numeracy* (Evans)	*Mathematical literacy* (PISA, Hoyles et al.) *Numeracy* (Steen, ALL) *Quantitative literacy* (IALS) *Techno-mathematical literacy* (Kent et al.) *Mathemacy* (Skovsmose) *Mathematical proficiency* (Kilpatrick) *Mathematical competencies* (Niss)

Behind type 1 constructions, the main concern – and perspective – is the differences between school mathematics and out-of-school mathematics and the acknowledgment of people's informal knowledge. The focus is what people actually know and do and their practices of using, adapting and producing mathematical competence are studied. In type 2, some of the constructions are mainly concerned with measuring, others with the relevance of mathematical knowledge and others with power relations. They are usually normative and conceived as intended outcomes in education. For the focus of this paper, I have chosen ethnomathematics (D'Ambrosio) and mathematical literacy (PISA) as the prototypes of knowledge developed in everyday life (type 1) respectively of knowledge seen as being wanted or required in everyday life (type 2). However, I have to stress that the tentative division of concepts in the two columns of table 2 is not a dichotomy. Some of the concepts put are actually dealing with the dialectics between the two types of knowledge as we shall see in the last section.

Jablonka (2003) has argued that any conception of knowing mathematics in the world (mathematical literacy) – implicitly or explicitly – promotes a particular social practice. She identifies five perspectives: Mathematical literacy for

- Developing human capital (OECD)
- Cultural identity (D'Ambrosio)
- Social change (Frankenstein)
- Environmental awareness (UNESCO)
- Evaluating mathematics (Skovsmose)

This analysis is based on the observation that different "conceptions of mathematical literacy are related to how the relationship between mathematics, the surrounding culture, and the curriculum is conceived" (p. 80). The names put in parentheses are examples of researchers and organisations found in her discussion of the five perspectives.

The perspective of mathematical literacy for *developing human capital* is based on a conception of mathematics as a powerful and neutral instrument for solving individual and social problems. Hence, mathematical literacy is defined as "a bundle of knowledge, skills and values that transcend the difficulties arising from cultural differences and economic inequalities" (Jablonka, 2003, p. 81). The perspective of mathematical literacy for *cultural identity* starts with a conception of mathematics being developed in all cultures where the mathematical practices differ in "the kinds of mathematics that are employed, in the purposes for employing that kind of mathematics, as well as in the associated beliefs about the nature of mathematics and in the values about the (mathematical) problem solution" (Ibid, p. 82). Here we find yet another criterion for distinguishing the two constructions discussed in this paper. In ethnomathematics which is a construction for cultural identity, mathematics is value-laden and cultural-dependent, and in mathematical literacy, which is a construction for developing human capital, mathematics is seen as neutral and universal.

Ethnomathematics

By the end of the 1970's and at the beginning of the 1980's there was a growing attention to cultural and societal aspects of mathematics and of mathematics education (Gerdes, 1996). The Brazilian mathematician and researcher in mathematics education Ubiratan D'Ambrosio lanced his “ethnomathematical programme” and presented it at the Fourth International Congress on Mathematics Education (ICME4) in 1984. He put *academic mathematics*, i.e. mathematics taught and learned in schools, towards *ethnomathematics* which

> is the mathematics practiced by cultural groups, such as urban and rural communities, groups of workers, professional classes, children in a given age group, indigenous societies, and so many other groups that are identified by the objectives and traditions common to these groups. (D’Ambrosio, 2006, p. 1)

This definition, which is taken from his recent book “Ethnomathematics: Link between traditions and modernity” (D'Ambrosio, 2006), does not differ in meaning from the origin definition (D'Ambrosio, 1985, p. 45). However, what were then called “identifiable cultural groups” are now explained as “groups identified by the objectives and traditions common to these groups”. The political background for the ethnomathematical movement was the cultural imperialism of the transplanted, imported mathematics “curriculum” which is emphasised to be alien to the cultural traditions of Africa, Asia and South America (Gerdes, 1996). According to D’Ambrosio, the students’ mathematical capacities for using numbers and measure, and for handling geometrical forms and concepts are replaced by other forms of practice, which have gained status as mathematics:

> the mathematical competencies, which are lost in the first years of schooling, are essential at this stage for everyday life and labour opportunities. But they have indeed been lost. The former, let us say spontaneous, abilities have been downgraded, repressed and forgotten while the learned ones have not been assimilated either as a consequence of a learning blockage, or of an early drop-out, or even as a consequence of failure or many other reasons. (D'Ambrosio (1985) Sociocultural Bases for Mathematics Education, UNICAMP, Campinas, quoted after Gerdes, 1996, pp. 912-913)

The mathematical everyday capacities of children and workers are downgraded, repressed and forgotten. In the same period in another part of the world (Sweden) and in another research field (adult education), Alexandersson (1985) did an empirical study of the relation between adults’ knowledge acquired in school and in everyday practice. His study showed that people’s mathematical everyday competence was algorithmetised through schooling and their problem solving ability decreased. From Norway, Mellin-Olsen (1987, p. xiii) revealed the question which had driven his research through twenty years: “why so many intelligent pupils do not learn mathematics whereas, at the same time, it is easy to discover mathematics in their out-of-school activities”. His definition of folk mathematics as knowledge biased by culture or social class is of type 1 like ethnomathematics. Mellin-Olsen finds that the definition of folk mathematics as mathematics and the very recognition of folk mathematics “as important knowledge is a political question and thus a question of power. (p. 15)”

In a study building on international ethnological and ethnomathematical investigations, Bishop (1988) has taken the power of definition and identified six types of mathematical everyday activity, which he claims are cross-cultural:

- *Counting* (the use of a systematic way to compare and order discrete phenomena),
- *Localising* (exploring one’s spatial environment and conceptualising and symbolising that environment, with models, diagrams, drawings, words or other means),
- *Measuring* (quantifying qualities for the purposes of comparison and ordering, using objects or tokens as measuring devices with associated units or ‘measure-words’),
- *Designing* (creating a shape or design for an object or for any part of one’s spatial environment),
- *Playing* (devising and engaging in games and pastimes playing by rules with more or less formalised rules that all players must abide by),
- *Explaining* (finding ways to account for the existence of phenomena, be they religious, animistic or scientific).

Mathematical literacy

In the late 1990’s, OECD lanced the International Programme for Student Assessment (PISA) which intends to estimate and compare between countries the store of “human capital” defined as: “The knowledge, skills, competencies and other attributes embodied in individuals that are relevant to personal, social an economic well-being”(OECD, 1999, p. 11). According to PISA *mathematical literacy* is

> The capacity to identify, to understand, and to engage in mathematics and make well-founded judgements about the role that mathematics plays, as needed for an individual’s current and future private life, occupational life, social life with peers and relatives, and life as a constructive, concerned, and reflective citizen. (OECD, 2000, p. 48)

Mathematical literacy is established as an answer to the question of what mathematics is needed in an individual’s life. At the societal level, Niss (2003) states that a well educated population is needed “to actively contribute to the shaping of society, and a broadly qualified work force, all of whom are able to activate mathematical knowledge, insights, and skills in a variety of situations and contexts” (p. 115). Niss, who is also a member of the international expert group in PISA, presents the conceptual framework of eight mathematical competencies as an answer to the question “What does it mean to master mathematics?” pure and simple. The competencies are almost identical with the eight competencies defined in the PISA framework (OECD, 1999), but here they are grouped in two categories:

(1) Ask and answer questions in and with mathematic

1. Thinking mathematically
2. Posing and solving mathematical problems
3. Modeling mathematically
4. Reasoning mathematically

(2) Deal with and manage mathematical language and tools

5. Representing mathematical entities
6. Handling mathematical symbols and formalisms
7. Communicating in, with, and about mathematics
8. Making use of aids and tools (Niss, 2003).

In his article "Understanding mathematical literacy", Kilpatrick (2001) gives an answer to the question "What does successful mathematics learning mean?" and presents what he is calling an elaborated view of mathematical literacy. However terms like "mathematical literacy" and "mathematical competence" are rejected as non suitable and *mathematical proficiency* is defined in terms of five interwoven strands: (a) conceptual understanding, (b) procedural fluency; (c) strategic competence, (d) adaptive reasoning,; and (e) productive disposition, which includes the student's appreciation of mathematics. Kilpatrick states that these strands are to be developed in concert and claims that "it was clear from the existing research that problem solving offered a context in which all the strands of mathematical proficiency could be developed together" (p. 107).

While it is possible to argue that "mathematical modelling" is the key competency in Niss' framework, it is obvious that "problem solving" is the crucial activity in a mathematics curriculum based on Kilpatrick's construction of mathematical knowledge.

In the late 1960s, according to Rubenson (2001) UNESCO introduced lifelong learning as a utopian-humanistic guiding principle for restructuring education. The concept disappeared from the educational policy debate but, in the late 1980s, it reappeared in a different context and in a different form. The debate was now driven by an interest based on an economistic worldview, emphasising the importance of highly developed human capital, science and technology.

It is possible to see the two constructions of ethnomathematics and of mathematical literacy as illustrations of the two generations of lifelong learning respectively with recognition of people's informal knowledge developed in everyday practice and arguments for formal education. From the late 1990's, according to Rubenson (2001), it seems that the restricted, economistic view on education of the second generation, which was severely criticised, has been succeeded by a third generation (*economistic – social cohesion)* with active citizenship and employability as two equally important aims for lifelong learning – at least on the rhetoric level because of the conflicting agendas between the two ideologies behind.

Third observation: Capacity or performance

Functionality is a common feature of all conceptions of ethnomathematics and mathematical literacy, and – as mentioned – all definitions refer to situations where mathematical knowledge is (to be) used or developed. However, any mathematical activity is carried out by someone – directly or indirectly; human beings are involved. Hence I have chosen the grammatical structure "knowing mathematics in the world" instead of "mathematical knowledge in the world" to denote my focus in this paper. For the last time I return to Jablonka's text about difficulties in defining mathematical literacy:

> Any attempt at defining 'mathematical literacy' faces the problem that it cannot be conceptualised exclusively in terms of mathematical knowledge, because it is about **an individual's capacity to *use* and *apply* this knowledge**. Thus it has to be conceived of in functional terms as applicable to the situations in which this knowledge is to be used. (Jablonka, 2003, p. 78, my emphasis)

In the late 1990's, the international education discourse changed from "qualification" to "competence", and today the term "competence" is almost hegemonic in educational discourses, with "mathematical literacy" and "numeracy" as prominent examples of constructs in mathematics education, where they are often divided into partial competencies (e.g. competency to interprete quantity & numbers and competency to indentify dimension & shape). Qualification can be defined a priori in terms of skills and knowledge and has to do with formal education and certification, while competence deals with people's capacity – based on knowledge and authority – to handle a specific type of situations (Wedege, 2003). In the OECD context of defining general concepts of qualifications and competences in the mid 1990's, a voice was heard introducing the individual in the discussion. Fragnière (1996) stated that the competencies are composed by the subjective ability to use one's qualifications, know-how and knowledge to accomplish something: "In fact, there are no "objective" competencies capable of being defined independently of the individuals in which they are embodied. There are no competencies in and of themselves; there are only competent people" (p. 47).

In constructions of ethnomathematics based on the definition "mathematics practiced by cultural groups" which was introduced by D'Ambrosio (1985), human activities such as counting, measuring, locating etc. and people's capacities to handle situations through these kind of activities are acknowledged as important. In the PISA definition of mathematical literacy from 2000 presented above, there was not any individual to use and engage with mathematics. But in the 2003 survey, where mathematics is the major domain, the individual is introduced in the definition [2] and, at the same time, the criteria of employability is removed and by that the citizenship perspective is accentuated :

> *Mathematical literacy* is **an individual's** capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen. (OECD, 2003, p. 37, my emphasis)

However, the way of modulating and describing individuals' mathematical literacies in a framework of eight "objective" competencies defined independently of the individuals is still the same. So is the way of testing young people with standard mathematical tasks across countries and cultures as the example in figure 1.

On the cross road between the second and third generation of lifelong learning, educational discourse and terminology have changed from qualification to competence but, in the political and educational context, some of the qualities of a scientific competence concept have been lost. For example the dissolution of the classical dichotomy of knowledge versus skills which allows the recognition of tacit knowledge and of knowing and learning in practice/action. In its basic sense of human capacity, competence unites the complex mix of knowing and doing. In the article entitled "Constructions of competence concepts", I have argued that in many educational documents, like policy reports and curricula, the discourse is not guided by a *logic of competence*, where the dualism between the individual and the situation is constitutive, but rather by a *competency logic* like the one we find in the international surveys. The former refers to inherent properties of the concept, while the later is meant to apply to a given context, once a concept of competency has been specified (Wedege, 2003). According to Bernstein (2000), in a *recontextualising process*, discourses are relocated from their scientific fields of production (philosophy, anthropology, psychology etc.) to establish pedagogic discourse within the field of reproduction (education) (see also Dowling's paper in this book). In Bernstein's analysis of the recontextualisation of "competence", he contrasted two pedagogic models: Competence and performance (see table 4).

In the competence models, emphasis is upon the realisation of competences that "acquirers" already have, or are thought to have. The pedagogic text reveals the acquirer's competence development cognitively, affectively and socially. In the performance models, emphasis is upon a specific output of the acquirer, upon specialised skills. The pedagogic text is the acquirer's performance objectified by grades. The competence models, like educational constructions of ethnomathematics, focus on the individuals' mathematical capacities in different contexts, while the performance models, like educational constructions of mathematical literacy, focus on the required qualifications in mathematics predefined in terms of competencies. However, as pointed out by Jablonka and Gellert (2010) when ethnomathematics is imported into the classroom discourse via a curriculum, there is a risk that the purpose of the recontextualisation is misuse in terms of traditional school mathematical topics.

Table 4: Recontextualised knowledge (Bernstein, 2000 p. 45)

	Competence models	*Performance models*
1. *Categories:*		
space time discourse	weakly classified	strongly classified
2. Evaluation orientation	presences	absences
3. Control	implicit	explicit
4. Pedagogic text	acquirer	performance
5. Autonomy	high	low/high
6. Economy	high cost	low cost

Returning to lifelong learning as a guiding principle for education, one might conclude that the two competence models co-existing within mathematics education as ethnomathematics and mathematical literacy illustrate a tension within the third generation (economistic – social cohesion).

Sociomathematics

I introduced the expression "knowing mathematics in the world" to cover a wide spectre of notions and ideas about what it means to know and to use mathematics in different cultural and societal contexts and situations. After observing that functionality is a common trait of these notions and that contextuality is either involved or ignored in the different constructions, and after observing that any concept is based on one of two meanings of everyday knowledge as developed or wanted in everyday, I choose ethnomathematics (D'Ambrosio) and the human capital version of mathematical literacy (OECD) as prototypes. Basic conceptions of mathematics as respectively value-laden & cultural dependent and neutral & universal are other distinguishing traits. Finally, I contrasted two conceptions of mathematical competence in the discourse ruled by logic of competence with the individual's capacity as the core respectively by logic of competency with performance in focus.

In any empirical study of people knowing mathematics in the world it is possible to take a *subjective approach* starting with people's subjective competences and needs, and an *objective approach* starting either with societal and labour market demands or with the academic discipline (transformed into "school mathematics"). The following two workplace studies in mathematics education illustrate the conflict between the general and the subjective approaches. In a study on proportional reasoning in expert nurses' calculation of drug dosages Hoyles et al. (2001) compared formal activities involving ratio and proportion (general mathematical approach) with nurses' strategies tied to individual drugs, specific quantities and volumes of drugs, the way drugs are packaged, and the organization of clinical work (subjective approach). In their large project involving 22 case studies, Hoyles et al. (2002) research questions were about employers' demands for mathematical qualifications, competencies and skills (general societal approach) and about what skills and competencies the employees felt were needed for the job, and what they currently possessed (subjective approach). However, to understand the cognitive, affective and social conditions for people knowing mathematics in the world, one has to take both dimensions into account (FitzSimons, 2002; Wedege & Evans, 2006). In PISA, the approach leading to the theoretical framework is general (OECD, 1999). PISA claims that the starting point is societal and labour market demands. However, the framework is based on a conceptual construct of academic mathematical knowledge in terms of competencies and not on empirical research on people's needs of mathematics in society.

I have introduced the concept of *sociomathematics* for a subject field where people, mathematics and society are combined, and for the research field where the societal context of knowing, learning and teaching mathematics is taken seriously into account (Wedege, 2010). The subject field encompasses constructions of knowing mathematics in society e.g. mathematical literacy and critical ethnomathematics. As a research field, sociomathematics combines general and subjective approaches when studying people's relationships with mathematics in society. Any sociomathematical study is based on the idea of dialectic interplay between the following two dimensions of everyday knowledge:

- Knowledge developed in everyday life, i.e. knowledge that the individual has acquired in her/his everyday and societal practice.
- Knowledge required in society, i.e. knowledge that is relevant/ useful in people's everyday and societal practice.

In a sociomathematical construction, people's everyday mathematics is recognized as mathematics and, at the same time, the powerful position of academic mathematics in society is acknowledged. Critical ethnomathematics, in table 2, type 1, as defined by Knijnik (1999) is an example. Her study of landless peasants' mathematics is not just about people's competences in a well-defined cultural context but about a larger political context, where power relations are made visible. Mathemacy (type 2) defined by Skovsmose (2006) is also an example of a concept based on a dialectic interplay between individual needs and dispositions and societal needs and requirements.

Notes

1. This distinction is made with inspiration from the research project “Everyday knowledge and school mathematics” (Wistedt, 1990).

2. In the first PISA framework published in 1999, the definition of mathematical literacy also started with “an individidual’s capacity” (OECD, 1999, p. 41), but a different definition was used in the 2001 report.

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