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WORKING TOWARD THE INCLUSION OF BLIND STUDENTS IN MALTA: THE CASE OF MATHEMATICS CLASSROOMS

(MALTA'DAKİ GÖRME ENGELLİ ÖĞRENCILERIN KATILIMINI SAĞLAMAYA YÖNELIK ÇALIŞMA: MATEMATIK DERSLERI ÖRNEĞİ)

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ABSTRACT
Basing ourselves on a case study in which one of us successfully taught mathematics to an adult blind student on a one-to-one basis and her more recent positive experience of teaching a blind student within a regular classroom, we try to shed light on the mathematics education of blind students and the ramifications that this carries for the inclusion of blind students in mathematics classrooms. The ensuing discussion is embedded within the inclusion discourse that is gradually evolving in educational spheres. Our paper ultimately carries a message of hope: not only can blind students learn mathematics and get certified for it, but it seems that they can also do so within a normal classroom situation.

Keywords: teaching mathematics; blind students; inclusive education.

ÖZ
Yazarlardan birinin, görme engelli bir öğrenciye, birebir etkileşimli olarak başarılı bir şekilde matematik öğretmesi ve yine aynı yazarın, normal bir sınıf ortamında yine görme engelli bir öğrenciyle yaşadığı başarılı deneyim üzerine kurmuş olduğumuz bu olay incelemesi çalışmamızda, görme engelli öğrencilerin matematik eğitimi üzerine ışık tutmayı ve daha geniş bağlamda da, görme engellilerin normal sınıf ortamındaki matematik derslerine katılımını sağlamayı amaçlamaktayız. Makalemiz nihayetinde umut mesajı taşımaktadır, çünkü bu çalışmamızla ortaya koyduğumuz üzere, görme engelli öğrenciler matematik öğrenmekle kalmayıp, aynı zamanda da bu öğrenme işlemini normal sınıf koşullarında gerçekleştirebilmektedirler.

Anahtar Sözcükler: matematik öğretimi, görme engelli öğrenciler; katılımcı eğitim

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INCLUSIVE EDUCATION

Traditionally, inclusion or mainstreaming is the practice of placing children with disabilities into normal classrooms, either for all (i.e., 'full inclusion') or for most of the time (in which case, children are 'pulled out' from the classroom from time to time for occupational or physical therapy, speech/language pathology, or other related services) (Bowe, 2005). The general idea, however, is to promote inclusive classrooms in which a number of students with disabilities learn side-by-side with age peers who have no disabilities. As presently understood, inclusion is no longer a matter of 'allowing' disabled children to be in mainstream schools as long as they are able to fit into the existing systems and cultures. Instead of simply integrating them in a mainstream setting, inclusion is about bringing change in school policies, practices and attitudes so that disabled children (and, for that matter, other groups that have historically been marginalized or have underachieved in our schools) achieve integration on their own terms. One can therefore argue that rather than preparing the student to be ready to enter the (unaltered) mainstream school and be able to stay there, in inclusion it is the school that has to ready itself for increasingly diverse students (see Nind, 2005; also Bartolo, 2003). As a result, an educationally inclusive school is:

> An effective school and one in which the teaching and learning, achievements, attitudes and well being of every student matter. This includes students with and without disabilities. This is evident not only in the school's performance but also in its culture and willingness to review provision in order to offer new opportunities to pupils who may have experienced previous difficulties. (Lupton & Jones, 2002, p. 1)

Inclusion, with its focus on bringing the management of excluded and marginalized populations to the fore, is consequently about addressing social injustices (Thrupp & Tomlinson, 2005) and parallel discourses such as human rights and equal opportunities. We are now even beginning to understand that inclusion should also touch upon issues of equity, participation, community, entitlement, compassion, respect for diversity and sustainability (see Ainscow, Booth & Dyson, 2006). All this renders inclusion both a journey and a project of transformation. The journey or struggle for inclusion has been like the confluence of different streams of thought – social, political and educational – that have been gaining momentum to bring inclusion ever closer (Nind, 2005). On the other hand,

> The transformation of education into inclusive education requires reflection and action on social justice, beliefs about the learning

> potential of everybody, theories of good teaching and learning and a reconceptualisation of the curriculum and learning support. (Nind, 2005, p. 274)

Inclusion is thus clearly both a pedagogical issue and a rights issue. In spite of the progress made, there is still much to be achieved to enable inclusion at classroom level, exactly where it matters most. At all costs, we need to avoid falling into the trap of 'change without reform'. For should we permit structure to dominate over ideology, we may well end up realizing that despite the general consensus and policies favoring the inclusion reform, the power of existing structures and the professional interests embedded within them may mean that the expected reform never materializes (Croll & Moses, 2000). In England, for instance, as in many other countries, regardless of the educational and social impetus toward mainstreaming, the trajectory of change has moved only slowly and unevenly toward inclusion (Croll & Moses, 2000). In line with this, Maras and Brown (2000) reported that most of the schools they studied in Southeast England were not providing the conditions that promoted the most effective forms of contact between their different groups of students. Faced with such and similar evidence, one may even understand why some individuals, as Croll and Moses (1998) have shown, can hold ambivalent and even contradictory views about inclusion – subscribing to the ideology but regarding it as unattainable. But instead of giving up on inclusion and its derivatives at school and classroom levels, we would argue like Croll and Moses (2000) that it is not possible to move to total inclusion in one attempt. Like any other journey, inclusion requires time, willingness and commitment. In the meantime, we will continue to maintain that

> The challenge for teachers and education policy-makers alike is to re-create in mainstream classrooms the kinds of co-operative and equal status learning contexts within a national curriculum that currently allows little time for alternative methods. (Maras & Brown, 2000, p. 349)

And this in accordance with our understanding that only a truly holistic approach to inclusion has the chance to succeed. As we continue to promote the road to inclusion, we feel heartened by the fact that research on attitudes toward inclusive education has clearly shown that involvement in inclusive practices and familiarity with more diverse groups of learners are linked with more positive attitudes to inclusive education (Mittler, 2000). With some evidence indicating that teachers become more willing to teach children with special needs when they have had more experience (Croll & Moses, 2000), we keep hoping that inclusion will become an area where success breeds success.

THE EDUCATION OF THE BLIND

In this paper, we are concerned with visually impaired students who are totally blind. In particular, although there are various categories and medical terms to describe blindness, we use the terms 'blindness' or 'blind' to describe individuals who are totally blind and unable to perform any work for which eyesight is essential (see Khaw & Elkington, 1994). A person may be blind from birth or may lose sight at some later stage in life. Quite understandably, the more direct visual experiences of the world one has, the greater will be his or her ability to grasp the physical concepts that underpin it (Dick & Kubiak, 1997). This renders blind people an extremely heterogeneous grouping in which the blind from birth appear to be the most disadvantaged.

Lowenfeld (1973) identified the educational, psychological and social aspects of schooling for blind students:

> Education must aim at giving the blind child knowledge of the realities around him, the confidence to cope with these realities and the feelings that he is accepted as an individual in his own right. (p. 158)

This probably explains why Chorniak (1977) argues in favor of blind students having the fullest possible contact with sighted students. Such contacts serve a dual purpose: they help blind students to relate well to the sighted world in which they must function and enable sighted students to appreciate that blind students are students with both limitations and capabilities (Gage & Berliner, 1992). It must however be stressed that blind students require modified school practices or special educational services in order to develop their full potential (see Agrawal, 2004). For they gain knowledge in a different way and the knowledge gained is sometimes of a different nature (Lowenfeld, 1973). At the most rudimentary level, the traditional much-used teaching method of supplementing oral instructions with writing on the board cannot be used with blind students. Again, for instance, blind students cannot rely on vision for details of form, size, color and spatial relationship of objects. Unlike their sighted peers who can pick up such details incidentally from the environment, blind students require systematic, prolonged tactile observations. Notwithstanding these efforts, some developmental milestones – such as the Piagetian notions of object permanence and conservation of mass and volume – may still be delayed for blind students (Dick & Kubiak, 1997). There seems to be no escaping that to gain an adequate education (which includes, in our view, a good conceptualization of the world around them), blind students need to make the best possible use of their non-visual senses.

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THE MALTESE CONTEXT

The Maltese archipelago – or Malta, as it is more commonly known – is strategically situated in the centre of the Mediterranean Sea. With a total surface area of 316 km^2 and a population of slightly more than 400,000, Malta is the smallest member state of the European Union.

The Educational System

In Malta, school attendance is compulsory between the ages of 5 and 16 – a total of 11 years of primary (6 years) and secondary (5 years) schooling. At the end of the secondary cycle, students may sit for the 16+ Secondary Education Certificate (SEC) examinations organized by the local Matriculation and Secondary Education Certificate Examinations Board (MATSEC). In each subject, students sitting for the harder combination of Paper I and Paper IIA may be awarded pass grades from 1 to 5, and students sitting for the less demanding combination of Paper I and Paper IIB may be awarded pass grades from 4 to 7. Depending upon their aspirations and qualifications, students may then enter one of the post-secondary institutions that offer either academic or vocational programs. Degree programs are available at the University of Malta, the Malta College of Arts, Science and Technology and a small number of private institutions that work in collaboration with foreign, mostly UK, universities.

Inclusion Policies

The Maltese educational system – which Ventura and Murphy (1998) have defined as 'intrinsically inequitable' – has traditionally promoted the 'talented' few at the expense of the rest (Darmanin, 1992). Notwithstanding this, "the rival discourse of the rights of each child for a quality education, and especially the right of access to education in regular schools for students with disability, has now taken root" (Bartolo, 2001, p. 69). Way back in 1993, the Maltese National Commission for Persons with Disability (NCPD) declared in its policy document:

> ... to the maximum extent appropriate, children with disabilities are educated with children who are not disabled and that special classes, separate schooling, or other removal of children with disabilities from the regular educational environment occurs only when the nature or severity of the disability is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily. (NCPD, 1993, p. 7)

This was in line with *The Standard Rules on the Equalisation of Opportunities for Persons with Disabilities* adopted by the United Nations

General Assembly that same year. This document emphasized in fact that special education provision has to be made only when the general school system cannot meet the needs of the disabled child.

At present, around 84% of Maltese students with special needs (which constitute as a group slightly less than 2.6% of the whole school population) are educated in mainstream schools (Spiteri, Borg, Callus, Cauchi & Sciberras, 2005). The remaining students attend one of the six special schools, according to the nature of their disability (e.g., the Helen Keller school specializes in hearing and visually impaired students), which cater for the more acute cases that require a specialized learning environment. To protect their educational interests, the Ministry of Education (2000) insists that for each student with a disability, an Individualized Educational Program has to be prepared in consultation with, among others, the class teacher and parents. Learning support of 'statemented' children with individual educational needs is provided, among others, by facilitators and supply kindergarten assistants (Spiteri et al., 2005). Particularly pertinent to the present paper, Education Division data (see Tanti, 2006) shows that during the 2005-2006 scholastic year there were 29 visually impaired students attending mainstream education, including two reading for a degree at the University of Malta. Only two of these students were totally blind.

This unfolding scenario signals a growing interest in inclusive education and a new appreciation of disability (Spiteri et al., 2005). The tangible manifestations of this are the various NGOs (even if still run on the old-fashioned 'charity model' – see Stivala, 2008) and state agencies that have mushroomed all over the island. But it was the National Minimum Curriculum (NMC) (Ministry of Education, 1999), which committed the state to work toward 'full inclusion', that finally provided the legal framework to our society's changing perspective on disability. We now recognize the full range of educational interests, potential and needs of students (see Bartolo, 2001). Moreover, Maltese society is becoming increasingly aware that inclusive education is not only a human right but can also be an asset to society as a whole (Spiteri et al., 2005). The current efforts toward full inclusion are somewhat hampered by the recognition that teachers do not feel sufficiently prepared and supported to address this great challenge (see Ministry of Education, 1999). Consequently, it is now being proposed that special schools be transformed into resource centers that, apart from providing services to students with special needs, offer professional support to teachers (see Ministry of Education, Youth and Employment, 2007). We therefore find ourselves passing through a transition period that takes us from the traditional complete segregation in special schools to the level of inclusion demanded by the policy documents endorsed by the United Nations National Assembly and the local NCPD and NMC.

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THE 'IMPORTANCE' OF MATHEMATICS

Cotton (2004) makes a bold assertion when he states that the purpose of learning and teaching mathematics is to create an inclusive society. While it is highly arguable whether this is or should be the case, the fact remains that mathematics is considered to be one of the more prominent school subjects. This is most commonly justified on utilitarian grounds through claims that mathematics comprises 'use-values' with respect to various economic and domestic practices (Dowling, 1998). Another contributing factor – which is generally seen as opposed to the utilitarian argument – is the elitist view of mathematics as an intellectual endeavor that is considerably isolated from other activities (Dowling, 1998). The related belief that mathematics lays the foundations for thinking systematically (Agrawal, 2004) and the perceived utilitarian need for a more mathematically competent workforce and citizenry probably explain the aura of 'sanctity and redemption of humanity' (see Valero, 2004) that surrounds mathematics in the school curriculum and beyond. The following excerpt needs to be understood within this 'glorified' mathematics scenario:

> Fennema (1980) and Jacobs (1983) both speak of mathematics as a 'critical filter' which determines entry into most of the higher paying careers and professions, and Steinkamp et al. (1985, p. 259) view mathematics as 'a pivotal discipline related to a broad range of occupational choices'. Mathematics avoiders are cut off from full participation in society (Morris, 1981), and Lorcher (1989) suggests that failure in mathematics not only leads to failure in school but also to a life-long feeling of intellectual inferiority. (Buhagiar, 1993, p. 10)

The underlying notion is that "mathematics is in itself an indispensable, good and desired knowledge in our current (Westernized) world, and that mathematics education has the positive role of enculturating the new generations into that knowledge and all its related values" (Valero, 2004, p. 13). We think, however, that a distinction should be drawn at this stage between 'understanding' and 'achievement' in mathematics. For while it is true that failure to pass the more critical mathematics examinations (in Malta these are at 11+, 16+ and 18+) could possibly put one's further study and some of the more tantalizing career prospects on hold, it is also known (see Brookhart, 1999; also Bishop, 1991) that students could pass important mathematics examinations without understanding properly the underlying concepts. Dowling (1998) speaks in fact about the 'myth of participation' which invites us to realize how people are not necessarily handicapped in their participation in society, rightly we would add, when they do not understand or

are not able to use mathematics critically. Although we fully appreciate Dowling's (1998) point, we would still argue that in educational scenarios, such as the Maltese one, in which certification is possibly more 'important' than understating, it would be unwise and possibly unfair not to give due consideration to the mathematics certification process and its ramifications. We would consequently argue that blind students, just like all other students, should not only be given the opportunity to learn mathematics, but also to get certified.

TEACHING MATHEMATICS TO BLIND STUDENTS

Although many blind students find the learning of mathematics a frustrating endeavor (Dick & Kubiak, 1997), we still hold that blindness, even if certainly a disadvantage, should not be seen as a condition that *per se* impedes the learning of this subject (see Agrawal, 2004; Lowenfeld, 1973). A number of studies have shown in fact that blind students can learn mathematics when they are taught in an appropriate manner (Agrawal, 2004). This encourages us to argue in favor of giving blind students the opportunity to follow the same mathematics syllabus of their sighted peers. For when teachers omit parts of the regular syllabus, often those areas of mathematics that are considered complicated, they would be disadvantaging blind students by not providing them with the necessary content to cope with sighted students in an integrated setting (Agrawal, 2004). More importantly, should blind students, for instance, not be taught basic geometry, they would be seriously jeopardizing their understanding of mathematics in general, not just of spatial relationships. Klingenberg (2007) highlighted this point:

> In elementary school children's development of skills and understanding in many topics depend on their spatial sense. Spatial properties and relations include shape, size, distance, orientation, and relative location. Fractions, measurement, estimation, positive and negative integers on a number line, map reading, and various concepts in science and social studies all include spatial elements. Manipulation of objects in space also provides background for understanding algebra, trigonometry, calculus, and many topics in higher mathematics that require spatial thinking (Kennedy & Tipps, 1994, p. 387). Studies of human problem solving and language understanding have pointed out the importance of spatial representation and reasoning (Hobbs & Narayana, 2002, p. 2). (p. 1)

We cannot but concur with Klingenberg's (2007) conclusion that teachers should be guided and helped when teaching blind students. This

brings us to the question of support, which should go hand-in-hand with blind students' opportunity to study the regular mathematics syllabus. We emphasize 'support' in the knowledge that traditionally mathematics has been inaccessible to blind students because its content is rich with visually presented concepts and information (see Schleppenbach, 1997). Cases in point are descriptions of mathematics concepts that appeal to visualization. While these may be grasped immediately by sighted students, they require significantly more cognitive processing from the blind (Dick & Kubiak, 1997).

But the understanding and application of mathematics is not just about external representations. In fact, the American National Council of Teachers of Mathematics (NCTM), in its *Principles and Standards for School Mathematics*, defines representations as "processes and products that are observable externally as well as those that occur 'internally', in the minds of people doing mathematics" (NCTM, 2000, p. 67). Blind students, however, can only rely on the latter type of representation. They are learners for whom all visual mathematics occurs internally, or in the mind's eye (Fisher & Hartmann, 2005). It is here that mathematical concepts are learnt to the power of imagination, which has little to do with vision (see Agrawal, 2004). The problem with blind students, though, is that the abstract nature of mathematical concepts necessitates that they be taught through systematic experience in a sequential form. Irrespective of whether blind students in mainstream schools are provided with special learning arrangements (e.g., being taught in a different room from their classmates) or not (see Klingenberg, 2007), the main issue remains that they are given all the attention and resources to overcome the limitations of their disability. This would guarantee that their visual disability does not become a learning one.

The fact that few teachers are willing to teach mathematics to blind students (Dick & Kubiak, 1997) suggests that inclusive values, which do not only concern disabled students requiring special educational needs (see Ainscow, Booth & Dyson, 2006), are not as developed within today's society as one would like to think. This teachers' reluctance may also result from the general unawareness that blind students can still develop mathematical concepts with the aid of specialized apparatus. The real 'difficulty' here, if it is indeed a difficulty, is that this apparatus is not as yet readily available. But this is where the ingenuity of the teacher can actually play a crucial role. For the lack of commercially designed and mass-produced apparatus gives the teacher the opportunity to produce his or her own apparatus that, even though possibly lacking in finesse, can better match the individual learning needs of the student. This does not however change the fact that blind students may find it hard to cope within a normal classroom setting unless accompanied by a caring and competent facilitator (or a 'learning support assistant', as they are now being called in Malta). On the other hand, when blind students and their teachers are given all the resources and support that they need, the presence of

blind students in mainstream classrooms becomes a challenge to be overcome rather than some dreaded burden to be endured.

MARIELLA'S TWO TEACHING EXPERIENCES WITH BLIND STUDENTS

The following subsections relate directly to Mariella's teaching experiences with two blind students (both names are pseudonyms). The first concerns her experience with John, an adult blind student whom she prepared on a one-to-one basis for the SEC mathematics examination. The second concerns her subsequent experience with Debbie, an 11 year-old blind student whom she taught in one of her regular mathematics classrooms. Given the intimate professional rapport that developed between Mariella and these students, we decided it would be more appropriate for Mariella to recount these two experiences in the first person.

First Experience: John

I first met John, a 34 year-old man who had lost his sight at the age of seven following a serious head injury, when I was giving evening mathematics classes to adult students. This evening course, which is organized by the Directorate for Lifelong Learning, is meant to prepare adults to sit for the SEC mathematics examination that is normally taken by local 16 year-olds at the end of their secondary education. At the end of the first session, John approached me and asked if I could give him lessons on a one-to-one basis as he had found it very difficult to follow what was happening in class during the first lesson. Although I had no training (my undergraduate teacher training had not prepared me for this eventuality) or experience in teaching blind students, I still decided after much pondering to accept John's challenging proposal. It was only later, after I had already started tutoring John, that I decided to base my research at master's level (see Tanti, 2006) – obviously with his hearty acceptance and collaboration – on this unique teaching experience.

It was clear from the start that John did not only want to learn mathematics, but also to get certified. At the school for the blind, were he was eventually placed following his loss of eyesight, John was taught Braille [i], basic Maltese and English, numeracy and life skills (e.g., using the walking stick). But much to his dismay as an adult, this type of education had not led to any formal qualifications, which he is now trying to obtain in order to improve on his present factory production line job and subsequently to fulfill his dream of going to university and read for a degree in social work.

Whenever he externalized his wish as an adult to learn SEC level mathematics, he was repeatedly discouraged by friends, and even some teachers (much to his disappointment), from acting upon it because, as they put it, 'he couldn't see diagrams and graphs'. And, quite frankly, when John

approached me to teach him mathematics, I too initially felt that he could not learn mathematics beyond basic numeracy in view of his disability. But after reading about the successful teaching of mathematics to blind students in other countries and learning, to my surprise, about a number of blind mathematicians who made a great contribution to mathematics advancement, I decided to help John pursue his dream. In the process, I discovered that it was the first time in Malta that a blind student was trying to study mathematics up to SEC level. This meant that I had to create from scratch the whole teaching program (see Tanti, 2006). Eventually, I also collaborated with MATSEC, the local examination body, in the preparation of the embossed version of the mathematics examination papers for which John sat and during the examination itself [ii].

We only had eight months to prepare for the SEC mathematics examination. During this time, John studied 'number', 'algebra', 'shape, space and measures' and 'data handling'. Initially, when we were doing 'number', I had no tools to work with, so most of the work was done orally or mentally. But as more concepts were introduced, tools became essential. We ended up making use of a number of non-technological and low technological tools which included: (a) a 60 cm by 40 cm corkboard and a variety of pins, each with its own particular meaning; (b) homemade mathematical operators and symbols produced from pieces of wire mounted on pieces of cardboard; (c) a talking calculator for simple computations (John could still use, with my help, a scientific calculator when dealing with the harder operations not available on the talking calculator); (d) a spur wheel that was used to emboss diagrams and graph paper from the reverse side to create a raised effect; (e) a homemade tactile ruler and protractor; (f) a homemade graphing board consisting of a grid produced by strings tied to nails placed at 1 cm intervals at the edge of a jablo board; and (g) a Braille textbook, which I designed and produced, subdivided in a number of booklets by topic.

In view of his previous very rudimentary mathematics background, we decided that John would sit for the less demanding combination of the SEC mathematics examination – that is, Paper I and Paper IIB. He sat for the examination in May 2006 and obtained grade 6 from a possible pass grade range of 4 to 7. Not being content with this grade, John re-sat the examination in September 2006. This time, both to his and my great satisfaction, he was awarded grade 5, which is the minimum mathematics pass grade needed for local university studies.

My experience with John, apart from convincing me that blind students can learn mathematics and also get certified when examination bodies create the appropriate conditions, has helped me to grow as a teacher. This is what I wrote in my master's dissertation when I reflected upon my experience with John:

> … this teaching experience has given me an extremely valuable insight into one of the many disabilities that teachers meet in class. Through this study, I did not only enrich my knowledge on the blind, but also explored ways of helping blind students. It made me think and experiment with various teaching methods and make them accessible to John. This will surely enhance my performance as a teacher. (Tanti, 2006, p. 110)

At that time, I had as yet only experienced teaching a blind student in a non-inclusive setting. Although I believed, based on that experience, that with the necessary support I could change my teaching to integrate successfully a blind student in a regular classroom, I still had no direct knowledge of this. The occasion to check this out arose the next scholastic year when Debbie, who had become totally blind at a very young age, was placed in one of my first year secondary classes.

Second Experience: Debbie

My school has an inclusive education policy and, over the years, it has catered for various disabilities. Debbie, however, was the first student with a visual disability. As such, having Debbie among us was a new experience for students, teachers, facilitators and administrators alike. Debbie, whose academic performance reflected what is normally expected from a student of her own age, had spent all her primary years in mainstream education. It was decided therefore that she would attend all the classes taken by her classmates. The only real concession was the assignment of a facilitator to act as her scribe.

Although, given Debbie's age, the mathematics content level and the teaching-learning environment were both different from John's, I decided to use the same teaching strategies and techniques that I had developed previously with John. This time, however, I could rely on the presence of a facilitator in class, with whom I worked in very close collaboration. Apart from showing the facilitator how to emboss diagrams, I made it a point to discuss my lessons with her well in advance so that she could prepare appropriate resources. This enabled Debbie – who, unlike John's mostly homemade tools, had bought her own set of embossed tools from an established society for the blind in London – to follow my lessons and to work out the topics in much the same way as her classmates. Throughout the year Debbie had to do a big chunk of her work mentally because, unlike John, she was still learning Braille [iii]. Moreover, just like the sighted students in my class, she was not allowed to make use of a calculator (a provision stipulated by the first year secondary mathematics syllabus of the time).

Having Debbie in class has helped me realize what an inclusive mathematics classroom can look like. For I could see that she was actually

learning, decidedly in a caring and supportive environment, the same mathematics to which I was exposing my other students. She even mastered, assisted by her facilitator, the use of the 'Derive' computer algebra system in spite of not having a computer equipped with a speech synthesizer at her disposal. The ongoing positive feedback that transpired from her overall mathematics experience was a constant reminder that her physical disability was not hindering her learning. Debbie's presence in class was indeed both fruitful and rewarding, certainly not a token one mimicking inclusion.

This reality, perhaps, may be better understood if I give an example from our daily work in class. Take, for instance, the plotting of Cartesian coordinates. This followed the following procedure:

- the facilitator reads out the coordinate;
- using an embossed graph paper with a pin in the middle to indicate the origin, Debbie moves her finger along the embossed grid to locate the coordinate;
- the facilitator marks on her 'normal' graph paper the position indicated by Debbie;
- the procedure is repeated according to the work set;
- the answers recorded by the facilitator are then collected and marked by the teacher.

This and similar methods were found to be both effective and time efficient. Not only did Debbie know exactly what was required of her, but she could also work at practically the same pace as her classmates. This made it possible for her to follow my explanations and/or instructions, and to listen to and participate in all the arising discussions in class. I find, in particular, that her often active participation in the classroom's teaching-learning environment rendered her presence truly inclusive. She was not just in class, but an integral part of the class. Considering also the number of times she had to miss class due to medical visits abroad, I would say that her consistently high mathematical performance throughout the year convinced me that, given the right conditions and encouragement, a blind student can succeed in mathematics even within mainstream education.

LESSONS LEARNT

A cursory glance at the history of mathematics reveals the existence of a number of blind mathematicians, some even from birth. The two success stories narrated by Mariella above strengthen our conviction that there is nothing in blindness *per se* that prohibits the learning of mathematics. We would add further that given the right commitment by all involved as well as

solid support structures, it is also possible for blind students to learn mathematics in mainstream classrooms and get their achievements certified in pretty much the same manner as their age peers. All this renders us doubly happy: the demise of academic isolation for blind students addresses a long existing social injustice and the possibility of mathematics certification clears the way for career prospects that would otherwise be barred.

But we remain of the opinion that the road toward the fruitful inclusion of blind students, not to mention other forms of disability, is still long. The fight is far from over. Not only are we not convinced that Debbie's positive inclusion experiences are representative of what is happening locally with other blind students, but speaking more generally there also appears to be widespread implementation difficulties when it comes to translating inclusion policies into practices. Suffices to say that when a leading Maltese disability lecturer and researcher was asked recently whether inclusive education is working in Malta, his reply was an empathic 'no' (see Stivala, 2008). The 'found lacking' inclusion picture he depicted mirrors Michael's impressions on local inclusion which he built sporadically over a number of years while visiting schools, mostly at secondary level, to assess trainee teachers on teaching practice. Michael would summarize his often disturbing encounters with supposedly inclusive classrooms as follows:

> Disabled students were usually placed at the back or side of the classroom, sitting on their own in the company of the facilitator (to be less obstructive?). They hardly ever interacted with the teacher or other students during lesson. Most of the time they were doing the 'other' work – read 'easier' – that was assigned to them … I invariably felt sorry for them as I thought that they must feel very lonely in these circumstances. They were physically present in class, but they did not seem to be part of it.

Contrary to Debbie's story of achieving inclusion on her own terms, it appears that other disabled students, although increasingly integrated in mainstream schools, "often remain excluded from the unchanged, one-size-fits-all curricula, organization and activities of schools dedicated to their normative function" (Bartolo, 2003, p. 170). This would mean that Mariella's positive experience with Debbie – although proven to be quite a reachable goal – is possibly an oasis in a desert. For sure, Debbie's innate ability to learn mathematics did not flourish simply due to the existence of some policy document urging schools to become inclusive (e.g., Ministry of Education, 2000), but also because of Mariella's insistence and ability to translate inclusion policies and school backing into a classroom ambience in which all students, disabled or not, could feel part of and participate fully (see Bartolo, 2003). As has already been demonstrated locally with the decade-long largely

unsuccessful efforts to reform classroom assessment (see Buhagiar & Murphy, 2008), educational policies cannot succeed unless embedded within an all encompassing supportive system in which teachers are unequivocally convinced and commitment toward change.

But the implementation problem seems to go deeper than just having teachers who, as the Ministry of Education (1999) readily admits, feel unprepared to work in an inclusive context. It is the whole educational system which appears to be unprepared. Mariella clearly remembers that although MATSEC, the local examination board, accepted enthusiastically to prepare its first ever mathematics examination paper for a blind student, it was she who albeit inexperienced was entrusted to oversee the whole process without jeopardizing the validity of the certification exercise. Had Mariella been less ready to 'fight' for what she believes in, John would have probably ended up not sitting for the SEC mathematics examination. And that would have meant abandoning his dream of making it to university on his own steam. The very fact that John's certification and future rested primarily on the determination of one teacher is indicative, we feel, of how much the very system that prides itself to promote inclusion is still failing to provide adequate support measures. Without such measures it is far more likely that teachers would choose to ignore or re-dimension policies of which they either do not approve or which, according to their judgment, would not function in their school (see Buhagiar & Murphy, 2008). The essentiality of support emerges also from the fact that most teachers are unwilling to fight against the system, even for things in which they believe (see Buhagiar, 2004).

We also note in John's story how the system, in spite of all the inclusion rhetoric, only seems to act when 'forced' to recognize diversity. Although MASTEC was more than willing to certify a blind student in a mathematics examination, it was only pushed into action once the occasion arose. Undoubtedly, MATSEC is a small and understaffed examination body (see Sultana, 1998). But the fact remains that catering for particular disabilities emerges from John's experience as an afterthought, which should not be the case in a truly inclusive environment. This suggests that local institutions, such as MATSEC, without necessarily expecting disabled students to fit into pre-existing structures, are still not being proactive enough to change freely in order to pre-empt the needs of diversity. Can anyone blame disabled students for feeling like 'intruders' once they sense that change just happens once they happen to be there? This local tendency to manage-by-crisis also explains why we think that Bartolo's (2001) desire to see Malta become a centre of excellence in inclusive educational practice has so far failed to materialize.

MOVING TOWARD INCLUSIVE MATHEMATICS CLASSROOMS

As argued previously, our position is that blind students should be given both the opportunity to learn mathematics in mainstream schools and to get certified. For only then would they be really prepared for inclusion in society, not just inside school or the classroom. We fear, however, that this trajectory is being jeopardized by school architecture and pedagogical practices that, as Dowling (1998) aptly points out, serve to totalize or mythologize the 'normal' human, thereby progressively excluding individuals who deviate from this constructed norm. Believing that 'ability' or 'achievement' are "variables which are constituted in and by the practices of schooling" (Dowling, 1998, p. 69), we fail to understand why so many still feel comfortable believing that "the division between those who can do mathematics and those who can't is perfectly natural and … legitimate" (Gates, 2002, p. 212). This understanding, which betrays the notion that some are simply meant not to learn and succeed in mathematics, may have serious repercussions on the education of blind students, which probably go far beyond the learning of mathematics itself. For by making it sound normal for sighted students not to be able to learn mathematics, the damning implication is that it is even more so for blind students. Should we start believing this, education and finance authorities may unwittingly have been given a reason for not investing enough in the teaching of mathematics to blind students, irrespective of whether such students are interested in and/or capable of furthering their studies in mathematics.

This eventuality would be a serious blow to the implementation of inclusive education and its parallel social justice discourse of 'quality education for all' as opposed to just 'education for all' (see Agbenyega, 2006). Greater investment (which is different from a fairer distribution of resources – see Thrupp & Tomlinson, 2005) for the benefit of those that need it most is required to achieve these ideals, not less. If we truly want to maximize everyone's learning, whether sighted or not, we cannot legitimize minimal learning services for those that appear to be disadvantaged in some way or another. Instead, each student should be encouraged and helped according to one's needs – if needs be even through 'personalized learning' (see Harris & Ranson, 2005) – in order to accomplish his or her journey. For inclusion to become a reality beyond the singularity of particular classrooms or schools we need to invest more in both teacher training (as Mariella's learning-on-the-job model should ideally be avoided) and support structures, including an assessment and evaluation system that caters for diversity. The ultimate aim is not to have equality of outcomes, but to have everyone achieve his or her full potential (Griffin, 2008). Only then would all students, including the blind, truly succeed in the educational system – which is, after all, the modern guiding principle of developed and developing educational systems in the

world, Malta included (see Ministry of Education, Youth and Employment, 2005). We are aware however that ours is 'complex hope' in the sense that it is "an optimism of the will that recognizes the historical and structural difficulties which have to be overcome" (Grace, 1994, p. 57). But it is hope nevertheless.

Notes

i. This knowledge of Braille was to prove a useful asset in his learning of mathematics. For it helped him to build a mental image of how a mathematical task is written down (e.g., an algebraic equation or a fraction). It also made it possible for him to keep record of the intermediate steps involved in procedures. According to John, he could 'visualize' mathematical representations through Braille and thus lessen his otherwise complete dependence on memory.
ii. Throughout this collaboration, Mariella never had any access to the actual content of the examination papers. She was consulted, however, by MATSEC regarding the best manner in which to present these 'special' examination papers. John had a trained special needs teacher to assist him during the examination (which was extended by 50% extra time to compensate for his disability). Mariella, on the other hand, acted as 'facilitator on call' – only being called into the examination room when a problem arose (e.g., to explain a diagram that was not clear enough in the embossed version).
iii. In fact, a Braille instructor used to visit her once a week at school to teach her Braille and how to type using the Braille machine. During typing practice lessons, Debbie chose to type important mathematics notes. These notes were then cut out and glued next to the embossed diagrams previously prepared by her facilitator. Having her own mathematics file, complete with embossed notes and diagrams, made it also possible for Debbie to study independently.

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