European Educational Research Journal
Volume 13 Number 3 2014
www.wwwords.eu/EERJ

Pedagogising Knowledge in Multigrade Roma Schools: potentials and tensions of innovation

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ABSTRACT Low school achievement and frequent dropout of Hungarian Roma students from primary education is mostly an effect of inadequate curriculum content and teaching methodology. Between 2004 and 2011, the UNESCO affiliated Research Centre for Multimedia in Education at Eötvös Loránd University (ELTE University) in Budapest, Hungary coordinated a series of learning experiments partnered with teaching staff and parents to develop developmental programmes using Information and Communication Technology (ICT) to enhance learning motivation and performance through the integration of the mundane knowledge of students and the recontextualised expert knowledge inherent in the national curriculum. Experiments involved primary schools in small villages with Roma student majority. Verbal and visual communication skills were developed through pair and group work during interdisciplinary activities based on music, arts and crafts traditionally present in Roma communities. Our results prove that lack of motivation and perspective, as well as factors resulting in low learning attainment, may be overcome through culturally grounded ICT-supported teaching and learning. Through staff development and curriculum enrichment, the projects also contributed to integration: they supported the continuation of studies of students in secondary level institutions of their choice, a prerequisite for better chances on the labour market or in higher education.

Introduction

In times of economic crisis, unemployment hits unskilled workers first. Many Hungarian Roma families are targeted, and their education as a remedy for inherited social disadvantages has once again become a major issue of educational policy making. Contrary to public belief, low learning attainment of Roma pupils is not caused by irregular school attendance or early drop-out – it is due to the differences in the quality of schools Roma and non-Roma Hungarians attend and the inadequate curriculum content and teaching methodology they encounter. The UNESCO affiliated Research Centre for Multimedia in Education at Eötvös Loránd University (ELTE) in Budapest, Hungary coordinated a series of learning experiments partnered with teaching staff and parents to develop developmental programmes using information and communications technology (ICT) to enhance learning motivation and performance through the integration of the mundane knowledge of students and the recontextualised expert knowledge inherent in the national curriculum.

In this article, we outline the 'Gypsy issue' in Hungarian education and show how our projects for pedagogising knowledge through synchronisation of the mundane and the esoteric were successfully introduced with innovative use of ICTs in Multigrade schools.

 http://dx.doi.org/10.2304/eerj.2014.13.3.325

The 'Gypsy Issue' in Hungarian Politics in State Socialism and after the Political Changes of 1989

From Forced Assimilation to Institutionalised Segregation

After the Second World War, the large estates in Hungary belonging to the aristocratic landowners and the Catholic Church were parcelled out among the peasantry. Though many Roma had been traditionally working in agriculture, they were excluded from this process. As a result, they did not benefit from the production of socialist cooperatives in the same way as other agricultural workers, and 'when cooperatives were dissolved after 1989 they, again, were left without land property' (Vajda & Dupcsik, 2008, p. 5). Deprived of work in agriculture, Roma were forced to seek employment in industry, and thus move to towns and cities to satisfy the demand for industrial labour. Lacking education and suffering from racial discrimination when applying for jobs, most Roma were allocated unskilled labour only, and were therefore confined to the lowest social status. Their claims to be recognised as an ethnic group were also denied (Kertesi & Kézdi, 2005; Vajda & Dupcsik, 2008). Politicians spoke about the 'Gypsy issue' as a social problem that needed social crisis management to support (or force) assimilation.

The first representative national survey on the Roma in the twentieth century showed that they had a low level of education and, consequently, a low rate of employment, poor health conditions, and difficulties in accessing social benefits (Kemény et al, 1976). Campaigns to eliminate Roma colonies in villages and forcefully settle the families in social housing blocks in towns and cities resulted in increased segregation. Wandering Roma musicians, merchants and craftsmen were banned from practising their trade. More than two-thirds of Roma men found jobs, mostly in unskilled labour in industry, and often in another part of the country – a situation that led to a family pattern of absent fathers.

After 1989 and the collapse of state socialism, the Roma became the first victims of the change of regime. Although their housing conditions improved after the abolishment of the poverty-stricken colonies in the outskirts of towns and the erection of new blocks for social housing, this tendency stopped and 're-ruralisation' characterised the turn of the century. Nowadays, most Roma live in small villages or populate the urban slums of deteriorated industrial areas in the economically disadvantaged North East and South West of Hungary. Privatisation (and frequent shutdown) of outdated industries led to growing unemployment, poor living and health conditions, and a shorter life expectancy. After the euphoria of the change of regime, the 1990s brought social insecurity for the majority population that resulted in growing intolerance and hostility against the Roma population. As a result of the employment crisis of the early 1990s, only 28% of Roma men aged 15-54 had formal jobs; among Roma women, the employment rate was 15%. Roma households raise more children than the non-Roma (3.5 vs 1.5), and their extended households have many dependants and few active earners. By the end of the twentieth century, internal differentiation within the Roma population resulted in a small group of entrepreneurs and intellectuals and hundreds of thousands of others living in poverty (cf. Vajda & Dupcsik, 2008).

The education of Hungarian Roma changed substantially when the country entered the European Union (EU) in 2003 and accepted the so-called Capotorti definition of this minority as a nation with equal rights to education in their native language, based on their needs and ambitions (Capotorti, 1977). While previous educational efforts were targeted towards segregation disguised as remedial primary level education in 'special' classes with lower attainment expectations (dead alleys that practically prevented further studies), new programmes envisaged textbooks in native languages and support for the training and subsequent enrolment of Roma teachers. Unfortunately, very few Roma chose to become teachers. Even those who graduated with an education degree rarely returned to their towns and villages. Therefore, even today, schools with Roma majority are staffed with non-Roma teachers, although more and more Roma women – mainly mothers of children attending the schools – are trained as pedagogical assistants or volunteer to work as occasional helpers.

The undereducation of young Roma continues today. Primary education that is supposed to develop learning-to-learn skills, and develop a motivation to pursue further studies, often fails them because neither their needs, nor their capabilities are considered when transmitting a curriculum that is largely text-based. Understanding concepts routinely used at primary level is problematic for

children whose mother tongue is not Hungarian or who do not attend kindergarten, an important preparatory institution for schooling. Most young Roma who continue their studies after the compulsory eight years of primary education, attend vocational schools that often train redundant workforce, as the system of vocational training in Hungary has not been restructured to meet the needs of a transformed economy. Thus, undereducation and unemployment are intricately related. Factors such as poverty, lack of education, and unemployment are becoming more and more powerful, and the social distance between the Roma minority and the social majority constantly increases (Kertesi & Kézdi, 2011).

One of the aims of the project described in this article was to explore the ways of closing the gap in educational outcomes between the majority and minority students, with a particular focus on Roma students in primary grades. We engaged in recontextualising the disciplinary curriculum into multidisciplinary arts, science and math curriculum, across 16 multigrade elementary schools with a large Roma student population.

Roma Education: need for transmitting 'powerful knowledge' instead of the 'knowledge of the powerful'

Bourdieu (1997) characterised education as a social arena plagued with constant conflict and competition for the monopoly over different types of capital, including knowledge. Acquisition of informational capital is crucial for self-formation through pedagogical socialisation. The brief overview of this article about the fate of Hungarian Roma is that they are losers in the battle for knowledge capital and they are deprived of education beyond the minimum required for entering the unskilled labour force. One of the main reasons of the failure of 'remedial' or 'special' education for Roma students offered by Hungarian schools is that their aim is to teach a diluted version of a national curriculum based on esoteric or elitist knowledge, or on what Beck (2008, 2013) calls 'the knowledge of the powerful'. When embarking on a 're-pedagogisation' of existing curricula and developing new contents and modes of learning intended to bring discipline- and domain-specific expert knowledge closer to the mundane or metacognitive knowledge young Roma possess in abundance, it is important to consider the social roots of all such pedagogical interventions.

However, benevolent intensions for intervention from outside the Roma community always face the danger of cultural colonisation – presenting a new kind of expert or esoteric knowledge to replace that of the ruling (educational) elite. Singh (2002) interprets Basil Bernstein's concept of the pedagogic device as an ensemble of hierarchically structured rules and procedures to convert knowledge into pedagogical communication. This device is distributive, as it regulates the power relationships between social groups. Bernstein identifies three main fields of the pedagogic device: *production* (undertaken by researchers); *recontextualisation* (selection and structuring of knowledge by educational curriculum authorities, teacher training institutions, professional publications, etc.); and *reproduction* or pedagogic inculcation, done by schooling institutions. Bernstein emphasises the importance of knowledge definition and distribution by the ruling elite:

> The incentives are huge in this struggle, for the group that appropriates and controls the pedagogical device exercises power in relation to the distribution, recontextualisation and evaluation of complex knowledge forms (competence embedded in conscience). Thus, this group exercises control over a ruler and distributor of conscientiousness, identity and desire. (Singh's summary of Berstein, 2002, p. 577)

These 'privileged and privileging pedagogical texts' are supposed to be recontextualised by teachers, while their ideas about authentic pedagogical content hardly ever reach decision makers.

Beck (2013) integrates and further develops the ideas of Bourdieu and Bernstein when he shows how transmitting 'the knowledge of the powerful' – authorised by those in power, in most cases educational policy makers and their experts – completely fails to reach the socially disadvantaged. He offers a sophisticated interpretation of similarities and differences between powerful knowledge and the knowledge of the powerful. Young (2012) emphasises the need for 'powerful knowledge' that, to mention only a few major characteristics: develops reliable ways of thinking instead of teaching readymade concepts and rules; suggests realistic alternatives instead of preaching truisms; is conceptual, as well as based on evidence; and is always open to challenge.

Sociological research on Roma culture helped reveal paths for education to follow in order to build bridges between minority and majority cultures that supports mutual communication, and ultimately leads to a better understanding. In the framework of the 'Societies and Lifestyles' project, realised between 2006-2009, 10 post-communist countries documented and analysed lifestyles and values of so-called fringers: small ethnic groups living on the fringes of society in a country that recognises their cultural values and social needs for self-governance with reluctance and prejudices. Representing different worldviews, values and beliefs from the majority of the country, Muslim minorities in Slovakia and Russia and the Hungarian Roma served as examples of social groups whose rich cultural heritage had been exploited without its integration into an authentic and empowering curriculum (Forray & Beck, 2008).

The study described lifestyles and belief systems of the most numerous subgroups of Hungarian Roma, about 600,000 in number, the biggest majority in a country of ten million inhabitants. Hungarian Roma belong to two major tribal groups that are basically different in culture, lifestyle and attitudes toward education. The Romungro ('Hungarian', Vlach, 'Wallachian' or 'Olah') tribal members call themselves 'Gentleman Gypsies' ('Raj'). They are better educated then the other groups and most of the 3% of the Roma cohort pursuing studies in higher education come from these families. They are proud of their culture and despise those who try to conceal it. However, their identity is not connected to their ancient tribal language which they lost in the process of acquiring middle-class Hungarian culture. The Boyash (or 'Beás') live in the South of the Transdanubian region of Hungary, in small villages in the vicinity of larger centres where they can find employment. Their identity is deeply rooted in their art (music, dance, crafts) and their language. Many of the Beás families live in peaceful coexistence with their Hungarian neighbours who consider them peaceful and hard-working people. However, in areas where work is scarce, the Beás are the first to lose their jobs (or never get any) because of discrimination based on prejudices. The vicious circle is thus formed: the Beás communities still live in the fringe of small villages or in 'Gypsy ghettos' of towns and cities, and, if there is no work, they are forced to make a living as beggars and thieves – a fact that makes employers reluctant to offer them a vacant job. Criminal rates among them are high and so is unemployment.

At the beginning of our project, in 2008, the National Core Curriculum and its regional supplements represented 'the knowledge of the powerful' inasmuch as they referred to expert knowledge requiring the use of linguistic codes that were not possessed by young Roma and other disadvantaged groups. They did not include knowledge related to Roma cultural heritage, nor did they consider methodologies that favoured students with restricted knowledge of the Hungarian language, but who possessed exquisite visual skills. Remedial efforts of educational policy makers failed because they focused on transmitting esoteric or expert knowledge instead of powerful – contextualised, motivating, relevant – educational content.

In the experiment reported here, we worked with the staff and students of village schools to empower Beás children to go beyond the local primary school and learn skills or a profession to succeed in life while retaining national roots. Adherence to cultural heritage (especially music, dance, crafts and visual arts) and strong ties to native language and lifestyle called forth a need for an education that promotes these valuable skills and integrates them with the knowledge necessary for pursuing a career in and outside their home environment.

We intended to focus our educational interventions on appropriation, and, ultimately, integration phases of recontextualisation and reproduction, and to bring the curriculum design closer to the reality of schools. Involving teachers, parents and other local stakeholders in the process of selecting relevant knowledge and locally authentic forms of group learning, we hoped to integrate common (or, using Bernstein's term, 'mundane and horizontal') discourses with esoteric (symbolic, conceptual, expertise-driven) knowledge. If this integration fails, the tension between the 'knowledge rich' and 'knowledge poor' will never be resolved (Bernstein, 1990; Singh, 2002). We believe that decoding or pedagogising specialist expert knowledge in a way to make it both understandable and relevant for young Roma is very important. An example is using interactive scientific visualisations – representations of concepts and rules through animated graphic images that students can add new values to and see how they affect processes. These animated images help visual learners understand complex scientific processes (McCandless, 2009). We also used educational games that connected knowledge elements and processes to real-life experiences.

These may produce in-depth learning and competence development without alienating students from a world of unintelligible concepts and rules.

Developing cognitive, affective or psychomotor skills are obviously unable to solve social problems of an oppressed minority. Nevertheless, such educational empowerment may lead to the formation of a native group of intellectuals who may represent the interests of Roma more effectively. On the other hand, in times of economic crisis, unemployment hits unskilled workers first. Many Hungarian Roma families are targeted, and their educational success may help overcome their inherited social disadvantages.

Fostering Roma Students' Affective Skills through ICT-Supported, Interdisciplinary Projects (2008-2013)

Pedagogising Knowledge: an attempt to synchronise the mundane and the esoteric

The transmission of powerful knowledge should be based on a detailed analysis of the context of innovation. In the course of the preparation for our project, we sent a questionnaire to all the 600 Hungarian Multigrade schools with a majority Roma student population and asked about problems, success stories, perspectives and future plans. Based on survey data, we compiled an interview protocol and visited 22 schools to identify local educational needs and issues of tension that prevented teachers and students from an enjoyable and meaningful educational process.

In Hungary, about 20% of Roma attend segregated schools, most of which are small village institutions with multigrade arrangement. Multigrade schools have undivided classes (usually for grades 1-2 and 3-4) with one teacher instructing two age groups simultaneously. These schools are characterised by: poor infrastructure (low local tax income results in no support beyond the state-financed minimum); high fluctuation of teaching staff and 'white flight': and the avoidance of Hungarian parents to enrol (or, if already enrolled, to withdraw) their children from schools with a high percentage of Roma students (Feinschmidt et al, 2010; Greenberg, 2010). The Eötvös Loránd (hereafter ELTE) University team has conducted several school-based research and development programmes in such village schools in collaboration with local teachers, and developed new learning programmes, as well as free time activities that developed competences of young Roma while strengthening their national identity.

In a Hungarian study on reasons for underachievement of socially disadvantaged primary school pupils, metacognition was detected as one of the major causes. This research called attention to metacognitive knowledge and the importance of regulation and control processes associated with it. For socially disadvantages students, lecture-style instruction seemed to be one of the barriers to their learning. Consequently, visual learning techniques combined with oral and written explanations could significantly enhance their learning performance (Taskó, 2009). According to our teacher surveys, reasons for underachievement also included communication problems (the lack of verbal skills and courage to ask questions during lessons) and difficulties in understanding abstract concepts without appropriate explanation and visualisation. Results of the survey (Kuhl, 1999) showed that learning deficits reported by the teachers could not be explained by the lack of motivation to learn, as more than half of them manifested high or very high achievement motivation. Teaching observation records showed that this motivational drive could not be realised at school. Here, socially disadvantaged students experienced extreme stress because they did not understand the language of textbooks and teacher explanation. Many of them came from Roma families where Hungarian language was not regularly used, and others had little opportunity to talk with parents as they had to work long hours to earn a living. Conceptual gaps turned out to be the most important reason for underachievement, together with the lack of authentic content. Socially disadvantaged students often saw no relations between information provided by school disciplines and 'real life'. When we offered the same knowledge embedded in lifelike situations through edutainment tasks, students actively engaged in tasks and their performance improved (Kárpáti & Munkácsy, 2012).

The basis of curriculum development was the trialogical learning theory (Hakkarainen, 2009). The trialogical framework of learning is a collective knowledge creation metaphor, aimed at understanding how new educational practices and/or artefacts are born. A central feature of this model is acting around shared objects that are likely to change during the knowledge creation

processes and act as tools for mediating collaborative activities (Paavola et al, 2004). Learning that occurs within one's mind ('monological' approach) happens in self-guided knowledge acquisition processes characteristic for instances of deep inner motivation. Classic concepts of artistic creation centre on this model of introspective self-refinement. In a traditional classroom or studio setting, learning involves a hierarchical interaction between the learners and teacher ('dialogical' approach). In 'trialogical' learning, a triangle is formed with the knowledge object (in art education, for example, an expressive or design idea) as the third component. Teachers and learners are both providers and receivers of new insights and methods at the same time and act as equal partners of the knowledge creation process. In learning groups, scaffolding educational discourse in a way that ensures an optimal interaction between personal and social levels and the elicitation of individual and collective agencies is a decisive issue.

Multidisciplinary Arts and Science: an authentic and motivating alternative to disciplinary education

Working in the Beás villages, the major aim of the UNESCO-affiliated research group at ELTE University, Faculty of Science was to co-develop learning and free time activities with Roma and Hungarian teachers that 'lure' Hungarian students to currently segregated schools that act as a cultural centre for the whole village. In 2005-2013, we introduced learning programmes that turned one-classroom multigrade education from handicap to advantage through multi-age, multidisciplinary learning programmes, focusing on collaboration among students of different classes in the computer-supported environments of the one-room schoolhouses. Discipline based education, often blamed for teaching unrelated facts, concepts and rules were supplemented and partially replaced by an interdisciplinary approach that integrated the arts, science and mathematics.

> I was not particularly happy with the new project about to hit our schools. ELTE is a star university, folks coming from there would certainly press for more practice and better test scores. I had six third graders – aged 8-12 years, yes, they often repeat a grade – and five fourth graders, aged 10-15 years. They are nice kids (even if we quarrel sometimes and they fight each day) but their interests are basically different from what I can offer. After the first maths lesson given by one of the researchers (never imagined they could actually teach!) I started to be interested and so did my class. Kati showed that maths was everywhere – it was useful and fun. Playing and hands-on stuff to show rules, I thought, okay, if this is the new way, I have loads of ideas, being a mother of three. Nice to hear I could use them. (Excerpt from a logbook, female teacher, aged 43)[1]

In socially disadvantaged schools with Roma majority, teachers usually considered poor prior knowledge, low motivation and insufficient abilities as the main reasons for the underachievement of disadvantaged children. Remedial programmes mainly targeted skills development through memorisation and practice tasks. As a result, learning attainment did not improve and students continued to perform significantly lower in mathematics than those in towns and cities (Andrews & Sayers, 2006).

After discussions with local teachers and parents about the tensions and their hopes about education, we chose a different approach. Our aim was first to increase motivation and curiosity, then enhance social and communication skills, as well as learning attainment. We targeted the improvement of numeracy, verbal and visual communication through the enhancement of affective skills through collaborative, interdisciplinary projects in ICT-supported learning environments. Experimental education involved 21 multigrade schools and was realised in cooperation with the European Network of Multigrade Schools in the NEMED (Network of Multigrade Education) Project (2005-2008),[2] and the similarly EU-funded Knowledge-Practice Laboratories (KP-Lab) Project (2008-2013).

Potentials of Computer-Supported Education to Promote Equity in Schools

In Hungary, internet penetration and computer use of the population is around the European average with 60% of citizens using the internet in the home and/or elsewhere. However, only 13% of the poorest (those with an income beyond the subsistence wage) go online at community centres or other institution with free computer facilities (Nemzeti Médiahatóság, 2012). Computerisation of education started in the 1980s with large scale deployment of infrastructure, but only irregular upgrades were provided to schools by the Ministry of Education. Today, even the smallest schools in the poorest villages possess a computer lab with at least 10 PCs and free internet access, but their educational potentials are not adequately exploited (Kárpáti & Horváth, 2009).

Regular assessment of internet availability and computer infrastructure at schools, however, reveals that digitisation of education – a model that potentially involves individualised instruction, the development of collaborative skills through pair and group work, and the development of important workplace skills – has traditionally been focused on schools in more developed areas (Hunya, 2013). National distribution of digital infrastructure is equal, but not sufficient: those schools with an average or above-average level of computer infrastructure have subsidiary support from local government, parent organisations, or other form of external support. Needless to say, Roma majority schools in small villages have no such resources.

But are computers so important for promoting equity in education? In the late 1990s, many organisations searched for the means to improve the quality of learning in schools through ICT-supported educational solutions. In the ICT and the Quality of Learning project, 1999-2000, commissioned by Centre for Educational Research and Innovation (CERI) (Organisation for Economic Cooperation and Development [OECD], 2001), researchers from 23 member and allied countries executed school-based case studies that evaluated the functioning of schools incorporating ICT in education, internal and external communication, and management to reveal potential and actual effects of computer use on educational achievement. Schools were revisited after 6, 12 and 18 months to see how educational change due to the introduction of 'digital pedagogy' evolved (cf. Venezky & Kárpáti, 2004). In Hungary, computers acted like Trojan horses. Their educational potentials evolved gradually, smuggling an army of new methods within the fortified walls of perhaps the most traditional public sector in Hungary: education (Kárpáti, 2003a). We observed a direct connection between the level of infrastructure and the innovative quality of teaching and learning in the schools observed (Kárpáti, 2003b). No other educational toolkit could so flexibly be adapted to local needs; no other set of information is so easily extendable for socially disadvantaged schools (Fehér, 2000).

In 2003, the OECD commissioned case studies were collected from 14 countries in the United States of America (USA) and Europe to see if computers made a difference in schools in areas with families in need. The studies unanimously indicated that the more disadvantaged a school is, the more ICT can contribute to innovation that supports the distribution of authentic knowledge in a flexible manner (Kárpáti, 2004). These results encouraged us to share computer supported, collaborative methodology with teachers of Roma majority schools, and co-develop a new, interdisciplinary arts and mathematics curriculum that integrates mundane and esoteric knowledge to create an innovative, authentic and motivating teaching and learning community in multigrade schools.

The results of the 2009 Programme for International Student Assessment (PISA) were analysed in detail to reveal factors contributing to overcoming social disadvantages at school. The study (OECD, 2010) revealed that the students with disadvantages at those schools where computer-based, personalised and collaborative education was introduced learnt with significantly more motivation and success. These results encouraged us to employ a sustainable, robust computer infrastructure to support the new interdisciplinary arts and science curriculum. Multimedia learning environments offered interactive visualisations instead of text-based explanations, quizzes and games instead of tests, and problems that are situated in real life instead of concepts and rules that are incomprehensible to young Roma. All of these content and methodology changes may be realised through traditional pedagogical methods as well, but the costs are incomparably higher and personalisation options much lower. We employed ICTs

because they may be most useful for schools that are far away from the world of museums, theatres, concert halls, libraries, and well-equipped laboratories.

Implementation of the Project: tensions of collaboration

Our transformative knowledge work belongs to the school-based research (SBR) interventions, 'recognising and acknowledging the emotional investments, energies and interaction rituals attached to local, domain-specific knowledge and ways of knowing ... processes of recontextualisation at the boundary between researcher and practitioner knowledge can hold the potential to make a difference to issues of seemingly entrenched educational disadvantage' (Singh et al, 2013, p. 102). In 2008-2011, we cooperated with 16 multigrade schools catering for 380 pupils aged 6-10 years with a total staff of 27 teachers. A total of 14 of these schools were situated in small villages where the number of students at the school was under 30, and 2 town schools with students with special learning needs. Two-thirds of these schools had a majority of Roma student population.

Teachers and researchers worked on a new, interdisciplinary multigrade curriculum as a knowledge building community where monthly face-to-face discussion sessions were supported by almost daily online dialogues and group work. Teachers, isolated in villages, far away from the cultural offerings of towns and cities, welcomed the chance of meeting colleagues with similar issues and interests and formed a professional community named after Hungary's most popular writer of the twentieth century, the late Géza Gárdonyi, a multigrade teacher himself. They kept blogs and recorded their lesson plans and experiences of realisation in an online, collaborative environment. There the teachers and the researchers shared their ideas and self-developed, adapted or implemented learning materials (images, texts, tools, etc.)

> I do not have high expectations. Everyone is jobless around and I cannot change it. I cannot give them better houses or food – although, as you could see, we have our own school kitchen and bake bread in that beautiful old oven in the yard. Why I joined? Because I am lonely as a teacher. I have my family; folks here do like me, too. But if I have an idea, or a problem with a parent I cannot discuss it with anyone as I am the only teacher in this school. I can chat about it with husband or friends but no real professional feedback. Being a Multigrade teacher is being your own boss and critic. Now that I have you all, and Zsuzsa from X. has even offered to visit each-other with our pupils during the spring holidays, I feel the same way I did at the university. You are my group, Gárdonyi members, and I attach the picture of a gingerbread heart that I baked for everyone. You will get it during the mentoring session next week. It is cute, but wait, until you see the slide series on our 'Roads' project! (Excerpt from a mailing list, female teacher, aged 32)

Classroom observations included visits to schools of the multigrade teachers' community by peers and researchers four times each year. Student work was collected in so-called 'process-folios' including plans, sketches, notes and results of accomplished individual or group work. These collections, supplemented by student interviews and group discussions, showed not only static pedagogical objects – success and failure in acquisition of knowledge in the disciplines targeted: visual arts, music, mother tongue and mathematics – but also a dynamic process of 'acquisition of ways of knowing' (Singh et al, 2013, p. 104).

We chose multigrade schools because of their Roma student majority and also because we believed that their handicaps (one teacher for two grades in one learning space) may be turned to benefits through interdisciplinary, collaborative work. At present, multigrade primary schools constitute one fifth of all Hungarian public schools. The majority of them are situated in economically disadvantaged areas. According to biannual national assessments, the knowledge level of pupils is significantly lower than the national average (Imre, 2009). Still, the integrity and self-esteem of small villages are closely linked to their only cultural institution, and even if the schools underperform, local communities are fighting for their survival. Therefore, teachers had mixed attitudes towards the innovation project we proposed:

> Another in-service training program! I have nothing against going to Budapest, actually love museums and shops there. The problem is that anything I learn in those wonderful labs will surely not work down here, with computers almost as old as I am! I have been trained and

> retrained several times in the past few years about equity and integration, and could see how nicely everything falls into place in the schools we visited. They even had pedagogical assistants! Coming back here, though, where I am alone with Éva who also has two classes to teach, it turns out that Multigrade education is different. We have a lot of ideas about how and why, and if this mentoring is really about sharing and polishing them, here is how I would like mother tongue to be taught. Teaching aids that you shared are fancy but no good. I made a sketch. (Excerpt from a mailing list message, female teacher, aged 48)

In the first year of the project, recontextualisation of knowledge involved restructuring the curricula of disciplines in integrated arts and maths units. Participating teachers were trained in ICT-supported collaborative teaching methods so that they could decide which of them were appropriate for their class. The innovation process of teachers, mentors, researchers and other local stakeholders was based on the trialogical learning model outlined above that encourages every group to share knowledge and experiences. We made contacts with all layers of the elite of the Roma community: traditional leaders of the communities (the '*Voivodas*' or Chiefs), the local artists and craftsmen.

An analysis of teacher blogs and classroom observation protocols showed that traditional methods of assessment of individual achievement and Hungarian language-based tasks were highly inappropriate for pupils of Roma origin, coming from families where Beás or Lovari languages were used for everyday discourse. Socially disadvantaged non-Roma children also experienced conceptual learning difficulties. Therefore, we developed a series of teaching aids based on visualisations for mathematics and science and employed illustrations for Hungarian language and literature. Pupils of participating schools were encouraged to communicate both orally and in written or visual forms (forum, chat, picture sharing sites and e-mail) with peers in a friendship network. These tasks effectively developed communication skills and also beneficially influenced learning attainment. We enriched curricula in mathematics, mother tongue and visual culture through integrated creative tasks in thematic areas present in both disciplines. In visual culture, interdisciplinary themes included balance, rhythm, symmetry, proportion systems. In mathematics, measurement, spatial orientation, text-based tasks and developing visualisations (charts and graphs) were involved. We also added lessons in cultural history in both disciplines through topics like Egyptian numbers and spatial organisation of dwellings through the ages. Learning content was presented in authentic context. Mathematical problems involved measuring volume and spatial orientation in real-life environments, combination, collection and arrangement of data, modelling and reading (decoding) different types of visualisations of mathematical concepts related to problems encountered while shopping or cooking.

Before starting the experimental teaching programme, we analysed the structure of social skills of students with Kuhl's projective test to elicit responses about sensitivity to social relations and to reveal students' emotional safety, ability to work under pressure, their position within their school community, and their relationship with teachers and peers (Kuhl, 1999). This test uses culturally unbiased, simple, but highly expressive images. The third author took tests and analysed results. Pupils were motivated to achieve, but school stress made them intimidated low achievers. Results also showed that social tension experienced at school was an important constituent of learning deficits and behaviour problems. Therefore, instead of focusing on individual performance, we developed a methodology based on pair and group work to diminish social stress and increase motivation for learning. Pupils were more comfortable with collaborating with peers than facing the teacher alone, and they even found pair and group competitions challenging.

Intensive computer use turned out to be less problematic than expected: students were keen on using tools that their more affluent peers regularly employed and had substantial meta-knowledge that could be used for the further development of their digital literacy.

> The computers are here! They are not the newest, but they run all right. The ELTE staff asked me what sort of introduction would be needed and I had no idea as we never worked with them at school before. It turned out that no intro was needed! It was only me and Maria (our librarian) who used the help docs ... Vince, a third grader, told us that in the local inn, gaming machines had the same scroll-down menus (he called them functions) as the ones in the grammar software and he asked me to let him go ahead. Others took out their mobile phones – yes, they have them! – to show me how similar they were to the software I was about to show. Those who

> needed help asked a peer, they rarely came to me. We spent the whole day care time solving grammar problems and listening to music played when a task sheet was successfully completed. (I hope I learn how to shoot this reward function down or will go crazy.) Next day the boys decide to compete and formed groups. I showed them how to save scores and chose tasks they were likely to solve. I also introduced them to their very own grammar books that were to be used as help during practice. It seemed impossible to stop them but fortunately (?) a PC froze and I could say it was tired and we called it a day. I can see them pass secondary school entrance grammar tests now that we have this 'gaming' tool! Or will novelty wear off soon? How soon? (Excerpt from a logbook, Male teacher, aged 35)

The question this teacher posed came up at mentoring sessions and the group of teachers and researchers worked on solving teaching problems and developing new activities together. We used the Moodle virtual learning environment [3] for sharing resources and discussion. Using log file analysis for monitoring activity and discourse analysis to reveal the quality and effectiveness of mentoring, we could follow teachers' professional development and immediately respond to methodological or technological issues (Dorner & Kárpáti, 2010). In this project, we used affordable, low-level computer infrastructure and developed multimedia learning tools that could be utilised in this environment. Collaboration between teachers and researchers was supported by the use of cognitive tools: the MapIt collaborative knowledge building platform and the Semantic Multimedia Annotation Tool (SMAT).[4] However, teachers dedicated to a face-to-face methodology experienced considerable tension while using computer-supported interactive tools that allowed students to work at their own pace, often in pairs or groups, with considerably less teacher control than in traditional settings.

> I must tell you I do not want to use computers in class too much. I believe in personal encounters. Laughs and talks, frowns and hugs, that sort of thing. I agree that in a classroom with two grades, it is just fine to have one of them to work silently in the PC corner while I make others sing or draw. I have been told by parents that PCs are great and later girls can be manager assistants and boys hackers – just joking. I perfectly agree that 'personalised instruction' is just what we need when we have kids like Tamás who solves a problem before I finish writing it on the blackboard and Laci who needs all the time there is. Still, I am happiest when the machines are shot down and put under cover. Am I old-fashioned? (Excerpt from a mail to researchers, Female teacher, aged 51. Subject: need alternative tasks with no PC!)

Some of the teachers considered leaving the project (three teachers actually left us), and others discovered means to bypass ICT-supported instruction. The majority, however, went with the flow and learnt how to integrate digital pedagogy, as well as internet based communication and learning management. During the project, we experienced a catastrophe when soiled mud from an aluminium plant flooded one of the villages where we had a partner school. Computer-supported internet-based communication in the teacher community gave immense moral and considerable intellectual support to those in need. Teachers of the village school decided to keep in touch with parents and children, after moving to neighbouring settlements while their houses were restored or rebuilt, through mailing lists and chatrooms. Elements of e-learning followed and are still integrated in their methodology, even after the village school resumed normal functioning.

Conclusions

The major aim of our project, in-line with UNESCO's mission, was to create a supportive teaching and learning environment for the young Roma, in collaboration with their teachers, parents and citizens of their village who offered their skills and expertise. We created learning spaces where their needs and interests, learning strategies and special skills were considered. Our main objective was to break the vicious cycle of educational failures, leading to families in need with children who fail at school, but we also contributed to the lessening of segregation in the institutions we worked with. In more than half of the primary schools, the enrolment of Hungarian students has increased, and in a third of them, the return of students from far-away, city schools has also been observed.

At the beginning of the experiment, teachers expressed difficulties in coping with national and regional educational requirements while maintaining locally authentic teaching strategies. They

appreciated the companionship of their community, the Gárdonyi Circle of Multigrade Schools, as a chance to identify professional needs and get support and encouragement from peers with the issues they themselves find important, instead of the usual provision of staff development tailored for non-multigrade schools in towns and cities. They mastered digital skills with varying success and motivation, and adapted their educational use to their personal capabilities and teaching strategies. As all the activities could be realised through traditional methods and tools, tensions created by the use ICT did not raise conflicts (Kárpáti & Dorner, 2012).

Learning attainment gains observed in the second and third school year confirmed our assumption that socially disadvantaged students are equally capable of learning mathematics and other disciplines as their more advantaged peers provided that teaching methods cater for their special motivational and learning needs. Mathematics problems presented through real-life situations and visualisations were significantly better understood and solved than traditional verbal tasks (Munkácsy, 2012). In further studies, we successfully tested more methods for the development of social and communication skills to foster the understanding of complex mathematical problems represented in images and verbal explanations (Kárpáti & Munkácsy, 2012).

The use of ICT for the increase of cognitive skills, learning motivation and attainment is a methodology that seems to be best suited to provide equal access to teaching and learning of Roma and non-Roma pupils with severe social disadvantages. For the young Roma for whom Hungarian is a second language, enhanced visualisation options of multimedia provide a welcome support in understanding concepts and processes faster and deeper than through verbal explanations.

The arts (visual arts and design, folk arts and crafts, literature, poetry, drama and music) constituted the basis of the multigrade curriculum. In this field, young Roma often manifest exquisite talent. Two very successful national initiatives – the Snétberger Music Talent Center Roma Youth [5], launched by the worldwide famous Roma jazz musician, Ferenc Snétberger, and the Igazgyöngy Alapítvány (Genuine Pearl Foundation) [6], that supports the visual creativity of Roma children, managed by Nóra L. Ritoók (2011) – are inspiring examples for all of us to continue research and innovation in this area. The road leading to reach the unreached has just begun, but good results may inspire further successful educational projects.

Acknowledgements

One of the research projects reported here was performed in collaboration with the Research Group on the Theory of Education, Szeged University of which Andrea Kárpáti and Éva D. Molnár are members.

This study was realised with partial support of the grant entitled TÁMOP-4.2.2.C-11/1/KONV-2012-0008, ICT in Teaching and Learning – Human Performance Technology.

Notes

[1] All quotations used in this article are part of the Hungarian project documentations of the NEMED (SOCRATES – Comenius 3) and KP-Lab (IST eContent 4) projects, unless referenced otherwise.

[2] NEMED project website: http://www.ea.gr/ep/nemed/, KP-Lab Project website: ww.kp-lab.org, information on resulting handbook: http://www.knowledgepractices.info/wiki/index.php?title=Main_Page

[3] Moodle (http://moodle.com/) is an open source, flexibly customisable e-learning software that is the most frequently used environment in Hungarian higher education, and so younger teachers had some basic knowledge about its use. Others were motivated to learn its use because the services – easy sharing of resources, following discussions without being forced to join, being notified about events without the obligation to attend, etc. – were in harmony with their professional communication needs.

[4] Description of the cognitive mapping tool (MapIt): http://www.esri.com/software/mapit, description of the Semantic Multimedia Annotation Tool (SMAT): http://2d.mobile.evtek.fi/help/index.php/Semantic_Multimedia_Annotation_Tool

[5] http://www.snetbergerkozpont.hu/en/the-talent-center/foundation (last accessed March 17, 2014).

[6] http://igazgyongy-alapitvany.hu/en/ (last accessed March 17, 2014).

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