Over the last two years I have had the good fortune to have worked with a multinational team of researchers on a European Union-funded project examining the teaching of mathematics in the age range 10-14 in England, Flemish Belgium, Finland, Hungary and Spain. In this article we discuss how the physical and social characteristics of schools create the conditions for learning to take place. These include the physical, as in the buildings and their contents, the human, as in the relationships between participants and the temporal, as in lesson lengths. Firstly, though, I discuss the locations of the project’s work, its aims and processes.

Project locations

In general the schools visited were local to the host universities. In Belgium we worked in Leuven, a typically brick-built Flemish city with a collegiate university founded several hundred years ago and not dissimilar to Oxbridge in the national psyche. In Hungary we worked in Budapest, the Hungarian capital founded on a major crossing of the Danube and overlooked by the fortifications of Buda. In Finland we went to Joensuu – pronounced yoh-en-soo – a town founded in the middle of the nineteenth century and located in the forests and lakes of Karelia, about four hundred kilometres north east of Helsinki and close, in relative terms, to the Russian border. Our work in Spain took place in Huelva – pronounced welba – an industrial city on the Atlantic estuary of the Rio Tinto and from where, we were told, Columbus sailed on his voyage of discovery. Lastly, the English element of the project took part in three places according to the locations of the English team members: Cambridge, Manchester and Northampton.

There can be few north-south journeys between EU university towns longer that that between Huelva and Joensuu and few east-west longer than that between Cambridge and Budapest. Thus, with Leuven, just a few kilometres east of Brussels, at the centre of the EU, project countries reflected well the geographical diversity of the European Union and its peoples. Importantly, the five countries represented an interesting diversity of attainment on recent international tests of mathematical competence like TIMSS1 and its repeats and mathematical applicability like PISA2 and its repeat.

Project aims

The project team set out to examine the ways in which mathematics is taught in the age range 10-14. This was, we felt, an important transitional time in the learning of the subject as traditionally this is when the processes of mathematics and mathematics teaching shift from concrete and inductive to abstract and deductive. Moreover, it allowed us to look for differences in the ways in which mathematics was conceptualised and taught at the upper primary and lower secondary educational levels. The project focused on two approaches to data collection. The first year was spent with a week of live observations in each project country. Each observation was undertaken by at least one member from each project team with the consequence that there were never fewer than five colleagues in a room although usually there were more. The purpose of this aspect of the work was to develop a shared vocabulary for describing mathematics classroom activity and a coding schedule for the second phase of our work which involved video recordings of sequences of lessons taught on topics representative of all mathematics curricula. This explicit focus on sequences of lessons set our project apart from other video-based comparative studies and allowed...
us to see in detail how colleagues develop their students’ mathematical understanding and competence over time. The topics were percentages in grades five or six (years six and seven), equations in grades seven or eight and, in order to understand more fully how topics are managed over time and across phases, polygons in grades five or six and again in grades seven or eight. In all, four or five lessons were taped in each sequence giving a total, across the five countries and four topics of just under 90 lessons.

The project schools

In order to contextualise our work we start by discussing the physical characteristics of the contexts in which learning takes place. Inevitably the buildings in which schools are located vary enormously, even within an educational system. However, we believe there are generalities to be inferred. In Belgium, the school buildings we saw varied in age and form and, in many respects, were not dissimilar to those one would find in any English town. Some were modern and some, acknowledging Flemish architectural traditions, were found in older brick buildings. Typically the extent of their surrounding grounds was determined by their location. The closer to the city centre the smaller the grounds. Children generally walked or cycled to school while more distant students used the extensive and regular bus services. There was little sign of students being ferried by their parents. Flemish schools provide lunchtime meals for their students although many prefer to bring sandwiches or go home. The meals, which are provided on a not-for-profit basis, comprise meat or fish, vegetables and a carbohydrate like pasta, rice or potato. Chips, Belgium’s best-known contribution to world cuisine, are also available and students could choose from, in addition to water, fruit juice, milk or drinking yoghurt.

The Hungarian schools, particularly those central to Budapest, were located in nineteenth century buildings and built on several floors around a small court which doubled as a play area. However, the closer one got to the suburbs the more modern and more spread-out they became. The corridors were wide and the rooms typically had high ceilings and windows with secondary glazing that opened into the rooms. Few schools had any grounds other than the central court. Students either walked to school or used the extensive public transport network. There was no overt tradition of cycling to school, which, bearing in mind the denseness of the city and the business of its roads, was unsurprising. The provision of meals at lunchtime – essentially the end of the formal school day – has changed over the last few years. Ten years ago a basic, but generally healthy, meal would have been available for purchase although the pattern of the school day, six forty-five minute periods separated by fifteen minutes’ break, means that many students snack regularly between lessons. More recently the market has been opened and the nature of the food, cooked on the premises has begun to reflect consumer demand for high salt and high fat foods that many young people prefer.

Spanish schools, typically, were modern and brick-built although one we visited was a delightful late nineteenth century building. Most were built around some form of inner court. Despite the overall availability of land in Spain, the schools we visited had limited grounds and were frequently built over several floors. In part this was due to the fact that Huelva was a fairly densely populated town with schools being located close to their neighbouring apartment blocks, houses or light industry. The majority of students walked to school although public transport was frequent, extensive and inexpensive, enabling those who lived a distance from their school to get there easily. Few students were taken to school by car. It was not uncommon for our group to be met by the head-teacher for a coffee and discussion about the school, its aims and traditions, before our observation began. In respect
of catering, Spanish schools normally have a break at around 11.00 during which children can buy cakes or sandwiches or eat those they have brought themselves. Some schools also offer meals for purchase at lunchtime but these tend to be few, not least because lunch follows the end of the school day. The food offered, which used to be of a healthy nature, has recently declined in quality.

The English schools were a mix of old and new and generally built of brick. Depending on location, their grounds ranged from extensive playing fields to a small metalled playground which doubled as a car park. A high proportion of students were taken to school in their parents’ cars while comparatively few walked, cycled or used public transport. All secondary schools had facilities for preparing lunchtime meals and snacks at the mid-morning break. The situation in primary schools varied according to the size of schools with, increasingly, sandwiches being prepared off-site for those students entitled to a means-tested pre-paid meal. Where cooked meals were on offer, the majority of students tended to choose high salt and high fat foods like burgers, chips or pizza although healthier options were always available. It was rare, when visiting a school, for senior staff to show any interest in their visitors and even rarer for refreshments of any sort to be offered. The observations or video-taping were undertaken in a very functional manner with the minimum of disruption to the routines of the school in general and the students in particular.

**The social milieu of project classrooms**

With the exception of those in England, the layout and appearance of project classrooms varied little from country to country. In Belgium, all classrooms had wall-mounted chalk or white boards and an occasional computer dotted around the room. The boards were cleaned every day. Walls were generally bare and, apart from the occasional poster or notice, rarely acknowledged students’ efforts. Students sat, in general, at two-person desks which were usually arranged in rows. The overriding impression was of classrooms as tidy but busy places. Relationships seemed friendly and informal, with students knowing and using teachers’ forenames. There was no evidence of any student being expected to wear uniform. Classes generally comprised students of mixed attainment with additional provision being made available for those with particular additional needs. Primary schools are comprehensive although there is some selection at the upper secondary level. There are also a large number of faith schools which create a de facto selection.

In Finland every classroom had either chalk or white boards which were washed every evening so that every new day started with a pristine board. Children tended to sit at individual tables arranged in a rectangular grid. Every room we visited had a video playback and wall-mounted television. The walls were generally bare with occasional posters or notices but little in the way of systematic celebrations of learners’ work. With the exception of one school, which was the teaching school of the university and which had recently undergone substantial refurbishment, there was little explicit evidence of computer technology. Relationships between teachers and students were informal with participants generally known by their forenames although occasionally one could hear students referring to their teacher as _teacher_. There was no evidence of any student wearing a school uniform, neither was there any evidence of any student disrupting the learning of others. Since the mid-1970s it has been unlawful for students to be grouped by attainment although all schools have a department which offers additional support to those students who need it. All Finnish schools are comprehensive and all parents have a right to choose which school their children attend. However, the vast majority of parents appear content to send their offspring to their local school as standards, supported by the evidence of the PISA studies, are uniform across schools.

In Budapest the classrooms were generally bare with twin tables arranged in rows across the room. There was always a chalk board at the front which frequently had hinged side panels to give the teacher additional board space which, in particular, could be prepared before the lesson and then revealed at the appropriate moment. There were few computers and the overall impression was of aging but cared-for facilities. Students use their teachers’ forenames, although these are often followed by the titles _bacsi_ or _néni_, respectful means of addressing older men and women respectively, and relationships were informal but respectful. There was no evidence of any child disrupting the learning of others and lessons were conducted in an orderly and participative manner. All students were dressed informally. Classes were generally mixed attainment although there is selection in respect of which schools students may attend. Usually, aged fourteen and the occasional use of what are called _special classes_ for subjects like mathematics.

The Spanish classrooms were also largely bare
of adornment although posters were not uncommon. Students were often seated at individual desks which were frequently arranged in rectangular grids although the use of islands was not unknown. At the front of the room was always a chalk or white board. Almost without fail the window blinds, designed to keep out the intense summer heat, were closed. Even in January when we made our first visit, students spent the entire day working beneath artificial lights. Students did not wear uniforms and relationships between participants were informal with students using teachers' forenames. Classes were mixed attainment and all schools are comprehensive. However, a growing culture of parental choice is creating a de facto selection in ways familiar to an English audience. Unlike in Finland, where social differences are ameliorated by well-funded support structures, their location within the town seemed to have a considerable impact on the appearance and resources of Spanish schools.

In England students generally worked at tables which, particularly at the primary level, were frequently arranged in islands. At the secondary level rows were more common. In all English classrooms walls were covered with displays of students' work as well as educational posters. Few English classrooms retained their chalkboards. The majority had whiteboards, a smaller number had ceiling-mounted data projectors and a few had interactive whiteboards which were usually linked to teachers' school-provided laptop computers. Where present, it was rare to see whiteboards cleaned as part of the daily regime. In all secondary schools and most primary schools students wore uniforms. Relationships were formal with students expected to acquiesce to a deferential culture in which teachers were always addressed by a title and surname and, frequently, as either Sir or Miss and, increasingly, Madam. In secondary schools students were almost always grouped by attainment, a trend found increasingly in primary schools.

Although this is necessarily a brief account it offers some interesting insights into how different systems manage the educational processes. It is clear, despite initial similarities in terms of the physical spaces in which schools are located, that the ways in which buildings are used and the social structures found within them both reflect and influence the manner in which systemic aims are addressed. While we would not wish to make claims unwarranted by the evidence it seems to us that there are some interesting inferences to be drawn which challenge some of the long-held tenets of English education.

**Issues arising**

**Firstly,** the predominance of heterogeneous teaching groups in other countries – particularly at the primary level and, for example, throughout the whole educational system in Finland – challenges one of the taken-for-granted assumptions of English education. Many teachers in our project countries clearly work with heterogeneous attainment groups in ways that allow a higher proportion of students to succeed than in this country. We acknowledge that this is a provocative issue for many English teachers which we hope, through future articles in this series, to address more fully.

**Secondly,** the societal equating of effective education with adherence to a school uniform is an unsubstantiated myth. Students in our project countries seemed to behave perfectly well and achieve substantially more without the requirement to tie their ties properly and not be seen in trainers. It is not without irony that we note that many English secondary schools employ a senior member of staff, at a salary substantially above that of a classroom teacher, whose main role seems to be the writing of letters to parents of children in contravention of the school's dress code. Can this ever be described as an effective use of public money? Moreover, the long-used argument that the abolition of uniform would create social divisions fails when we look in other countries’ classrooms and see students from all walks of life working in socially and intellectually productive ways. Those readers who have visited classrooms overseas will know that where students are expected to conform to a dress code they are almost certainly working within a system based on a legacy of British imperialism with its implicit social divisions and explicit emphasis on student conformity.

**Thirdly,** the decoration of English classrooms with students’ work and other adornments appears to have little impact on students’ ultimate attainment. Of course, a simplistic argument might be that teachers who are busy double mounting students’ work are unable to pay attention to the important elements of their work – planning effective opportunities for their students to learn mathematics. Again, we acknowledge the provocative nature of this argument, particularly when Ofsted appears so keen on assessing the so-called quality of the learning environment.

**Fourthly,** the deference of English classrooms and the use of titles like Sir and Madam appear to make no contribution to the education of the learner and, if anything, lead to contempt rather than respect. Students in other project countries know and use teachers’ names. All participants,
through the ways in which the classroom discourse is conducted, show each other respect.

Fifthly, other countries have recognised the value of healthy eating and the acquisition of good dietary habits. An unquestioning adherence to the Thatcherite dogma of market forces has created a situation in which cost effectiveness outweighs any consideration of personal benefit and has contributed significantly to the growing obesity and projected long term ill-health of English children. Thatcher’s legacy is that taxation is now viewed not as a necessary, but an unqualified, evil to the extent that no political party can afford to adopt a principled position on public spending and expect to be elected. The Finns are highly taxed and, although individuals may complain privately, they accept it as a necessary precursor of quality services. Healthcare, in every respect, is free to all at the point of delivery and waiting lists are short. Schools are well equipped, spacious and exceptionally well maintained. Class sizes are small and no one can qualify to teach without a Master’s degree. Higher education, including maintenance grants, is free to anyone who wants it. Public service is not seen as a necessary precursor of quality services.

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In closing, I would like to summarise two of the most challenging issues to emerge from our observations. The first is that in all countries bar England the social climate of classrooms seemed focused on the development of learner autonomy within a collective context. That is, students arrive at school as individuals, hence their right to choose how they dress, but conform to a collaborative mode of classroom working in which all share responsibility for the learning of all. Indeed, so strong is this collective responsibility that the primary objective of the first year of Finnish education is the socialisation of students. Also, when we coded the Hungarian lessons not a single example of differentiation was observed in almost a hundred episodes, even within undifferentiated classes. This, it seems to us, contrasts greatly with the English tradition where students conform to some sense of collective outside the classroom, hence the enforced wearing of uniform, but are expected to be treated as individuals inside with little explicit responsibility for the learning of others. In short, the evidence of our observations suggests that in many European countries there is an expectation of individualism outside the classroom but collectivism within, while in England we find collectivism, with all its implications of social conditioning, outside the classroom and individualism within.

The second concerns differences in systemic views about long term goals concerning life style. In England, the manner in which children are driven to school and the market-led provision of school meals has created a generation of children who are not only incapable of working out how to use a bus but who have had their dietary whims massaged by the menu offered by almost every school in the country. It is not surprising that concerns have been expressed about the long term implications of inert children living off fat-ridden food. The continental traditions, at least as far as our observations went, presented a picture of children not only getting daily exercise but also assuming responsibility for their own lives by getting themselves to school and, once there, being encouraged to eat sensibly. It shames me to admit being English.

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This article is the first of several we hope will appear, either in MT or on the ATM website, over the coming year or two. The data collected by the Mathematics Education Traditions of Europe (METE) project team has proved to be extremely rich and we feel it would be a shame, for example, not to discuss how teachers in other countries structure and teach standard topics. Also, each lesson was coded against a schedule developed by colleagues during the first year of the project and the analyses of these has alerted us to a number of significant differences in the observable objectives and didactic strategies employed by teachers in different countries which we feel it is important to share with colleagues. Lastly, the production of these articles will be our tribute to Gillian Hatch who worked so hard on behalf of the project and whose untimely death last November has left a huge professional and personal gap.

Colleagues wishing to contact the English project team should email either Paul Andrews (pra@cam.ac.uk) or Judy Sayers (judy.sayers@northampton.ac.uk) who will be happy to discuss their work further.
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