Connecting mathematics and culture using ICT in non-formal settings associated with tourism

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Abstract: In this text, we will present the basics of a project connecting mathematics and culture. This project pretends also to bring information and communication technologies to help dissemination on non-formal settings associated with tourism.

Résumé: Dans ce texte, nous présenterons les bases d'un projet associant mathématiques et culture. Ce projet prétend également intégrer les technologies de l'information et de la communication pour faciliter la diffusion dans des environnements non formels associés au tourisme.

We think that both the development of language and the development of a culture with objects influence the creation of mathematical thinking. And both also influence the creation of cultural artifacts. These can be of varied type, such as baskets or handcrafted fabrics, boats, rulers, or even numerical registration systems as in quipu (Palhares, 2010).

Gerdes (1991) devised a methodology that allows the discovery of mathematical thinking of artifact builders. He begins with the researcher learning the techniques of artifact manufacturing by asking 'What geometrical considerations have a role to play in the next phase?' Thus, elements of mathematical thinking (hidden or frozen) (re)appear easily. From these elements, it is possible to see the evolution path of geometric thinking. Through manual labor we recognize that certain forms are more appropriate than others, and these reproduce through sharing within a community. With continuous reproduction, an aesthetic sense becomes part of that form, which is used for other purposes as well.

Brousseau (1997) sees the work of mathematicians as, first discovering, then communicating. In the second phase, they rearrange the results obtained to form something more general, removing context or personal characteristics of the discovery phase. Teachers, on the other hand, must do the reverse, providing context and customizing, to give meaning. He called this second process didactic transposition. But in an increasingly culturally diverse world, it is ethnomathematics (the mathematics of identifiable cultural groups - D'Ambrósio, 2006) that can help us in the process of humanizing mathematics. Through the contextualization of activities in the cultures of peoples, we associate meaning that is easily relatable by children and also why not, by adults. Some research was done in this direction in the classroom.

School is not the only place where mathematical understanding can take place. In fact, this can happen in non-formal environments, with the added motivation that multi-touch platforms technology can bring. We think it is important to bring mathematics closer to the places where popular culture is exhibited and visited, including ethnographic museums.

During the development of the project, there will be a continuous collection of processes and knowledge culturally linked (either related to people's work, or related to the religious – see figure

1 for a small example of artefacts on top of a very old chapel in Braga that are full of mathematical motives to be used -, or related to leisure).
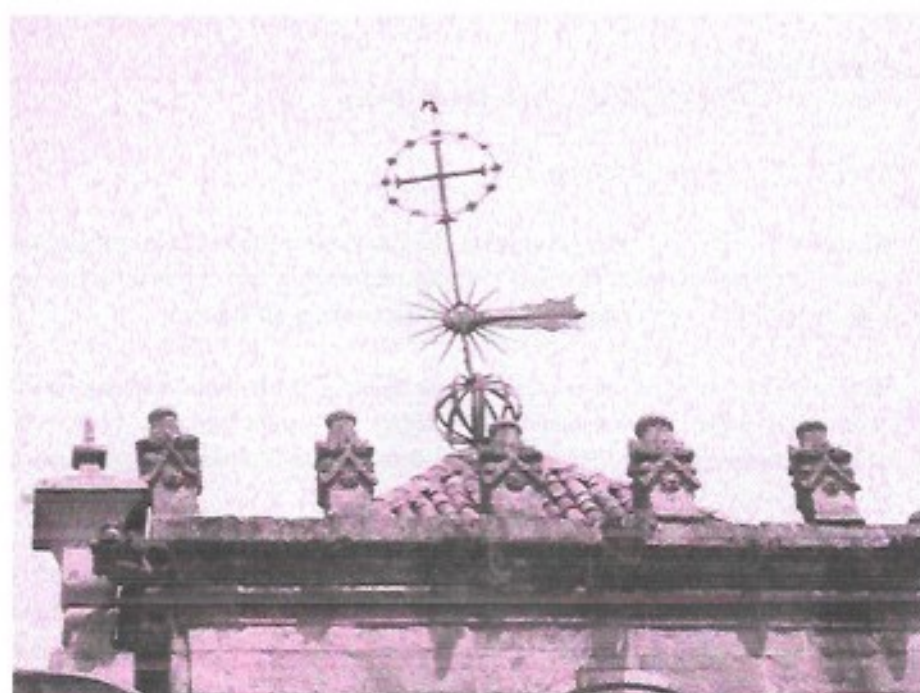
Figure 1 – roof of a chapel in Braga

This collection will be made first by literature review, collecting what has already been produced in previous research, and also by means of a series of small-scale case studies. These studies are meant here as qualitative studies that try to catch both the particulars and the complexity, and in general small in scope, with a few weeks of fieldwork and a few months for analysis and writing. There will also be the completion of a study on caulkers and fishing community and a PhD study, just beginning, on folkloric dances in the north of Portugal and Galicia.

Another thing to be carried out during the development of the project is the design, testing and improvement of culturally contextualized mathematical tasks in a design-based research framework. These tasks will be adapted to be carried out in field trips of basic school classes to the museums, and will be available in different languages (Portuguese, French, Spanish, English) for foreign people visiting. The tasks are meant to be about elementary mathematics, but not necessarily for children. In fact, many adults will gain from a renewed contact with mathematics, especially because in this case, it will be linked to culture, therefore making possible to possibly understand or see with a new perspective what they have learnt in the past. And what is the age we must end mathematics learning? For us there is no age limit and we think that senior citizens might enjoy this kind of learning that brings sense to their cultural roots and experiences.

Final work will consist on the construction of contents for digital devices that can be placed inside ethnographic museums or interpretation centers of popular culture. These contents will emerge from the ethnomathematics that

has to do with each museum, together with mathematical information needed to understand it, so that both adults and children can also learn when visiting the museums, as part of the effort to disseminate and promote mathematical

knowledge linked to people's culture. During the periods in which the multi-touch platform is placed in a particular museum or territory interpretation center, we will organize, together with teachers and social caretakers, visits of groups of children and of senior citizens. These visits, guided by researchers of the team will have both a function of evaluating the material (through answering the questionnaire by randomly selected individuals) and of dissemination of knowledge in the north and center of Portugal.

References

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