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The role of ICT for supporting relationships between students. Evidence for Spain

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Abstract

At present, the use of ICT (Information Communication Technology) is integrated in everyday teaching. Apart from developing new knowledge, it is convenient to test if computer enhances communication and solidarity among students. The implementation of the Program School 2.0 in Spain in conjunction with PISA survey for 2012 provides a unique opportunity for analyzing this issue. We estimate a bivariate ordered probit model for the frequency of support provided to other students and Mathematics performance. We posit the potential endogeneity of the variable Mathematics performance given that support received from others could have a significant effect over the resulting Mathematics achievement. We highlight two main results. First, the probability of helping other classmates with Mathematics increases notoriously in participant Communities in School 2.0 for "strong performers" and "top performers". Second, for repeater and immigrant students (and specifically those with different mother tongue), the probability of providing support "always/almost always" or "often" increases significantly in participant Communities with respect to non-participant Communities for all Mathematics performance levels. ICT provide an incentive for exchanging mathematical problems and discussing different solutions. And what is even more valuable, ICT may foster togetherness and ease the integration of different profiles of students.

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Keywords: Mathematics; ICT; interaction, integration

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1. Introduction

Spanish Universities have adapted their degrees and masters according to Bologna Process, establishing a list of general and specific competences that students should have acquired before graduating. One of these competences is "*being able to project the knowledge and skills to promote a society based on the values of freedom, justice, equality and pluralism*" (UMU, 2010). This competence remind us that the main goal of school is not to do well at university but to succeed in life (Eisner, 2004). It also raises the following question: beyond looking for comparable academic results among students of different cultural/economic stratum or different gender, would it be possible to enhance support among students, so that they learn from conviviality at schools?

The educational system should set up citizens who treat each other with respect, who value others' contributions (irrespective of race, social class or gender) and who act in a sense of justice. The first step towards this objective is to configure environments (classrooms) in which students learn to act in such a way, because students learn a lot more than specific knowledge associated to the different subjects in their classrooms. There is a growing group of scholars who recognize the need for students to learn to work collaboratively with others, especially those from different cultures and backgrounds. The implications of globalization should be taken into account in the pedagogical context with the purpose of melding the intellectual capacities (i.e, critical thinking, problem solving) with social abilities (i.e, respectful social relations) (Gardner, 2004).

Anderson (1999) has stated that "*democratic equality is identified by an individual standing as an equal over the course of an entire life*". If students (potential adults) are going to live in a pluralistic society, it is important that such ways of interaction should be included in the academic curriculum. Although this paper is related to Mathematics subject, the main focus is not on academic performance per se, but on the ways in which students learn from others.

In this sense, Gordon (2001) supported a move away from Mathematics subject being conceived as an individual practice towards a group activity in which the main purpose is less on finding the right answer than on providing a suitable explanation for a particular strategy, and where part of the responsibility for determining the solution shifts from the teacher (or the textbook) to the students (community of learners). Additionally, it may allow students with different native language to express their opinions and learn suitable language patterns by exposing them to models of collaborative talk and thinking. Shweder (2003) recognizes the importance of considering different perspectives and states that "*not only alternate solutions, but multidimensional ones, addressing several orders of reality or orders of experience may be more practical for solving complex human problems*".

Boaler (2008) performed a 4-year study of different Mathematics teaching approaches. In one of the high-schools, students learned to value the act of helping and to care about the learning of others. He found that interactions among students were extremely successful for reducing Mathematics' achievement differences between groups of students belonging to different ethnic groups. At the beginning of the year, Asian students and White students were outperforming Hispanic and Black students. At the end of the first year, there were no significant differences between White and Hispanic students. At the end of subsequent years, Asian students continued to significantly outperform Black and Hispanic students, but differences among Hispanic, White and Black students had disappeared.

At the same time, another competence which has been profusely incorporated to most academic programs is "*being able to information and communication technologies (ICT) in its disciplinary field*" (UMU, 2010), and in fact, the use of ICT has been integrated in everyday teaching. Apart from developing new knowledge, and given that the letter "C" stands for Communication, it is convenient to test if computer enhances communication and solidarity among students.

However, it seems difficult to test this hypothesis given the omnipresence of ICT in university classrooms. It seems quite implausible to compare students' habits and performance with and without ICT. The key point of this paper is that the availability of PISA survey and the different implementation of the Program School 2.0 in Spain provides a unique opportunity to analyze the effect of ICT over collaborative behavior among classmates. Nowadays, computers are an essential instrument in the workplace and certain mathematical literacies are required for effective practice in modern life (Hoyles et al., 2002). Given that mathematical literacy is so completely intertwined with computer literacy, we will try to asses if the implementation of the Program School 2.0 in Spain has improved Mathematics achievement.