

Education as a development and change factor: the integration of digital technologies in education – the Portuguese case

José Manuel Canavarro (University of Coimbra)

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Overview

- In this presentation, the integration of digital technologies (DT) or ICT in education will be discussed having the Portuguese case as grid for analysis.
- 21st century skills are outlined as a paradigm that can be fulfilled with a strong and adequate use of technology at school.
- The Portuguese case has had considerable success, with education, social and economic impacts that must be highlighted. However, a stronger involvement of teachers is supported based in follow-up research studies conducted in Portugal. Beyond the Portuguese case, some prospective reflections are stressed and also some recommendations are pointed out for stronger education-technology based projects to be implemented in the future.

- **1. The Changing World (Is it changing Education?)**
- In a changing world, there are no guarantees. Paradoxically, perhaps there is one – **change will continue.**
- So, having change as a guarantee, we find that everything that helps us deal with it as a factor that develops countries and people.
- To recap, with change being the most certain issue, it is clearly important to manage it for the benefit of a better world and in this almost paradigm, that in just managing change (anticipating or boosting it) we will get better individual and collective results, education and learning occupy a prominent place.
- And does it make sense to distinguish learning from education?
- It does make sense if we neglect the classical definition of education as an institutionalised activity, and learning as an activity inherent to the human being, regardless of the context, which happens “naturally” by interaction of the subject with the “environment”.

- **1. The Changing World (Is it changing Education?)**
- At this stage, the immersion of the technologies in schools and in daily life, is a mark of today, creating and following a **new economic, scientific and social-cultural context. The “environment” of a lot of people is loaded with technology. And of others, not as much. That, in itself, makes the latter potentially more deficient in learning, and it is important to properly overcome this, institutionalizing the appropriate use of technology in schools and at home, based on the assumption that almost everyone has access to Schools. Thus, technology becomes a condition of equal opportunities, of fairness of development.**
- A school without technology is not a current school; it is not a 21st century school. And not just because it lacks the equipment, but above all because without it and without careful interaction, students do not become competent, they will not be able to meet the requirements needed in the 21st century, in personal and professional terms for the future.
- This new economic, scientific and socio-cultural context puts up educational challenges, **since it requires complex skills from individuals**, which allows them or will allow them to be successful and to prosper in the present.

- **1. The Changing World (Is it changing Education?)**
- In the short term, the importance of these skills will be reflected in the way international organisations develop the evaluation of young people's general skills, for example in the case of the **Organisation for Economic Cooperation and Development (OECD)**, the drafts of the conceptual frameworks for the **Programme for International Student Assessment 2015 (PISA 2015)** are already being developed, which provide the theoretical underpinning for the PISA 2015 assessment in which fifteen-year old students will be tested in science, reading, mathematics and collaborative problem solving.

- **1. The Changing World (Is it changing Education?)**
- Recently, as mentioned before and as is widely known, several countries and several organisations have claimed the integration of *21st century skills* into their school curricula. Collaborative problem solving is one of these skills, as mentioned before. Professional and Organisational life nowadays increasingly requires the ability to work in groups and to do it in real groups and virtual groups, sharing in a physical form, traditional, face-to-face, or distance, particularly using in this case digital information and communication technologies.
- In one form or another of collaboration, people will be increasingly required to be efficient in communication, conflict management, team organisation, managing consensus (*21st century skills*), and all this will be vital to professional and organisation integration and development.

- 1. The Changing World (Is it changing Education?)
- Thus, the school architecture, from the construction, physical, technological, curriculum, teacher training, classroom dynamic aspects must be geared so that each student gets involved in a process in which he/she tries to solve a problem, by searching and sharing information, and also sharing knowledge and the effort required to reach the solution. **This will be a widely facilitated process through the efficient use of digital information and communication technologies by teachers and students**, as mentioned and upheld before.

• 2. The Education System in Portugal

- The education system in Portugal, citing, with adaptations, Paiva et al. (2012; pp 21-23), can be presented briefly in the following manner.
- The access to culture and education is consecrated in the Portuguese Republic Constitution as a fundamental right. The minimum compulsory education is universal and free between the ages of 6 and 18 years-old and intends to serve the development and formation of full, aware, free of charge, responsible, autonomous and solidary citizens. A welfare service was designed to assist disadvantaged students.
- The National Education System refers to pre-school, school and extra-school education. Basic Education is structured in three cycles. The Primary Education is divided in four grades (1st to 4th, students aged between 6 and 10 years-old); the 2nd Cycle is divided in two grades (5th and 6th, students aged between 11 and 12 years-old) and the 3rd Cycle in three grades (7th, 8th and 9th, students aged 13 to 15 years-old). Secondary Education includes plus three grades (10th, 11th, 12th, students aged 16 to 18 years old). Higher Education follows the so called Bologna Declaration.

- **3. The Technological Plan for Education (TPE)**
- In 2007, Portugal was still behind in relation to the European average on indicators of technological modernisation. At the technology level, Portugal had a reduced number of computers and support equipment in schools, and internet connectivity had limited speed access. Regarding content and platforms, some limitations were observed that made these sectors capable of growth. And this showed a use in Portuguese schools that was below the desired intensity. Although there is an effort in Information and Communication Technology Training by students and teachers, there was clearly room for growth especially in training teachers and other educational providers. The investment in technology in education was 48% of the average of the European Union in 15 countries.
- This framework clearly opened the possibility for change and investment. The TPE headed this, which represented a more sectorial approach included into a more global approach called a Technological Plan.
- **The strategic objective of the TPE would be to place Portugal among the five most advanced countries in the technological modernisation of education and of Education in 2010.**

- **3. The Technological Plan for Education (TPE)**
- The initiative set ambitious targets for 2010, with an internet connection speed higher than 48 Mbps, 2 students per computer with internet connection and 90% of teachers integrated into the education system with ICT certification.
- The TPE developed in areas.
- The first, the **Technological Area**, included a set of devices for schools, such as: High-speed Internet; School card; Video Projectors; Interactive Whiteboard; Computers; electronic security devices of the School (as a building).
- A second Area is called **Contents**, which is based on the streamlining of a school portal, in adopting a school management platform and also in creating and connecting each school to an official portal of the Ministry of Education – the “Schools Portal”.
- A third area, **Training** developed a whole concept of certified training in the use of information and communication technologies, addressed to the school community.
- There was clearly an effort on Info-inclusion and streamlining of the business market in the area of information and communication technologies.
- The qualified use of Information and Communication Technologies (ICT) was attempted, as well as the streamlining of the production of digital content. The training of Teachers and other Education Providers was also streamlined.

- **3. The Technological Plan for Education (TPE)**
- The E.Escolinha initiative, a part of the TPE, was specifically designed to offer Primary students better conditions to acquire a first personal computer with learning contents - Magellan a portable PC specially designed for children based in Intel Classmate PC, locally manufactured by JP - inspiring knowledge and equipped with educational resources. Under E.Escolinha the broadband access was optional and computers were delivered with at zero cost, 20 or 50 euros to Primary students, according to educational welfare level. **600.000 Magellan computers were delivered to families.**
- In the case of pre-teens and teenagers, there was a specific programme (E.Escolas) that also mobilised, at reduced cost, students of this age segment to the acquisition of "financially beneficial" computer equipment.
- **Portuguese schools were subject to substantive introduction of computer equipment and were motivated by the use of ICT in the interaction with students and with the school community.**

- **3. The Technological Plan for Education (TPE)**
- The TPE elicited support and criticism, as is the norm in what regards sweeping changes, large-scale changes in educational systems with clear implications in the everyday life of schools.
- It was also a political choice started and developed by the Portuguese Government. From 2011, with the election of a new Government and with different partisan support, the initiative was suspended. This was also due to the financial crisis, which led the country to ask for the intervention of the European Commission, the European Central Bank and the International Monetary Fund. This intervention forced the Portuguese Government to rethink some projects with budgetary implications, and the TPE was affected for this reason.
- However, the strong investment previously made in schools, with families and students, maintains a strong level of support to Digital Technologies (DT) - Digital Technologies (DT) and Information and Communication Technologies (ICT) are not theoretically the same, but we will use them as “synonyms” for practical reasons. – From schools and from Portuguese students, with Portugal being a country recognised for a relatively proficient use of these means, especially in the younger generation.
- And we should mention that the fall-back in equipment investment, as mentioned in the TPE, did not inhibit Portuguese schools from maintaining the regular use of digital technologies in their pedagogical practices, nor did it inhibit context producers from maintaining their investments in production of related areas with school learning and the curriculum.

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- **4. The Overall Impact of the Technological Plan (TP) and the Technological Plan for Education in Portugal (TPE) – some considerations**
- Briefly, we can mention five impact areas: political; economic; regional competitiveness; social; educational; all heavily interconnected.
- The Portuguese Government's investment in the technological modernisation of the country brought major impacts. The discussion in Portugal about this issue is not politically unified or peaceful, but some evidence is clear.
- Portugal faces, as is known, a strong economic crisis in the present day, and many of the past policy options are still discussed today. However, the option of administrative modernisation or e-government, the strengthening of technology in the everyday life of people, the use of technology in education, has relative consensus. Portugal frankly improved in several of the indicators, for example, in the faster and easier access of the citizen to public services in general.
- On the political level, the option was clearly an advantage. And regarding citizenship and its exercise, the same can be said.

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- **4. The Overall Impact of the Technological Plan (TP) and the Technological Plan for Education in Portugal (TPE) – some considerations**
- **Economically, Portugal clearly encouraged the growth of a business technology cluster that is connected to Education via the PTE and associated initiatives.**
- There was creation of companies, jobs, turnover growth, and increased export activity with international recognition of the Portuguese companies' abilities in this sector.
- **An interesting example is that of the creation of the E-xample that joins knowledge, products and services of 26 Portuguese companies in the areas of learning and educational technologies (<http://www.e-xample.com>). These are companies that produce and offer different solutions, like solutions for students and classroom, equipment and content and global education project development, education and communication platforms, training, among others.**
- The companies that integrate this consortium have had an appreciable economic growth, with a strong weight in international business, some of them noting annual growths in double digits and demonstrating a weight exceeding 65% of sales abroad.

- **4. The Overall Impact of the Technological Plan (TP) and the Technological Plan for Education in Portugal (TPE) – some considerations**
- By individualising economic impact, Portugal has been able to assert itself internationally, regionally in the context of the European Union, and more broadly as a competitive and innovative country in the technology sector, namely in connecting Technology to Education. The penetration of Portuguese companies of this sector in markets like South/Central America and Africa clarify our statement and emphasise it beyond European borders.
- **Political action can have benefits down the line, strengthening the economy, the competitiveness and international affirmation of local businesses.**

- **4. The Overall Impact of the Technological Plan (TP) and the Technological Plan for Education in Portugal (TPE) – some considerations**
- Social and educational impacts will be discussed with more detail in following points. But, we can already state that from the investment in digital technologies in information and communication technologies, with a structured investment on a coherent and comprehensive educational project, it is possible that the best school learning is developed and that communities are socially empowered, improving ways of social interaction. It is possible to make School more interesting, motivating and generating more and better learning for students, to retrain teachers to be more active and empower adults with low qualifications, if this is also one of the objectives once the facilitating condition of technology is fulfilled for access or reintegration of school learning by adults in their labour activity.

- **5. The "follow-up" of the TPE or Impact of Digital Technologies (DT) in Education in Portugal**

The report also stresses that almost every teacher includes Magellan in its classes: “98 percent of polled elementary teachers reported using the Magellan PC in the classroom at least one day a week, with nearly half of all teachers using it more than two days a week.”

On the one side, 92 percent of teachers referred to use Magellan in their classes to perform several activities. Approximately, 9 out of 10 teachers train children to use computers. Accessing internet (79%), web navigating and searching (78%), reading (71%), presenting (74%), listening to music and watch videos (60%) and accessing digital libraries (59%) are the most common activities. On the other side, less than one quarter of teachers reported implementing internet security activities, doing or correcting homework assignments or doing tests. Only, 1 percent referred social networks. Almost half of teachers reported to use Magellan in their classes at least one time per week.

55 percent of polled teachers classified Magellan initiative as “good”

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- **5. The "follow-up" of the TPE or Impact of Digital Technologies (DT) in Education in Portugal**
- In a general manner, emphasising the good general assessment that the TPE deserves, we could almost say that from the "vox populi" among Portuguese teachers arises the criticism that the Technological Plan of Education, that the E.Escolinhas project, or Magellan, did not satisfactorily involve teachers, that it was missing training and a greater involvement of the teachers in the project so that their integration could become more facilitated.

6. How do we increment the impact of Digital Technologies (DT) in Education? - the involvement of teachers as an educational integration factor

- Six groupings of Portuguese public schools were studied (Paiva et al; 2012), representing socio-economic diversity. Some of the schools are located in rural areas. Others in urban areas. Purchasing power per capita was also diverse, when comparing schools. Various educational providers and actors from the educational community were inquired and participated in the study, like regional and local leaders from educational context and from local authorities or municipalities, School principals, teachers, parents and students.
- The study **adopted a qualitative and action-research methodology**, that is, the researchers involved the school and were involved with the school, even carrying out training, trying to fill some gaps in the use of the equipment for educational purposes.
- **What we stress from the conclusions is primarily the existence of different technology integration modes for each school grouping. It is an expected result. We have schools that integrate the use of the DT in their daily activities, in the curriculum, proficiently in home activities and in others that are still in a very early stage.** If, on the one hand, this conclusion can apparently reflect the autonomy of operation of each school, and be, therefore, desirable, on the other hand, it stops reinforcing the need for greater integration and greater involvement of officials in the promotion of good practices.

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- **6. How do we increment the impact of Digital Technologies (DT) in Education? - the involvement of teachers as an educational integration factor**
- Other studies, for example, those that describe the activities developed in the **Primary School Várzea de Abrunhais** (<http://escoladigital.blogs.sapo.pt/12241.html>), aggregated in the meantime, and throughout the social environment of the School, show the potential that the proficient use of technology can have in a small community in the interior of Portugal.
- This community became one with the ability to use technology at the service of the improvement of their communication conditions, of knowledge-sharing, daily task planning, among other aspects.
- It also allowed for facilitated communication among the inhabitants of this Village, of various ages, and the emigrant diaspora of the same. The involvement of people of all ages, more and less skilled in the use of technology, has been remarkable, and this school won numerous awards, as it was in the School, with the investment in technology, with a teacher who lead and mobilised students and families, where social and community benefits aroused.

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6. How do we increment the impact of Digital Technologies (DT) in Education? - the involvement of teachers as an educational integration factor

- A study, conducted by the authors previously cited and with our review, followed based on a **qualitative methodology with an action-research design**, supported by JP-IK (Paiva et al; 2012), which sought to evaluate and facilitate the educational integration of digital technologies, deepening and trying to markedly reach classroom practices and the school community, which we quote with adaptations.
- The study was conducted in the last quarter of 2012, which corresponds to the first term, in this case the school year 2012-2013, and allowed to act and reflect on the educational integration of Digital Technologies (DT), in six classes of Primary Education. It was possible to analyse its impact on the perceptions, attitudes and representations of the education providers.
- Each head teacher of the classroom had the collaboration of a consultant-researcher who supported him/her in the adaptation and design, implementation and evaluation of activities of curricular infusion and pedagogical innovation of the DT. Data was collected through a series of semi-structured interviews to the various “actors” pertaining to every School groupings, to head class teachers and to a set of students and guardians in each class.

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6. How do we increment the impact of Digital Technologies (DT) in Education? - the involvement of teachers as an educational integration factor

- The qualitative analysis of the interviews indicates that the participants, through different approaches, which derive both from the roles as well as the perceived objectives, **positively evaluate this project, highlighting dimensions such as technological empowerment of the School (it becomes more able to use technology), the critical use of technology and the improvement of student learning.**
- The members of the Governing Bodies of School Groupings **value the action of the consultant, considering that tutorial or training support is critical to the success of process integration.** The teacher assessment is also characterised, not only by their perception of support, but also by the sense of security given by the consultant's actions.
- **Teachers have shown to be progressively autonomous and intentional in their action, recognising the legitimacy and the effectiveness of strategies for curricular infusion and pedagogical innovation,** even in the disciplinary area of mathematics. It is clear that the process adopted in this study created conditions for effective questioning and transformation of meanings. In fact, teacher immersion in the design, implementation and review of educational integration activities, according to curricular objectives, usually missing in training actions, have proved to be strategically effective. **The teachers appropriated the role of privileged speakers of digital development.**
- **For some students, the meaning of learning is more immediate; for others, the emphasis falls, firstly, with the technological component. However, after they are encouraged, they show that they are aware of the curricular learning occurred.**

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- **6. How do we increment the impact of Digital Technologies (DT) in Education? - the involvement of teachers as an educational integration factor**
- **The DT constitute an alternate means, effective and legitimate for constructing knowledge in the classroom itself, acting in school inclusion mechanisms, on the extent to which it favours the reconfiguration of the relationship of students with knowledge.**
- **An incursion in students' computers reveals an intense appropriation.** Through icons and mini-programmes, students modify their desktop. Later, this expression of them becomes subtler. Not only do the students organise their documents in folders, according to personal criteria, they also collect digital documents – their own or of others – that emanate from a guided exploration of their interests. It is during breaks between activities that they create and govern this idiosyncratic universe, without prejudice to their involvement in school tasks.
- **The results of this study are not limited to the classroom. Both students as well as parents indicate that gains extend to the family. It is not only about the technological empowerment of students, but also about the foundation or deepening of a relationship with technology that overcomes mere gaming.**

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- **6. How do we increment the impact of Digital Technologies (DT) in Education? - the involvement of teachers as an educational integration factor**
- **A framework was established throughout the project for shared meaning that legitimised DT educational integration according to the ecological, constructionist, and developmental model, that prefigures effective ways to empower educational communities. Curricular integration allowed to recognise the possibility of transforming the classroom into a place of meaning and the DT into legitimate supporters of learning.**
- This was a study with remarkable success due to the transformations occurred in schools, teachers, and students. It clearly demonstrates that, with adequate support, teachers engage in the search and integration of DT in classroom activities and in curriculum administration. They become active agents in the use of the technology, which they cease to fear. And, in this way, students obtain learning and performance improvements.
- Thus, we conclude that DT integration is vital for overcoming limitations raised by the educational projects that merely privilege the equipment component. This will only determine learning benefits with a strong involvement of teachers. And they will get involved if they feel trained, empowered, and supported. Only this way can the equipment "come to life" and become partner of the day-to-day, of the curriculum, of the community, of the people in and outside schools.

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• 7. Final remarks and Recommendations

- Change is an inevitable feature of the times.
- It is up to countries, to society in general, to manage change, anticipate it, propel it, boost it, and the best way to do it is by investing in Education. In an Education that is suited to a different economic context, capable of responding to the challenges of this century, capable of forming and qualifying competent people.
- Portugal invested heavily in Digital Technologies, Information and Communication Technologies, created a Programme, the TPE, which reached thousands of schools and many thousands of students and families.
- The TPE was a programme that equipped schools, students, but that would have benefited with emphasis in teacher training and teacher involvement in the entire process.
- But, even in financial conditions that prompted a withdrawal in the “digitisation” of the school and of Portuguese society, even with budget changes that are known and that are affecting Portugal, the empowerment that was gained is notable, and with due support and the involvement of teachers, it is possible to make a considerable difference in Education.

• 7. Final remarks and Recommendations

- The lessons learned from the Portuguese experience tell us that it is worth to invest in technology for education, and that this will be so much more enhanced the more educational providers and partners are involved in the process. From here arise benefits to the teachers' performance, to their training, to curriculum management, to student learning, and to the wider community, generating a momentum of knowledge societies or learning societies, in which Portugal is now proudly included.
- **In the economic sphere, Portugal, despite the financial crisis affecting the country, benefited with the growth of companies in the technology sector, with a considerable international recognition of the this sector, with the increase of exports and with qualified job creation. These are aspects which do not emanate directly from educational or pedagogical issues, but they do point out that Technology Projects for Education can bring benefits in other areas.**
- The Portuguese experience is an experience to retain. To emulate critically, because criticism will improve it, when considering the past six years after its implementation. We learn from our mistakes, from our limitations, and the Portuguese case is a good example, that we could do better than we did, noting after the fact, in our case, what could have been done differently, and in this way, just as we have stated before, we can help others who want to do something similar to do things a bit differently, a bit better, in order to achieve excellence.

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- **7. Final remarks and Recommendations**
- **In summary, and in the spirit of leaving some recommendations, an educational technology-based project:**
 - - should hopefully be more than the mere acquisition/distribution of equipment;
 - - should actively involve teachers and students, training the first, holding the second accountable;
 - - should involve the entire education government (central, regional, and local levels according to the national models of education government) and thought leaders and the educational action of each country, also as a way to continuously adapt to the realities of the country from the very beginning, without ignoring this framework for *21st century skills* as a methodological guide;

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• 7. Final remarks and Recommendations

- - should be based on a political decision at the highest level and be able to configure it as a global project, that would give rise to concrete and measurable impacts in addition to the educational ones, searching for new competitiveness in each country, with economic benefits, employment and community development.
- - should be seen as a medium-long term project, because in that way it will be able to, not only change the education system and improve teacher and student learning skills, but also help the global development of the country, of the region where it belongs, and in a larger sense, because we live in a global age, of the world. It should always benefit the children and young people.

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