

Defining the engineering student of 2030

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INTRODUCTION

Since 2006, Higher Education Institutions (HEIs), educational policies, and stakeholders have been addressed to EU recommendations aimed to provide a framework for lifelong learning in a knowledge society [1]. Strategies like “Europe 2020” or “Education and Training 2020 (ET2020)”, focusing on smart growth through the development of knowledge and innovation, try to answer the new global challenges occurred in the digital era. New concepts like digital native [2], digital competence, and digital society are, nowadays, keystones for a better educational achievement.

Engineering studies, in an effort to meet the needs and accomplishments of the future engineers, start incorporating those concepts in their different curricula with new methodologies.

Surveys results among students, evidencing their low motivation, have put a red warning signal in our educational systems demanding for new teaching strategies to build a bridge among what they learn in the classroom and what they can learn outside the classroom. E-learning, flipped learning, open learning, blended learning

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or partnering learning among others teaching methods, are being used in different pilot projects to improve the results. But information society technology (IST) evolves so fast that the faculty members, the methods and, even the native digitals themselves have to be updated. Improved methodologies with the student as a keystone have to be elaborated if we want a successful system.

1 DIGITAL FRAMEWORK

1.1 Haptic feedback

Faster access to network and wifi networks became crucial when, in 2007, Steve Jobs launched the first iPhone. Its introduction in market became very popular and worldwide known. A completely new global horizon was opened for any human being that wanted or could interact with it.

In June 2010, in a screen showing an iPhone and a laptop with a question mark in between, Jobs asked to the public “*is there room for something in the middle?*” [3]. The answer to this question was the first launch of the iPad. Its main feature was the multi-touch interface; the integration of apps like web surfing, email, camera, video and music players, games, eBooks, calendar, social networks, weather forecast, among others. The easy and intuitive use, the portability, the affordable price compared with other devices, and its lightness; have made of this all-in-one device an essential device in many fields like learning, business, medical or economical for instance due to their positive implications. Isaacson affirms in his book [3] that “*The iPad was the digital reincarnation of the Whole Earth Catalogue, the place where creativity met tools for living*”.

The irruption of tablets and smartphones in our daily lives, the creation of cloud computing, Internet-related services and products, collaborative interactions among peers based in cloud storage, the emerge of open learning environments, digital mobility, timeless accessible, personal adapted and the evolution of fast speed connections, have transformed our personal way of learning by inviting activity. Since their arrival its use has grown faster among the youngest and oldest age groups as we can see in *Fig. 1*.

Strongest UK tablet growth is coming from the youngest and oldest age groups

UK Tablet User Growth, by Age, 2012-2017						
<i>% change</i>						
	2012	2013	2014	2015	2016	2017
0-11	124.4%	76.5%	29.2%	19.1%	16.4%	11.3%
12-17	170.8%	52.3%	21.8%	15.4%	14.2%	9.4%
18-24	189.8%	40.3%	23.4%	10.7%	10.5%	7.7%
25-34	184.3%	36.9%	19.0%	12.5%	11.3%	7.4%
35-44	168.8%	39.7%	15.4%	8.5%	7.8%	5.8%
45-54	125.4%	27.3%	21.7%	9.1%	10.1%	6.9%
55-64	195.8%	43.8%	23.7%	20.0%	12.5%	11.9%
65+	244.5%	64.6%	66.2%	49.1%	28.6%	22.9%
Total	165.3%	41.5%	22.9%	14.7%	12.6%	9.4%

Note: individuals who use a tablet at least once per month
Source: eMarketer, Oct 2013

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Fig. 1. Use of tablet by age in UK [4]

According to Holloway [5], kids from 0 to 8 have increased their online digital presence in all EU countries and will continue to rise. Digital presence assumes the use of any device that goes online. The increase in Europe reflects what is happening in countries like South Korea, where the 93% of 3-9 years old go online; or Australia, where the 79% of 5-8 years old go online at home.

This increase also reflects that the use of those personal and inviting activity devices starts to engage people of whatever age, whatever level education or incomes and in wherever place.

Haptic feedback has helped to open up new human psychological possibilities through new habits that involve the tactile, the auditory and the visual sense in just one fingertip. With the arrivals of new habits it is expected new ways of understanding, expressing and approaching to knowledge.

The inclusion in our households of such devices has given birth to a new type of native digital, the iScholar that belongs to a new generation: The Haptic Generation.

1.2 Digital Citizenship

Recommendations of the European Parliament on “*key competences for lifelong learning*” defines Digital Competence as “*the confident and critical use of information society technology (IST) and thus basic skills in information and communication technology (ICT)*” [6].

But the concept has evolved with the arrival of new online possibilities, expertise and use, giving place to a new concept Digital Citizenship. Fig. 2 gathers the many features a *digitally competent person* has to deal with.



Fig. 2. Digital competent person [7]

Digital citizenship is defined [8] as *the effective and appropriate use of web-based tools and technological resources by acting not just like consumers, but critical consumers, of online content when using the digital skills.*

With the widespread use of haptic devices by different type of users, the proficient use of those digital tools and resources is hardly recommended to make a responsible use and keep entire our online identity. The recommendation becomes a must if we speak about kids.

2 STUDENT OF 2030

2.1 Digital Birth

Digital society has many types of digital citizens. One of them is the digital native born after 2010, grown up into a kid who decides to become a university student.

Their births were instant messaged to relatives and friends outside of the room, broadcasted for YouTube upload, photo-selfied with parents and hospital staff; geo-located, social-network introduced, snap-shots cloud stored, blogged, emailed, inserted in birthdays calendar to remember, and, consequently, immediately web community liked and commented. Immediacy was given by just one small touch-screen interface that has become an essential item in the pocket any proud parent.

Once at home, around them, together with other toys, a haptic device is always in sight to interact with it. From zero days they are exposed to music and voice hearing, image viewing and imitation touch, and there for, receiving learning input by just fixing their attention to the finger haptic tips.

On-site experiences of babies between two and five months old, show they are fixing their attention in the finger haptic movement, reacting to the consequences of the tip, sudden change of images and sounds that appear on screen. First reactions are eye moment for surprise, even some smiles, and in the moment they are able to imitate, they try.

Saby et al. [9] findings have shown that babies rapidly learn new skills and customs while imitating others' actions. Those actions are influenced by many factors, including the specific means by which the observed action is carried out, in our case haptic movement.

Meltzoff made head-touch studies in preverbal babies incorporating a remote effect, showing that infants can learn novel interventions by just pure observation [10].

Touching an icon on a haptic device, as specific effector used to accomplish a goal, like any other action, is preserved in infants' action representations, giving then effects like imitation, integration of new habits and routines and, creation of new-personal skills. We hardly think that haptic feedback gives new brain abilities allowing them to go beyond the limits of their own capabilities and creativity.

According to Marina, not all the kids learn at the same pace or in the same way, nor at the same speed, neither do they have the same capabilities or the same motivation [11]. As Marina also says, humans learn by many ways like priming, habituation, conditioned responses, semantic learning, through action, and by creativity, a way of gaining imaginative knowledge by transferring rules from one context to a completely different one [12].

But the different learning speeds, the different capabilities or the different ways of learning can converge in just one fingertip with a small haptic movement. That specific movement is going to innovate for the better the entire educational system incorporating new personal skills (*Fig. 3*) whatever they are or want to be.

kids even before the adults. It is a keystone, then, to look at the new students that will come to us around 2030, the iScholars that are growing up, right now, in our households.

Emerging primary schools like Steve JobsSchools (O4NT) in the Netherlands [16] are, since 2013, using haptic devices to teach the compulsory school matters and, to stimulate the iScholars in a unique way aimed to discover their own talents and to develop skills that are of vital importance for the world of tomorrow.

The system teaches them how to find information, to filter it to its relevance and to apply it, based on their own inquisitiveness (*Fig. 4*).

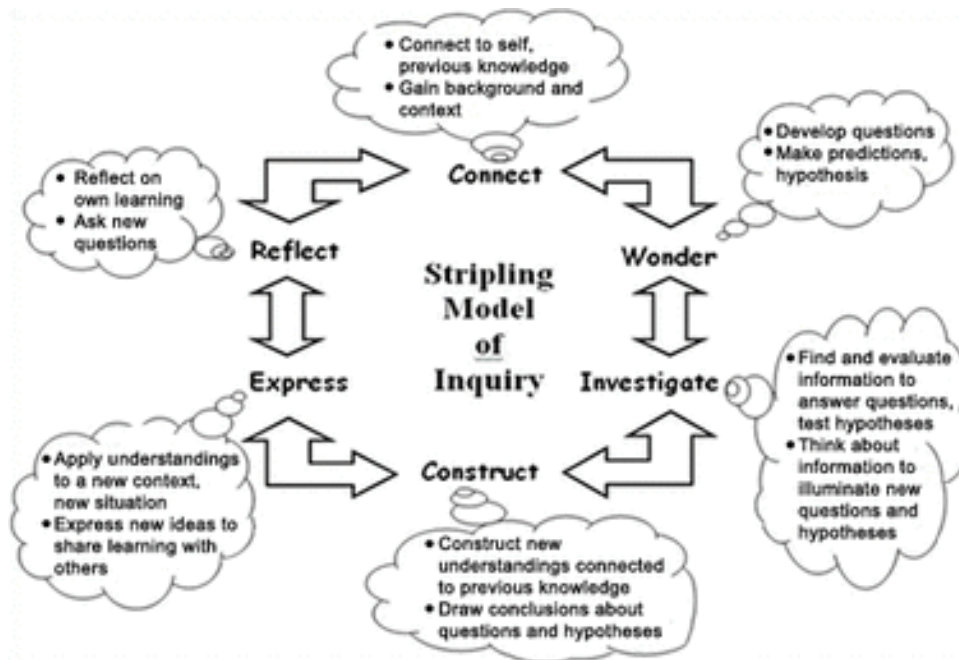


Fig 4. The inquiry Process [17]

Once those students arrive to engineering studies, with new habits, abilities and capabilities, aware of their digital citizenship, they will be able to ask good questions, provide adequate context ensuring rigor, behave creatively, and the most important of all, they will advocate for their own point of view [17] giving valuable feedback in return to the faculty members.

iScholars will imprint unique digital fingerprint in the instant, global and digital world even before they arrive to us. They, and their way of learning are keystones of their own future. Hence engineering fields should introduce a new innovative curricula perspective to engage them and ensure, as a result, success making any effort worthwhile.

4 SUMMARY

The irruption in our households and normal life of haptic devices has introduced a discovery-driven learning in our kids, the iScholars.

We strongly believe that 2030 Engineering students will be able to create a net of ideas through debate and discourse, through quick pursuit, reflection and adjustment; and through the reconfiguration of new combinations to provide new solutions to new problems [18]. Tactile, auditory and visual sense in just one tip, play an important role on the new skills for kids, not only because make those goals affordable, but also because redefine learning with new perspectives and possibilities.

As HEIs, we should get ready for those iScholar aware of their learning process; and learn how to motivate them through passion to achieve new talents. It is important to be ready for new abilities, capabilities and habits that slowly are filling the new brains used to haptic feedback.

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