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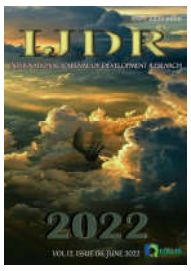

RESEARCH ARTICLE OPEN ACCESS

TELE-EDUCATION: THE IMMERSION OF AGLOBAL USER COMMUNITY - FROM RICH CONTENT TO RICH INTERACTIONS

***[1]Anastasios Nikiforos, [2]Dionysios Politis, [3]Nektarios-Kyriakos Paris, [4]Sophia Aidona, [5]Georgios Kyriafinis and [6]Jannis Constantinidis**

[1,2]School of Informatics, Aristotle University of Thessaloniki, Greece; [3]Dept. of Music Science and Art, University of Macedonia, Thessaloniki, Greece; [4,5]Cochlear Implantation Center, AHEPA University Hospital, Thessaloniki, Greece; [6]1st ENT Clinic, Medical School, Aristotle University of Thessaloniki, Greece

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****Corresponding author:***
Anastasios Nikiforos

ABSTRACT

Rich Content, whether accessible through Educational TVor globally accessed Mass Media, promotes the quest for Interactive Learning. Either in classic education, special or remote, learners are transformed to two-way users. The complexity of the content, and the type of learning, which are unique for each subject, promote a new educational agenda, with Rich Interactions. Inclusively, these factors require considerable resources to ensure a constant flow of accredited, high-levelinstruction. The potential of TV-like viewingis examined from the perspective of intervention, as a mental action of acquiring knowledge and understanding through sensual augmentation, thus leading to a new paradigm for massive interactive learning. Previous experience and measurements from medical field are used as navigational indices.

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INTRODUCTION

The worldwide educational agenda in its whole aspect of schooling faces a prolonged, heated disagreement in all its levels of public affairs. While no one may contest the dramatic improvement of all indicators representing the reference values of specified measured quantities, like literacy and numeracy, and even further competence in specified areas encompassing a wide range of digital skills, it is the general feeling, disregarding exceptions, that the overall management of educational policy has considerable downturns (Ng & Forbes, 2009). The unprecedented extend of penetration for Mobile Communication Technologies, Internet portability and Wireless Connectivity over a global audience otherwise segmented by steep dissimilarites, variances and disparities has formed an emerging collective intelligence culture that has been elicited (in neurocognitive terms) by mass media conglomerates (Statista, 2019). Digital broadcasts are not any longerconfined to the radiotelevision sphere of (commercial) activity; they rather tranform to simultaneous synchronous or asynchronous transmissions of the same program over considerably more than two communication modes. Emissions for entertainment, information, and education develop as cluster activities orchestrated (and performed) by diverse media than those older viewers have been habitually set to interact with: radio receivers have been subsidized in new cars, households and portable modes with multi-functioning tranceiving devices, like dazzling car dashboard touchscreen displays, giant smartTVs, and smartphone-like paraphernalia, while TV viewing has been fused into multimedia two-way interconnection with screens of very high resolutions, sharp color reproduction, either 2D or 3D, offering browsing capabilities similar to those experienced thus far by Internet computing (Behera, 2013; Boyle *et al*., 2016).Amazigly, the screen size of these omnipotent devices may vary from a few inches, when personal viewing is involved, up to several tens of inches, when group activity is stimulated. Furthermore, the mobile communication saga does not restrain the center of interest primarily on entertainment and extensive reports of news, as the broadcasting paradigm has been adjusted to function for decades, but extends to multi-party and multi-channel communication, over the social media sphere of interpersonal communication, in multifaceted groups targeted either by self-proclaimed interests or otherwise recognisable identity compounds

(Wong, 2019). Artificial Intelligence and extensive 5Gpropagation are expected to enhance this immersive potential for providing systematic education (Looper, 2019). As these devices offer at least two-way communication channels, strong cognitive processes infer emotions and exert affective tactics as an example to follow and imitate. Further dimensions in this communication are triggered as social agents motivate collaboration, through immense social networks. This is exactly the case recently experienced worldwide when imposed isolation restrains physical moves in one hand, but increases exponentially the affective tactics of mass communication means, i.e., television, radio, newspapers and beyond all, the Internet (Chorianopoulos & Lekakos, 2008). Quarantined populations are vivid examples of how impressions are conveyed to the senses of subjects at a distance. As information and audiovisual recordings flood the media, a conversational ecosystem with interactive collective building blocks is inferred, oriented to navigate viewers throughout a virtual network. Major conglomerates are the leading palyers, of course, but since many web-based learning portals are indispensably involved in each recipient's receivers, each netizen becomes a teaching subject that may be regarded as a rather independent unit receiving elementary pieces of knowledge from many, diversified sources, thus developing a multiagent approach for exploiting his assumptions (Tan *et al*., 2013). As the peaks of sesnualstimuli befit extravagantlevels, the affective dimensions of people otherwise used to simply watching television are overwhelmingly enhanced. News heavily influences most times negatively their recipients, and thus new modelling tactics are devised to trigger through emotional posts and encouraging messages self efficacy, heavily needed in times of widespread affliction, like the Covid-19 plague (Werling *et al*., 2021). The rapid deployment of mobile device interfaces, virtual reality computational environments, sophistacted consoles, new forms of game-based simulations, innovative intelligent systems for distributed learning, multi-agent applications that enhance knowledge representation, shared with numerous peers worldwide, and the personal archived sources of each user may promote new cognitive models that stretch epistemological and psychological foundations to high levels of understanding (Li, 2010). However, the main query is whether these inspiring "tutoring" systems may form quite pragmatic, cognitive and learning architectures, or any other way lead, ulbeit being powerful tools, to uncertain domains.

Digital Broadcasts: Communicating With Rich Content: Indeed, the pioneers of distance learning, at its previously stages utilized the best innovations of each and every technological era to deploy instructive chances to individuals who failed to attend regular schooling.Historically, the ones who mostly profited by such remote training included persons with physical incapacities, ladies who were not permitted to take on instructive establishments open just to men, individuals who had occupations amid typical school hours, and learners who lived in remote districts where schools did not exist(Nikiforos, 2019). Although this idea and intention, to give instructive chances to the individuals who were not potent for participating in institutionalized learning was a motive for advancing Distance Education and e-Learning, in its recent transformation scene, the broadcasting-like instructive paradigm heavily invests in bringing comprehensive coaching and neuroscientifically based learning potential. Actually, curiosity arousing, student familiarisiation through audiovisual presentations, movies and 3D animations and brain-friendly content delivery not only provoke positive and potentially faster learning but also empower familiarization, student grasp-of-field and the overall process dynamics of learning (Agrawal *et al*., 2015). This kind of enhanced neurocognitive training can aid students of different age groups invoking Deeper Learning procedures (Friesen &Kuskis, 2012).Building upon a social network-based agenda, which is inherent to current-day mass media connotations with social media networks, Distance Learning among peers can provide a very positive outcome to the whole learning process. Digitization of TV content has not merely changed the format of the transmitted message; overall it has initiated a migratory trajectory of content across multiple media platforms, leading to cooperation between various media industries, and most importantly changing the viewing habits from prime-time watching to prime-event focusing (Politis *et al*., 2018b). In other words, it is not clear if the news is seen or learned via the TV set or a hybrid formation of something that bears a resemblance with something that looks like the TV of the 20th century (Wright, 2013). Collaboration can be alternatively provided, currently, via online environments for Distance Learning courses, aiming to improve interaction and communication among students (Avouris *et al*., 2003), especially in periods of crises. Structured environments can be deployed to improve the experience of problem solving, collaboration and therefore advanced personal communication when no feasible face-to-face communication may be achieved.(Nikiforos, 2019). Illustrating this general rule, the emerging Interactive Educational TV (aka IETV) shapes a Modeling Space that in its intitial conception was promoting a collaboration-support environment for problem solving in Open and Distance Learning (Mouridou & Virvou, 2002). It is a type of a collaborative design, within which the Administrator has the ability to define and construct the learning media formats; therefore, it may evolve from an abstract system for teaching or even an existing modeling space, to new concepts for designing course presentations according to the Administrator's prerequisites or the end-user demands (Chengzhi, 2001).

In its current tranformation over the IETV communication sphere, it triggers metacognitions and fundamental coaching practices that communicate with the brain in a more cerebral dominant manner. As there are not actual long-term results of this neurocognitive practice now empowered with smartphone and tablet animations, Talking Pens, AR and VR simulations, Interactive Whiteboards, Study Rooms over the Internet and online two way communication exams, a comparability-based approach will be developed in this research from the world of intense special traing, where expensive assessment techniques have been deployed for delivering much needed processing learning dynamics (Savela *et al*., 2020). Properly assessed techniques, the best of two worlds, that of normal schooling alongside the one from special-education, are bound to enhance independent learning skills promoting learners'autonomy. These action initiatives may be a possession of the few, the experts of the field, but when they are interpreted as a decline of public schooling opportunities or a vigorous action for the restoration of displaced organizational activities that burden the taxpayer, then, journalists, politicians, social media, intellectuals and technocrats undertake manipulative campaigns to make the best use of resources. Indeed, special education is a very expensive learning process. Successful Techniques from the broadcasting arena, otherwise intended for commercial exploitation, together with methodologies for educational services offered at home, by the family support group of a special education learner, may be well tranformed to building blocks of a cost-effective, inherently globalized learning culture. Undoubtedly, the compulsive nature of broadcasting may create euphoria to entrepreneurial consortia for profits out of an energetic educational policy thus far dominated by localized, mostly state-controlledinstitutions functioning in a primary, secondary or tertiary education level (Ng & Forbes, 2009; Nikiforos 2019). The risk for unreservedly adopting mass-media practices may lead, under certain circumstances, to centralization, to the creation of dominant global powers with significant geographic expansion - a phenomenon dealt in TV practices but not in education, and deregulated models of supply and demand, which prevail in the broadcasting world. New channels of instruction may change the whole training infrastructureand forcefullyre structure the state-controlled domain (Politis *et al*., 2018a).

Although some countries excel in offering qualitative public education, in most others the discontinuities of learning, starting from primary education ongoing to specialist institutions, amidst heavy state spending, prevent ordinary people from getting involved in the affairs of the schooling community and lead them to undertake the education of their families out of the family budget (Connell *et al*., 2015). As the failure of adopted schooling systems demands consideration when tertiary education fails to deliver it’s promised goods, i.e., stabilized employment, acting sincerely and in the earnest

leads to the conclusion that it is a consequentialeffect of itsbreakdown to organize the horizontal dimension of learning. Indeed, a plethora of ministries, agents, institutes, companies, educators and other stakeholders are involved, along with social groups, and the coordination of recumbent properties or activities proves to be a difficult task that needs deep reflection, large scale national involvement and macroeconomic stability (Kafai *et al*., 2007). Thus, in practice, most learners increasingly turn themselves to vertical learning procedures, having a characteristic progression towards different levels in the hierarchy of learning materials (Holden & Rodenberg, 2017). Under this reflection, Interactive Educational TV Learning (aka IETV-Learning) becomes aprominent methodology of Distance Learning and Remote Control combining integrated virtual learning with high degree of personal involvement (Meixner, 2017). A factor of learning analyticscalled Engagement Factor describes very well this tendency (Zhang *et al*., 2006). Even further, as the user participates not anonymously but rather as an identifiable learner, the providers develop formal entities providing classifiable series of lectures in a particular subject, typically leading to a "qualification".

User Immersion and Navigation: As the use of Rich Content becomes widespread, a new concept and its application in various fields becomes prevalent. Rich content depends heavily on high quality visual components usually distributed through online platforms. Visual learners perceive the significance of the course by watching short format engaging videos rather than simply by examining carefully or listening to the approved course materials.This methodology is somehow related to Proactive Inhibition, i.e., *situated action* and *distributed cognition*. In the emerging communities of IETV all these attitudes are determined by context, rather than being pre-planned (Powers *et al*., 2022). For the two-ends involved in teaching and learning via immersive technologies, this in practice means the following:

At the one end, the users of innovative physical devices and gadgets developto key figures of Interfacing methodologies excelling in problem-solving activities, according to the utmost of their human motor system understanding. At the other end, scientists and engineers devise detailed long-term modelson how human memory and processing capability, highly dependant on the asserted educational policy of IETV, may enhance an individual's perception and cognitive understanding (Häkkinen, 2006). The first clues of such interaction were evident with the Gamification of Learning. Its evolution has brought to surface new ways of interaction that have developed through the rapid development of technology, smartphones/tablets as well as virtual reality and 3D spaces (Asmar *et al*., 2009). Already some aspects of this new culture have been traced to applications developed by Facebook, Instagram and Google, to name the leaders of the field, with notable success.As it was expected, this way of interacting with content is on its way to commercial TV. Although not yet a protocol with massive application, since its foundations lie in Special Education practices, it seems that it has prospects for widely spread solicitation, since it affects the customary modes of behavior and the practices of groups (Wouters *et al*., 2007).

Information and Communication Technologies (ICT) have led to the reformation of educational systems. The use of advanced digital systems causes a series of changes in the curriculum, teaching and the role of teacher in the classroom (Molnar, 2014). Apart from ICTs as an enabler, RichInteraction makes education more interesting. ICTshave created, the so-called serious games which are intended to educate users on facts and procedures. By this term educators refer to the use and integration of mechanisms and interaction to activities not related to the content but aiming to find solutions by changing the users's behavior by increasing their participation and commitment (Schoeffmann *et al*., 2015). The tools to implement Rich Interaction in "classroom" are thus analyzed. In any case, since the closest paradigm of similar stances to Rich Interaction comes from the world of gaming, the gaming itself and the Gamification of Learning will be used as an example of how increased sensual interaction may serve asmeans to intensify and escalate learning (Ball *et al*., 2018). As it happens with real games, the user participates in a reciprocal way of communication, whichestablishes a competitive form of browsing information and getting formative evaluations, according to pre-described rules; the outcome is decided by the skill with which the user performs the activities in the virtual world (Jung *et al*., 2009). The more rich the environment in which the user contests, the enthusiastic and the more close to the real world the machination turns to be (Figure 1). Indeed, the participants of such interactions, while confined within the walls of their room, may become experts in coping with local knowledge qualified to an extent to take charge of very complicated equipment (Blades *et al*., 2013). This happens not only by learning what the complicated arrays of control keys do, but, more important, how they alter the functions of the "spacecraft" when various unmodulated reference signals are encountered, how to test the user's reaction when speculative synchronization with advanced maneuvers is needed, and finally, how instrumentation may assist the "pilot" to operate a complex structure towards a predefined route, using advanced instrumentation and navigational maps. Already in the field of gaming, as far as the richness of content is concerned, two categories have been already molded:

Figure 1. Rich Interaction by representative and symbolic stances coming from world of Gaming. Left, young operators use advanced Frasca RTDTMequipment to simulate and learn how to operate the flying controls of an airplane, actually not leaving the ground, thanks to multiple TV screen animations. Right, more low rank and status control equipment, which, however, may enable the user participate in activities and experiences much more intricate than normal everyday adventures

Class A games: the ones that can be played with the usual computers, tablets or smartphones. High quality screens, if possible with screen analysis crisper than HD (like 4K or 8K) are recommended; 3D glasses, assisting single lens viewing and offering a stereoscopic experience may be seen as normal extensions. Also, control levers, like those depicted in Figure 1, right, may be considered as basic expansions needed to control the movement in a display screen.

Class B games: these ones create an interaction environment characterized by higher levels of sophistication, with exposure to environments developed to a high degree of complexity. Users are expected to interpret complex issues, to learn fast through their exposure to advanced observation, to gain practical knowledge and understanding by guiding the sensual receptors and, at the end, directing the users' thoughts, attitudes and expectations.

To do so, Class B games, create an augmented reality environment, usually within a 3D interactive virtual reality sphere, which involves either the user changing the physical location of his moving parts, sometimes his overall position, and mostly, getting involved in activities with progressive development of sensual arousal (Crişan& Enache, 2013). Anymovement of the user, either physical or mental, if possible, should provoke responses to the situation observed in the virtual world; the maturity exposure to handling critical situations or the awareness of situations and facts, in terms of perceptual understanding are key features of this reality (Figure 2). However, the way of interacting with Rich Content does not *per se* imply that a general activity hasled to Rich Interaction. The latter has more to do with learning (over the whole spectrum of the curriculum) than by merely actualizing applications over a "sensory" virtual space. Repeated practice with Rich Interaction turns to be a method, rather than a theoretical application, enhancing performance and skill

matching so as to acquire and maintain a proficiency in it (Häkkinen, 2006). As seen in Figure 3, the road from Interacting with Rich Content towards Rich Interaction goes through *Situated Learning* and *Proactive Inhibition*.

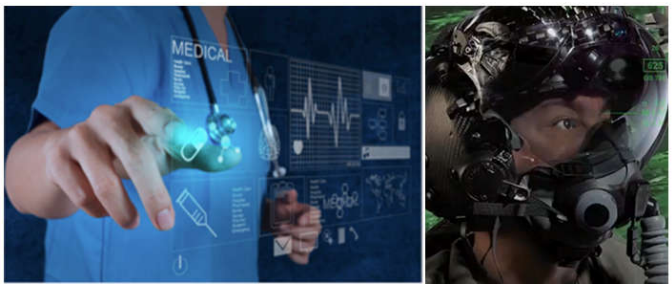


Figure 2. The road towards Rich Interaction. Left, a medical expert interacts with InnoplexusTM advanced diagnostic equipment using a proactive 2D panel. Right, a 5th generation fighter pilot demonstrates environmental awareness within his RaytheonTM 400,000$ advanced optical display 3D helmet

Accepted practices, as expected, extensively use computer generated simulations, transferring interaction from the Virtual Reality reconstructions of the physical view to the real-world situation and vice versa (Sanders & Albers, 2010). When fitted sensors attempt to accurately transfer the real-world image to a screen or a 3D helmet, then, a highly adaptable "room" is created that can be adjusted to suit the needs of its users. Different themes and concepts are utilized to meet individual needs.If it is learning, then, the "room" needs sensory special electronic equipment to create a procreative and stimulating learning environment for the students outside the classroom (Bovill *et al*., 2011).

Figure 3. From sensual awareness to Proactive Inhibition with Rich Interaction. Left, the "sensual room" research method used by Apple to inhibit in its smartphones advanced gyroscopic kinesthetic sensoring. Right, the final step in medical praxis: Mixed Reality high precision surgical action to relieve from injury and correct deformities

If the "room" is a medical ward, then, gloves, visual aids, robotic arms and similar may be operated in a seemingly real (if they are supportive) or programmable, real, complex series of robotic actions that replicate movements and functions of the clinician automatically. Rich Interaction, as expected, increases understanding and skill through repetition. Users are expected to reiterate over and over again, not only reinforcing the communication and sensory stimulation, but also reinforcing tendency of previously learned material to hinder subsequent learning (Kyriafinis *et al*., 2017).

Problem Formulation: As it has been recently globally apprehended in quarantine states and periods, the "learning classroom" is a highly adaptable habitat that can be changed to suit the needs of users. For the sake of economizing on resources, the usual instrumental surroundings for instruction are rather automatically transformed to mold the preferred surroundings: Each "class", whether real, virtual or both, has its own "container" where in sensory equipment, audiovisual instrumentation and thematic contiguity a variety of stimuli can be hosted (Jones & Jones, 2008). This methodology flourished in special education environments (2019-2020), as it can be characteristically seen in Figure 4.

Figure 4. "Pictures from an exhibition". The sensual studio in its utmost. Diagnosing, programming-calibrating and applying audiometric study with treatment of the cochlear implant user's speech and language potential. The parents are part of the "game" as well

Indeed, in Cochlear Implantation the medical team's is not merely restricted to linking auditory nerves with a stimulating hearing mechanism. A prolonged post-operationset of processes follows, part of which focuses on the missing hearing link, in conditions of neurophysiological calibration. The implantable nerve simulator has to be parameterized periodically, for two reasons: firstly, from time to time the bioprosthetic device needs to be scaled for the proper functioning of the instrument's accuracy, and secondly,it should be adjustedaccording to comparison with other data, as is for example the particular type of environment regarded as "home". Small alterations are thus performedto achieve the desired fit when the user has to shift from the normal schooling environment, for instance, to a summer camp, where amongst other activities swimming in the sea may be included. Therefore, the support team in a combinatory action of maintenance along with augmentation adopts the user's sensual perception levels to the standards required by the constantly changing habitat. However, most of the job is performed by the patient's brain. He or she is the one that directs the motor mechanism for producing speech. In this point, the "transdiciplinary" group of scientists involved, attempts to visualize the "big picture" that comes out of thousand of synapses linked with bioelectronics. The subject having undergone Cochlear Implantation does not react on the basis of what he or she hears; in reality he or she reconstructs sounds based on what his brain morphs as speech communication out of the audiovisual stimuli that charge the "room's" habitat (Green &Bavalier, 2008). All the involved scientists, whether clinicians, pathologists or educators attempt to model the multi-dimensional world within which the Cochlear Implant (aka CI) user wanders in. Surgeons try to model the absence of auditory feedback by monitoring poor laryngeal function in terms of voice quality, frequency and intensity. Speech audiometry is a way to assess the level of rehabilitation in deaf subjects who have undergone Cochlear Implantation. It reflects the Quality of their everyday Life, taking into consideration the fact that communication plays a vital role in it. The objective of such measurements is to evaluate the dynamics of recorded speech versus live voice recognition in CI users, and thus determine the effectiveness in the comprehension of spoken language for these patients. Norms used for evaluating the lack of auditory control are the levels of hearing designated for the user in perspective (Figure 5). By adjusting the hearing potential of the subject, they do not alter his sonic perception, but affect also his laryngeal function for proper speech communication. The immersion of global public to isolation, e.g. due to contagious or infectuous diseases is quite similar to the process experienced by CI users in rehabilitation and special training, attempting to stay fit so to join normal life by specialized training.

Figure 5. Programming the Cochlear Implant in correlation with audiometry, speech recognition and acoustic performance scores

Indeed, inCochlear Implantation, the speech pathologist along with the special education counselor will further deploy the special schools'pedagogyby extending the concepts of sensory studios to support students' learning according to their individual needs. As the parents are part of the inner circle, the first learning augmentation takes place by applying co-educational practices to the family members (Griffith and Arnold, 2019). Schooling does not take place only in "classrooms" but extends to a multivariate array of everyday activities; prominent is, thus, the support given to the student's learning by amplifying its individual needs and extending the learning space at its utmost (Means*et al*., 2010). What characterizes these procedures is feedback control at every stage of their development. The learning protocols used in special education rely heavily on getting constantly a response from the learning subject itself, his inner circle and his educators, for all these established series of therapeutic actions are extravagantly expensive.

The Communication Evolution: Participants of classic learning procedures acquire many skills without receiving systematic instruction; knowledge is acquired by being exposed to an environment rich in stimuli, which triggers mostly intellectual, and to a lesser extent, emotional and physical activity (Van Muijden *et al*., 2012). For instance, children from the very first stages of physical development learn to speak properlytheir mother tongue, especially in acoustic terms of speech communication, not by instruction, but via constant immersion into a continuum that conveys information and expresses feelings (Lee & Horsley, 2017). The cerebral activity exerted the first five years of a toddler's development is amazing; after this age, the plasticity of the brain commences to decline, and if a subject has not acquired linguistic efficiency, that of his mother's tongue, he or she may never properly speak any language (Lenneberg, 1967). Apart from language acquisition, the first years of a child's development are very critical for laying the foundations for his cognitive and communicative status, upon which his further development will be based on (Kral & Eggermont, 2007). Interacting with peers, family membersand teachers is crucial for establishing a collaborative learning agenda. It has been diagnosed in hard in hearing children that their limited potential for proper communication deprives them of qualitative stimuli, crucial indeed for the further development of structured human communication and performance boost toscholarly pursuits and activities (Hart & Risley, 1995). Any drawbacks or delays in the potential of young learners is bound to have negative feedback in assering self-respect and on the long run linguistic intelligence, social-behavioral adaptation and professional engagement (Beer, *et al*., 2009).

The Educational Evolution: Under normal circumstances, educational competence - which commences from linguistic proficiency - is crucial for fellowship of social values and communal responsibilities. If these particular characteristics in common are not adequately developed, then, the group of people around a subject has limitations in sharing common attitudes, interests or goals, not to mention eloquent understanding (Remmel& Peters, 2009). Impaired in heraing subjects, for instance, have been long diagnosed with limitedness in reading, writing, mathematics; even further, one in three need assistive tutoring, and worse, accomodation in special education. Therefore, if their knowledge progresion is characterized by limited qualitive characteristics, then, their professional evolution will be unavoidedly dismissal (Venail *et al*., 2010).

The Behavioral Evolution: Disordered speech communication, although not always related to confused educational trajectories, leads to failure to conduct oneself in a manner acceptable to others. It is not always that clear if the former is the principal causation of the latter, although somehow behavioral misconduct is interwoven with a subject's learning evolution. It is significant for the research presented in thisarticle, if the learner is extrovert or not. If he or she is burdened with disorders like ADHD, poor concentration or impulsivity, his learning deficit will be automatically translated to behavioral disruption. Stress, anxiety, withdrawal symptoms are typical disintegrators to the learning process, and finaly, to an acceptable behavioral conduct (Baker *et al*., 2009). If parents and educators fail to detect what is assertive for ceasing to participate in an activity, the learners will be predominantly self-centered and neglect to engage themselves into a two-way communication. Even further, if this tendency restricts the sensory stimuli received, specific functional reaction of their habitat is needed to compensate the lack of inducement (Quittner *et al*., 2007). Putting all these factors together: if IETV lacks the potential to make its recipients involved in particular knowledge acquisition activities or learning interests, then the remote learners develop lack of enthusiasm and concern, spreading apathy and unresponsiveness.

MEASURING THE SUCCESS OF FEEDBACK

ICT learning technologies constitute very powerful cultural tools and have an immense transformative potential. From the learning point of view, they constitute forcible, radical alterations following language and writing, along with the transformation of broadcasting (Courage *et al*., 2015). In a brief but unmistakable and comprehensive manner, formal and non-formal e-Learning combined with TV broadcasts becomes right now the most important cultural tool. They emerge as uniquely remarkable, in some aspects, giving many hopes and expectations for following suit theadvocacy of a new *society*, that of *knowledge*. The basic measurable factor for overall achievement is the Quality-of-Life index. It is a universal parameter of outcome research that evaluates the subjects' overall status of wellbeing co-related to disease and treatment.

Bodily, kinesthetic, mental and behavioral activities were monitored, aiming to interpret how symptoms are related to external stimuli and awareness taking into acount the following parameters:

- **Senses:** The receptiveness of the five external senses is assessed, and the increasing variability of the complex phenomenon of synaesthesia which involves more than 15 "internal" senses.
- **Feelings:** the emotional response to obscure or ambiguous is examined, along with aggressive, embarrassing or disagreeable, sheer or other strong sentiments.
- **Disabilities:** incurable, severe, light, exhausting, etc.
- **Conversation:** squelching or with clinching arguments, negative, vague, hurried, equivocal, easy, difficult, clever-cute, etc.
- **Bodily movements:** "druggy", hurried, rapid, with stride, leisurely, etc.
- **Memories:** inextinguishable, sweet, sour, disagreeable.
- **Looks:** careless, indiscreet, effulgent, ominous, nasty, ravishing expressional, inquiring, clouded mind – turbid, glassy – vacant stare.
- **Oral and aural communication:** rambling, boring-colorless, enthusiastic, meaningful, insignificant, polite, rude, disconnected, careful.
- **Complexion:** dark, heavy, lightsome, pleasant, lissome, agile, nervy, restless, etc.
- **Attitude:** socialable, amiable, reclusive, cautious, chary, etc.

As no exact measures have been reported on what is the transformative power of IETV, results of its augmentation dynamics coming from the special education sector will be used instead. For many years, Cochlear Implantation has served as a well-established therapeutic approach for patients with severe to profound sensorineural hearing loss. Cochlear Implants are electronic devices that work as an artificial ear, surpassing the ear and stimulating directly the acoustic nerve. The results discussed in this section examine the impact of Cochlear Implantation on Quality of Life in patients, and compare and correlate the above results to pure tone audiometry scores, speech recognition scores, and acoustic performance scores.In an analogy, the use of intense pedagogy for CI users, which "floods" their mental and sensual entity, is parallelized with the immersion of IETV users to the world of personalized

remote multimedia education (Stegeman&Zydney, 2010). Indeed, as it has been emphasized with relevant researches (Damen *et al*., 2006).

This kind of immersion has ameliorated performance in the following axes of schooling development:

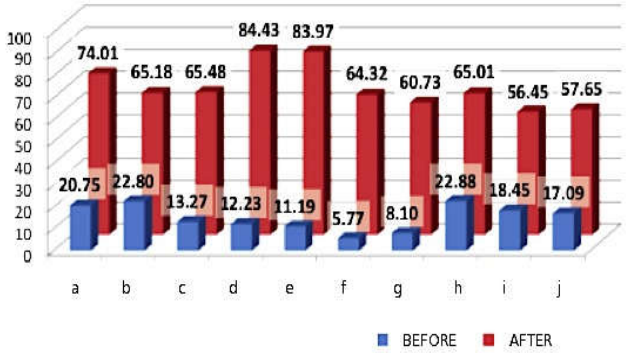
- Verbal domain: subjects are supposed to be able to complete, understand, and use oral speech, revealing adequate knowledge of vocabulary and syntax. This index can predict the skill of writing since it is related to reading and writing. Children with low grading have poor vocabulary, do not use elaborate speech, and have difficulty in recalling oral directions or organizing verbally their ideas in coherent sequences.
- Nonverbal domain: subjects understand spatial relationships and nonverbal, abstract, symbolical thinking. This is also related to the skill of recalling objects or letters and organizing them by using memory. It allows children to realize reasonable relationships and abstract concepts, to think without the use of words, to recall schemes with the use of their memory. Children, who receive low grades in this field, have difficulty in recalling nonverbal information, motoric responding, organizing and solving visual problems, and understanding abstract symbols like letters.
- Attention-Enhanced domain: indicates the skill of the children to successfully complete actions that require instant recalling, the use of short-term memory, and focused attention. Children who receive low grades in this field have the tendency to be easily distracted, they are careless, and they do not focus.
- Attention-Reduced domain: indicates the skill of the children to use their long-term memory, necessary in vocabulary activities, in understanding and thinking, and in realizing abstract complex relationships. It also indicates the skill of recalling information and ideas and using them in everyday situations.
- Motor-Enhanced domain: pedagogists can evaluate complex motor skills that relate to the visual-motor coordination which are essential for writing. Low grading in this field may reveal problems in coordination.
- Motor-Reduced domain: it reveals the skill of a child to respond to a free motoric frame. High grading in this field is in accordance with improved speech, naming, and recognizing of symbols.

All subjects in this survey were evaluated by the "Sanders Profile Questionnaire" for Rating Communicative Performance and the Categories of Auditory Performance (CAP) before Cochlear Implantation. Pure tone audiometry scores, speech recognitions scores (sentences and words) and acoustic performance scores were obtained for all patients after Cochlear Implantation. In addition, all patients were administered the Profile Questionnaire for Rating. Communicative Performance, the Categories of Auditory Performance (CAP) and the Glasgow Benefit Inventory (GBI) after Cochlear Implantation. The parents of the children evaluated the Quality of Life and the Auditory Performance of their children before and after Cochlear Implantation. Speech audiometry is a way toassess the level of rehabilitation indeaf subjects who have undergone Cochlear Implantation. It reflects the quality of their everydaylife, taking into consideration thefact that communication plays avital role in it. The objective of such measurements is to evaluatethe dynamics of recordedspeech versus live voicerecognition in Cochlear Implant (CI) users, and thus determinewhich method is more effectivein the comprehension of spokenlanguage for these patients. 123 patients (43adults and 80 children) were monitored in this survey; they had undergone Cochlear Implantation in the 1st Academic ENT Department, Aristotle University of Thessaloniki, AHEPA General Hospital, at least two years prior to their inclusion in the survey list, and it was required to use their CI daily(2012-2016).Their average age was 16.47 years.

The monitored group was split to 4 subgroups

- Adults, post-lingually deaf or hearing-impaired: 29 subjects
- Children of schooling age, from 6 to 17 years old: 60 subjects
- Children of schooling age, from 6 to 17 years old, burdened withconcomitant neurological problems: 20 subjects
- IV: Adults, pre-lingually deaf or hearing-impaired, having at a later stage of their life undergone Cochlear Implantation: 14 subjects

Pure tone audiometry (at 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz and 6000Hz) along with speech recognition tests was extensively applied to all 4 groups. Speech pathologists have been using in this research and onwards digital modules for the treatment of language problems. It is very important that the Profiling Questionnaires for Rating the Communicative Performance of all 123 subjects were applied for some time before, and of course as much as required after Cochlear Implantation. The overall performance boost is depicted as a clear improvement of indices in a range of communicative channelsaccording the SandersProfile Questionnaire for Rating Communicative Performance (Figure 6).



Legend: a. post-lingually deaf - home environment b. post-lingually deaf - occupational environment c. post lingually deaf - social environment d. children - mother e. children - father f. children with comorbidity - mother g. children with comorbidity - father h. pre-lingually deaf - occupational environment i. pre-lingually deaf - occupational environment j. pre-lingually deaf - social environment

Figure 6. How deaf and hearing-impaired performed after Cochlear Implantation in Quality of Life indices

The results presented refer to CAP monitoring of subjects before and after medication and counseling have taken place, in clinical trialsthat the CI users along their family, occupational, social and schooling habitat are taking part in. In statistically significant terms, the Sanders evaluation criteria that give the correlation of Quality of Life indices are presented in Table I.

FROM POSITIVE FEEDBACK TO RICH INTERACTION

As seen with CAP, Speech Audiometry, Quality of Life indices and other Special Education practices, direct therapeutical approaches enhanced with digital sources provide the means to stimulate users optimally, providing more interactive and direct, and thus more effective, counseling procedures (Ammari and Schoenebeck, 2015). However, these activities are very expensive to be considered as a scheme for massive learning. Although they concede for a new, particularly effective schooling principle, they continue to withhold approval of its use in terms of classic instruction given for most disciplines (Aleksandrova-Nigmatullina & Vasilyevna-Artemyeva, 2015). However, in the on-line world the cost-effectiveness of a method is transplanted with different metrics. Once the success of the learning methodology has been certified by experimental results over a rather long period of time, its basic protocols are transplanted in the world of IETV instruction, simultaneously set into operation as a computer-controlled network. A variety of tools is used, as the interaction is downmarketed to the end user.

Class Management Tools: Although the end user is more or less an autonomous entity in navigating the oceans of knowledge in digital format, various software and hardware tools assist him in planning a route. As instruction becomes more formal, various apps are used to influence the development of "classes".

Table I. Performance boost in Quality of Life indices after Cochlear Implantation and Special Schooling counseling

Correlations			Frequency	Sanders % home env. before	Sanders% home env. after	Sanders% occupational env. before	Sanders% occupational env. after	Sanders% social env. before	Sanders% social env. after
Spearman's rho	Frequency	Correlation Coef.	1.000	-0.128	0.179	-0.033	0.049	-0.374*	0.023
		Sig. (2-tailed)	-	0.509	0.354	0.867	0.799	0.050	0.908
		N	29	29	29	29	29	28	28
	Sanders % home env. before	Correlation Coef.	-0.128	1.000	0.295	0.221	0.400*	0.580**	0.169
		Sig. (2-tailed)	0.509	-	0.120	0.249	0.031	0.001	0.391
		N	29	29	29	29	29	28	28
	Sanders % home env. after	Correlation Coef.	0.179	0.295	1.000	-0.133	0.600**	0.064	0.564**
		Sig. (2-tailed)	0.354	0.120	-	0.491	0.001	0.747	0.002
		N	29	29	29	29	29	28	28
	Sanders % occupational env. before	Correlation Coef.	-0.033	-0.221	0.133	1.000	-0.270	0.280	0.190
		Sig. (2-tailed)	0.867	0.249	0.491	-	0.157	0.149	0.333
		N	29	29	29	29	29	28	28
	Sanders % occupational env. after	Correlation Coef.	0.049	0.400*	0.600**	-0.270	1.000	0.361	0.435*
		Sig. (2-tailed)	0.799	0.031	0.001	0.157	-	0.059	0.021
		N	29	29	29	29	29	28	28
	Sanders % social env. before	Correlation Coef.	-0.374*	0.580**	0.064	0.280	0.361	1.000	0.362
		Sig. (2-tailed)	0.050	0.001	0.747	0.149	0.059	-	0.059
		N	28	28	28	28	28	29	28
	Sanders % social env. after	Correlation Coef.	0.023	0.169	0.564**	0.190	0.435**	0.362	1.000
		Sig. (2-tailed)	0.908	0.391	0.002	0.333	0.021	0.059	-
		N	28	28	28	28	28	28	29

Usually, they commit group assignments, they partake discrete roles when developing clusters, thus having distinct digital rights in accessing learning material mash-ups, they are assessed electronically and grades are produced, so a virtual "office" is created to assist with correspondence, keep records, make appointments, and carry out financial transactions and subscriptions, sustain a "help desk" and many more similar tasks(Van Schaik *et al*., 2019).

Tools for Content Management: While in the beginning IETV broadcasts were simply structured as parts of series of Learning Objects (aka LOs -see Key Terms and Definitions), they have evolved to more complex entities that cover a specific subject in such a manner that knowledge acquisition leads to some kind of an awarded certificate. As the educational establishment is handling how has successfully a course of study may have been completed, new learning material is constantly produced and re-distributed, courses are restructured, files are managed, assignments, surveys, quizzes are constantly feeding-in the virtual working place of a "class", massive backups are kept, etc. (Chorianopoulos and Lekakos, 2008).

Communication Tools for User Support: If learners simply receive the IETV transmitted material, they do not ameliorate their learning potential much more than what their peers did in the era of broadcasted Educational TV. Greater understanding is however achieved when synchronous or asynchronous electronic means are used for structured communication between instructors, learners and the support team. They maybe e-mails, IMs, chats, discussion topics in fora, audio / video conferencing sessions, wikis, blogs, journaling presentations, desktop sharing for co-creation, and many, many new tools in the domain of social media that manipulated at both ends for group dynamics gain. Phone support, although a 1G tool, is greatly adhered (Hanley *et al*., 2008).

Assessment Tools: It does not concern the mere functionality of questionnaires or quizzes. As most of IETV environments do not cater for offering formal tests of a user's knowledge or proficiency on a particular subject, various methodologies have commenced to develop automated systems enabling instructors and learners to cross-examine, cross-question, interrogate, reliably assess the quality of performance, create e-portofolios with student activities, etc. The basic notion is that while IETV as predominantly self-assessed in its teaching profile, it would benefit if a user's actions, attitudes and performance on learning tasks were considered in relation to an objective standard (Rosenkrans, 2009).

Course Management: Participation in such massive learning schemes encapsulates regulatory information such as arranging the disposition of received noteworthy information, the interference and relocation of courses, the announcement of important events and the communication opportunities, the subscriptions, the participatory obligations, the resulting grants wholly or partly supported by advance orders, the promotional campaigns related with already subscribed learners, other endorsements or recommendations, etc. (Moriates *et al*., 2019). As it appreciated with the application of telemedicine technologies, new approaches in medical-related instruction, including ENT, and special counseling have been founded (Figure 7). These technologies offer great potential in reducing working hours and/or travel time of the doctor-audiologist and/or CI recipient, but have not established themselves in the field of special counselingyet, as being too revolutionary. There are a number of publications about the application of remote programming of CI in ENT clinics(Shapiro *et al*., 2008). Despite the fact that, up to now, in all the published studies the use of remote programming of Cochlear Implants is regarded as technically feasible, timesaving and cost efficient, the extensive application of such technologies in daily audiological routine demands further evaluation in terms of multi-cener prospective studies (Ramos*et al*., 2009). Factors, like confidentiality, medical ethics or traumatic abrasion have an influence in hindering its institutionalized use. The Center for Cochlear Implantation, AHEPA University Hospital, along with the host institute, the Aristotle University of Thessaloniki, has participated in studies, together with other four CochlearImplantation centers, that were conducted according to the guidelines established in the Declaration of Helsinki (World Medical Association, 2018), having received the approval of the Ethics Committee of the aforementioned University. Such as it is, a protocol for the remote postoperative handling of CI users has been formed (Kyriafinis and Vital, 2008). The services thus far described, are offered by the Center for Cochlear Implantation in conjunction with the Aristotle University of Thessaloniki (AUTh). AUTh is not merely a provider of bureau - based, secretariat and stationery-like resources that facilitate blended learning and accreditation in medicine. Being perhaps the biggest tertiary institution in South-Eastern Europe, it aims to provide ample access to learning resources in the digital space of medical education and technology management. As it happens with other, large Institutions offering similar services (Wei, 2010), in practice this means: Web delivery of Rich Content LOs, live broadcasts, vast electronic and in-situ Library Resources, Digital Rights Management

(DRM) and highly interactive technology navigation systems that change the way we administrate, deliver and provide learning content (Coutts, 2005). Already AUTh provides some 7,000 highly interactive courses via its e-learning facility (see http://elearning.auth.gr) while offering more than 250 video based courses (see http://delos.it.auth.gr). The proposed research scheme has been involved directly on the production of more than 20 of these. Aristotle University, the bigger University in Greece, is probably the most massive provider as far as Authentication and Authorization Infrastructure is concerned. It has an immense Library facilities orientation, which in association with the HEAL-Link Federation for Higher Education and its library repositories gives access to about 15,000 International Journals, 21,000 BS, MSc and PhD theses. This federated oriented service is guaranteed to provide access vast collections of LOs. Indeed, the project described in this research realistically envisages the production of some 1,000 Learning Objects. The University federated infrastructure ensures a highly automated navigation to an Open-Archives like "cloud" service that provides apart from safe, in terms of Intellectual Property safeguarded navigation, ample free viewing and further information provision (Sclater, 2016). AUTh has profound expertise in providing resources, descriptive metadata and automated local collection management systems, which assist the creation of huge local repositories. It also provides its massive IT servers, in Virtual Machine format for Joomla, WordPress and Drupal compatibility, to develop further plugins to the proposed research. Additionally, it postulates its network, conference and direct, on-line streaming services to research groups in e-learning aggregated at a national level. These figures are not mentioned as a recommendation for a certain Institute, but rather as an exemplary indication for the appropriateness and competence of an Institutional Environment, as far as legal and ethical matters detain the propagation of an officially endorsed Learning sensory Studio. Furthermore, enthusiastic approval or admiration is not wise to be given in periods of tranquility but rather when crises emerge. Whether AUTh and similarly oriented institutions may perform sufficiently, for instance during the Covid-19 shutdown, is a case under consideration. I.e., the immersion of the global community to educational resources will have in the leading role acclaimed universities or corporations, afterall?. At this point, the transfer of educational material from the academic environment to a worldwide curriculum is not uncomplicated in form or design. Indeed, the Intellectual Property Rights (IPR) protection scheme implies some stringent rules on how educational resources may be used on-line. The project working team always assigns all rights, including copyrights, to the supporting authority. The authors, creators and producers involved retain their rights to any intellectual property developed by the project participants, without limitation, on any models, theories, or LOs architectures and methodologies. When patients are involved, matters become far more demanding. In whatever way, further exploitation of the deliverables of the project is a property of the funding authorities, and the creators of images, educational videos, tables, and screenshots usually refer to it, alongside the creators. As a result, the policies of Cochlear Implantation Centers and Universities, from this point and further follow steeply divergent trajectories. In practice, Rich Interaction does not merely include tools such as large video projection screens, head displays, sensory toys, sound beams, color change lighting and projection levers and similar client-based interaction equipment; the most congenially associated factors to it, as a television or generally speaking, broadcasting production, are the IPR schemesused.

CONCLUSION

Online education along IETV flood streaming is generally perceived more effectivein comparison to typical education. Not only young people but also middle-aged people have access to broadcast-oriented Computer Based Training and become more and more familiar with this way of getting educated as workforce. The concept of co-creational learning, so crucial in special education and counseling, leads the content formation, in terms of educational material, as far as advanced training needs are serviced by the provision of massive educative supplies. As post-operative special education and counselling, along with medical-oriented Remote Fitting have demonstrated no significant differences between on-line and face-to-face programming sessions, it seems plausible to promote advanced Rich Interaction activities as stances where no particular adverse events were noted. Furthermore, the reduction of travel time and cost in order to sustain such high-level sensory studio-oriented experiences promotes these learning technologies as very powerful cultural tools. Typically, as some CI recipients have expressed their fears about how lack of face-to-face sessions may reflect negatively on their doctor-patient relationship in the long run, a blended learning culture of combinatory face-to-face and remote programming sessions is suggested, by way ofthe best approach, thus far, for Rich Interaction learning experiences. Telemedicine technologies are used, for the moment, for bridging the gap for what is though as Transactional Distance between the publicization of methods that are quite safe, relatively user-friendly and definitely cost effective. However, the criterion for the success of Rich Interaction methods is not the availability of parameters like network/internet resources or further improvement in the remote control and audio/video conferencing equipment, but the distance of real-world intervention practices and virtual world, special electronic equipment, fitted sensors generated simulations. The experience from the medical world demonstrates that although Rich Content gives immediate medical help to people in isolated areas, privileging them with unprecedented support, in parallel it underlies the danger of unacceptable practical complications and non-viable clinical alternatives.

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