

The Use of ICTs by Children and Young People with Mental Retardation and Syndrome Down in Domains of their Daily Life

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Abstract

In this paper we present a study, which revolves around the importance of Information and Communication Technologies (ICTs) at people with Intellectual Impairments. The goal of the study was to unveil how people with disabilities, such as Mental Retardation and Syndrome Down could use ICTs in order to enhance and facilitate their teaching, learning and everyday lifestyle. ICTs will be potentially a tool towards overcoming difficulties of these individuals. These people require ICTs systems highly configurable and adaptable to their personal needs. Otherwise, they will not be useful at all.

Keywords: ICTs, Intellectual Disabilities, Mental Retardation, Syndrome Down, access, educational process, socialization, learning tool, vocational tool

1. Introduction

Nowadays, it is evident that Information and Communication Technologies (ICTs) have become a crucial aspect of community, living and education. In particular, the development of ICTs provides the opportunity to individuals with Intellectual Disabilities and Syndrome Down to enhance and facilitate their teaching, learning and everyday lifestyle. The term 'Intellectual disability' (ID), once called Mental Retardation, is characterized by below-average intelligence or mental ability and a lack of skills necessary for day-to-day living. People with Intellectual Disabilities are able to learn new skills, but they do it with slowly rate. There are variety degrees of intellectual disability, from mild to profound. According to the ICD-10 and DSM-IV for a classification of intellectual disabilities, a person firstly must have lower than average intelligence, identified by an IQ score lower than 70. Levels of cognitive impairment have been related to different ID labels: Profound IQ < 20, Severe IQ 20–34, Moderate IQ 35–49, Mild IQ 50–69 and Borderline intellectual functioning 70–84. This should also be coupled with limitations in adaptive functioning in at least two areas (*i.e.*, communication, self care, domestic skills, social skills, self-direction, community, academic skills, work, leisure, health and safety), and an onset prior to age 18. In this review, the influence of ICTs tools and devices to people with ID conduct in their communication, self-independence and generally in the way of living. Nevertheless, this impact depends on their IQ level. As far as concerned, Down Syndrome is a set of physical and mental traits caused by a gene problem that happens before birth. They also have some degree of intellectual disability. This varies from person to person. But in most cases it is mild to moderate. Down Syndrome is a lifelong condition. But with care and support, children who have Down Syndrome can grow up to have healthy, happy, productive lives. For this reason, the last decades software and application of ICTs have developed in order to aid people with SD to be self-dependence and expand their skills and knowledge.

2. Intellectual/Mental Disorders

2.1 The use and the difficulties of ICTs

It was proved that ICTs have positive repercussion to people with Mental Disorders in order that they correspond to requirements of modern life. However, individuals with ID find obstacles at usage of ICTs, mainly due to their low IQ.

D. Chadwick et al. refer to a tool of Information and Communication Technologies and specifically the Internet Access and the ability to be used by People with Intellectual Disabilities. They moved on from this to critically describe some of the possible benefits the Internet could provide to people with intellectual disabilities, including the potential for self-expression, advocacy and developing friendships. In this review, they explored the inequalities and empirical evidence base surrounding the use of the Internet by people with intellectual disabilities (ID). Furthermore, they gathered existing literature to address the following questions: (i) To what extent people with ID access the online world(ii) The factors impede and facilitate Internet access (iii) The potential benefits to people with ID of being online and (iv) The way to be reduced the inequalities and facilitate Internet access for those with ID. According to the ICD-10 and DSM-IV for a classification of intellectual disabilities to be given a person firstly must have lower than average intelligence, identified by an IQ score lower than 70. Levels of cognitive impairment have been related to different ID labels: Profound IQ < 20, Severe IQ 20–34, Moderate IQ 35–49; Mild IQ 50–69, and Borderline intellectual functioning 70–84. In order to answer the questions firstly they made a bibliographic review, search dates ranged between 1987 until 2012. The authors subsequently identified and reviewed 43 English language studies focusing on Internet by people with ID to collect the necessary information. Additional resources were found by looking through previous knowledge and personal communication with colleagues working in related fields. Contextually and Due to the literature, this paper is written from a UK perspective, but also incorporates research from North America, Asia, Australasia and other parts of Europe. Of the studies that have addressed Internet accessibility specifically in the ID community, most have found that people with intellectual and developmental disabilities are much less likely to have access to and use the Internet than their non-disabled peers. With regard to Barriers to Internet Access for People with Intellectual Disabilities such as *Financial and Economic, Societal Attitudes and Exclusion, Policy and Governmental Support, Support, Educational and Training Barriers and Individual Impairment Associated Challenges in Accessing the Internet* which reduced the accessibility to the Internet of people with ID experience. Another issue worth mentioning is not only the Potential Benefits of Internet Use for People with Intellectual Disabilities, such as *development of Online Social Relationships, Expressed Identity and Reducing Stigma and Self-Determination and Advocacy* but also, the ability to be reduced the Inequalities, *Supporting Impairments and Strategies and Addressing Attitudes*. Summarizing, Internet use, which has become such an integral part of the daily lives of people around the world, is a further part of life that people with ID appear to be fundamentally excluded from. So for people with ID, the promise of the Internet is far from being fully realized and the advocacy and academic community, in collaboration with people with ID, are needed at the forefront of the struggle for full online inclusion.

Pavel Zikl et al. (2011) introduced a partial survey which refers to manual abilities as a premise for the use of modern technologies by children with mild mental disabilities in comparison with intact children in the age 10-11 years. The researchers tried to figure out the size of the differences between these groups of children and the way that this situation will change when

the mental demand of the submitted tasks will increase. For this reason, three hypotheses were formulated and arrived at specific conclusions. In the first hypothesis, concerning the time of disassembly brick box Merkur children with mild mental disabilities needed 59% more time than intact children. In the second hypothesis, regarding the time of assembly brick box Merkur children with mild mental disabilities needed double time due to the fact that there is a lower level of attentiveness and higher tiredness. In the third hypothesis, which is relevant to the combination of assembly of brick box Merkur and brick box Meccano children with mild mental impairments put double effort in order to construct the second brick box compared with intact children because of their intellectual deficit. In conclusion, it is essential that children with mild mental disorders have to be prepared so as to correspond to requirements of modern society.

Pedro Gutierrez and Almudena Martorell (2011) refer to the research which was conducted about the use of Information and Communicational Technologies (ICTs) by individuals with Intellectual Disabilities (ID). Especially, a survey was made of 156 adults with ID in order to show how many people with these impairments use new technologies such as cellular phones, Internet and television. The results have shown that the utilization of these technologies is akin to those expected of the general public notwithstanding with specific differences. Namely, as far as cell phones are concerned the vast majority of participants have one in order to communicate with others. Although, there is no difference in using cell phone among people with ID and intact ones, individuals with lower IQ have some difficulty in performing operation which are cognitively complicated. Furthermore, taking Internet access opportunities into consideration, the plurality of participants is very close to the norm for the general public. The only difference, which was presented, is the fact that younger persons use the Internet more often. Finally, regarding the use of television a great percentage of people with ID watches television at the same pace as the general public. On the other hand, people with ID and especially who have lower IQ present great difficulty understanding the content of news programs.

Dror Ben- Zeev et al. (2012) refer to the use of mobile technologies in order to enhance mental health services in the future. The authors conducted research in which 1.592 individuals participated about the use, access and interest in these technologies by individuals who have serious mental illnesses (SMI). This research aims to observe how these people correspond to current mobile technologies. The authors, also, want to discover what type of services they would be interested in receiving from providers through mobile devices in the future, namely, they find out mobile health (mHealth) options treatment provision in community settings. The participants answered questions about their ownership and use of mobile devices and interest in future services. Survey information was combined with data from the electronic medical record including demographic and historical self-report, DSM-IV diagnosis determined by agency clinical staff, and ongoing status. It was proved that the wide use of mobile technologies is relevant to some factors, such as education, age, income and the high penetration of these technologies in the current life. To sum up, as a result it is essential that mobile technologies should be used by people with SMI because they could help them relay time-sensitive information and support during emergencies they can also help specialists maintain ongoing contact with them over prolonged periods of time.

Rebecka Näslund and Asa Gardelli, in 2012 tried to give an answer in these questions: how do people of different ages with intellectual disabilities experience the use of ICT in their everyday

lives? Are people with intellectual disabilities able to influence their level of activity by using ICT? And if so, in what ways? This study introduces how technology and humans are part of relationships that influence agency among people with disabilities. It aims to focus attention on the use of, and access to, Information and Communication Technology (ICT), and agency among youths and adults with intellectual disabilities. The study draws on empirical research conducted with youths and adults with intellectual disabilities, as well as staff at a day center. It shows that by drawing upon interests, previous experiences, and cooperating in ICT activities the participants' agency changed. The sample for this study is based on six youths aged 15–20 years and five adults aged 40–60 years. The materials and methods drawn upon in this article are based on observations, diary notes, video-recordings, photographs, drawings, and interviews with youths and adults with intellectual disabilities, as well as, staff at a day center. The analysis of the empirical material was inspired by a qualitative approach. Furthermore, the results showed how people with intellectual disabilities were able to influence their levels of activity, their agency, by using ICT, and the ways that this was done. Also this study has shown how agency among the participants was developed by support from others, through cooperation, and networking during ICT activities. Another aspect for the participants was that the computer encouraged them to believe that things in life are interesting and that using computers is worthwhile and that there is a good reason to care about what happens when using computers. Finally, the use of the computer increased their motivation to try new techniques, their self-esteem, the belief in themselves and their abilities.

Penny J. Standen and David J. Brown refer to the rehabilitative opportunities provided via Virtual Reality to people with Intellectual Disabilities in order to become independent and socially active. There are studies that have shown the advantages of VR for rehabilitation in Intellectual Disorders. Namely, they can make mistakes without suffering the real, humiliating and hazardous consequences of their errors. Virtual Worlds can be constructed in ways the real world cannot, according to the users' requirements, with less challenging tasks for the novices. Furthermore, VR helps these people to gradually improve their daily life. Another important issue about VR is the fact that creates conditions in order individuals with ID to acquire skills to support independent living. In this context, researches have taken place in domains such as grocery shopping, food preparation, orientation, crossing the road and vocational training, so as to discover how virtual worlds can assist people with ID to cope with the pace of the real world. In these studies, people of age 7-46 years old participate in a simulation of real life. It was proved that these individuals accomplished these activities with great ease in VR than in the real world. Moreover, VR enhance cognitive skills to persons with ID. Specifically, implementing virtual environments in education encourage active involvement, because this interactive software urges them to make choices and reach decisions. That would not happen otherwise because of their tendency to passive behavior. To sum up, VR should not be considered as a solution that would suit all users. For this reason, future directions are in the development of more applications for independent living skills, rehabilitation and cognitive skills.

Lopez-Basterretxea, A. et al. (2014), created a telemonitoring tool based on computer games, aimed at money management skill improvement for people with Intellectual Disabilities (ID). Money management habits are considered essential for independent and autonomous life. The tool is divided into two parts: on one hand, some training activities related to payments and currency discrimination based on Serious Games are proposed to the user using a multi-touch device. On the other hand, the psychologists and specialists who work with them, can access to the Serious Games results using an online application in order to evaluate their progress. The results are measured according to the number of errors they have during the proposed activities,

the time they need to complete them and the score. In addition, an adapted questionnaire was created, to measure the satisfaction of people with ID regarding the proposed system. A research was conducted with a clinical sample of 12 users with ID between 12 and 15 years, taking into account that all of them are capable of correct oral communication and they do not have severe physical coordination problems. Only two users completed all the games without errors. The results showed significant difference between the selection of games 1, 2 or 3, because all of them preferred the game 1 related with “Payments” probably because it permits more interaction using the multitouch device. In the questionnaires, the users experienced pleasant sensations and enjoyed playing the games. The professional instructors also expressed positive views. The results of the database reflect that the complexity of the levels is appropriate, since a wide range of results were obtained. Furthermore, the design of the application structure is considered to be appropriate, since the users were able to understand and move throughout the different sections. Summarizing the researchers concluded that tools for intervention that focus on instilling skills training via technological devices and through leisure could be a step towards a more independent life for people with ID.

2.2 The Contribution of ICTs in Educational process

Students with Intellectual Disabilities (ID) face difficulties in cognitive performance. Thus, the usage of ICTs not only it is essential for them so as to acquire basic learning skills, but also it contributes to the effectiveness of teaching and learning process.

Li – Tsang C.W.P et al. (2006) conducted a research to evaluate the computer skills that people with intellectual disabilities (ID) acquired during an information and communication technology (ICT) training program six months ago. The ICT training program took place at Hong Kong in 2001. The government designed this program in order to confront the gap in accessing ICT among different individuals and social groups. During this program 100 people with ID trained in four main areas of computer skills: the components of a computer, the use of the mouse and keyboard keys, commonly used icons and access to the internet. After six months, 59 of the 100 people who had participated in the initial ICT training program agreed to participate in a follow – up interview. A checklist of 17 items was used to evaluate the adequacy of computer skills before and after the training program and at the interview after six months. The analysis of the difference among the results of the pre-training, the post-training and the follow-up assessment was made with one-way repeated measures ANOVA. The analysis showed that after six months the participants maintained the computer skills that acquired during training. The caregivers of the people with ID were also interviewed after six months of the initial program. The caregivers noted that the perceived benefits were in cognitive functioning, increased social interaction, better use of leisure time and a reduction in behavioral problems.

Young-cheol Lee and Yank-taek Sim mention the effects of the ICT program on word reading, sentence reading and writing for students with mental retardation. Three students from Korea took part in this investigation. The IQ of these students was 54, 48 ad 41. The present reading and writing levels was measured using a Basic Learning Functional Test. Moreover, in order to investigate the influence of reading and writing they used testing tools which were made from ‘Booky’s Talr Country’. The design of this research was multiple probes across subjects. With regard to the procedure, the experimental duration was from April to August 2002. This phase was divided into four stages called baseline, intervention, break and maintenance. Specifically,

there was a multimedia computer where participants firstly they got familiar with basic functions prior to experiment until they passed lessons three times in a row so as to continue. Then, they interacted with the ICT program for fifteen minutes. During the baseline they were tested on the 25 probe items of word reading, 20 sentence reading and 25 items of writing without intervention. At the intervention phase they were taught with the aid of their teacher firstly and then the mobilization was decreased after the achievement performance of three sessions of tasks. After analyzing the results of the ICT program in three figures it is reported that most of the programs had effects in improvement of communication and language acquisition and maintenance. Also, this program had strong intervention effects. This research suggested that the ICT program can facilitate the reading, writing ability for students with mental retardation and their suggestion was to be further research in order to find out this aspect.

Johny KV et al. (2012) in India, developed “Puranjjani”, a web based software tool in order to provide assistance to special educators working with children with mental retardation (MR). The developers wanted to introduce the power of Information and Communication Technologies (ICTs) in assessment, evaluation and choosing the appropriate lesson plan for mentally challenged children. “Puranjjani” provides an integrated environment of various tools for the initial evaluation, age appropriate placement, setting the long and short term objectives for the children with mental retardation. The program has the capability of grouping the children according to the level of performance they achieve. In addition an algorithm analyzes the previous three consecutive evaluations in order to find the strength and needs of the child. This knowledge is used to define the objectives of the intervention for each person. Furthermore the tool has an inference engine that can separate the activities of the person as items with complete independence, items which require occasional help and problem areas. The items which require occasional help are suggested as strengthening in the next stage. Subsequently a lesson plan can be used from the scalable repository of the program. This tool was tested in eight special schools in Kerala, India for 18 months. 40 special educators and 667 persons with mental disability participated. The results of the trial were encouraging. The manual labor of special educators reduced 40 – 45%. The program was decided to make a wider user trial in 100 special schools.

G. Koutromanos and D. Zisimopoulos, in March 2009 tried to investigate the psychological factors that may influence teachers’ uptake of Digital Game-Based Learning (DGBL) material (e.g. educational software, websites) for students with mild mental retardation (MMR) in their teaching. The Greek Ministry of Education, in cooperation with Greek Universities, adopted a series of activities and ICTs programmes. One of these programs was the “EPINOISI” programme concerning students with Mild Mental Retardation (MMR). Under this scope, this specific programme was implemented by the University of Athens, with the objective to realize a specialized formation programme for primary, secondary and special education teachers’ by supporting students with MMR and at the same time developed digital game- based learning (DGBL) material for MMR students to be deployed and tested within the special classroom, as part of practical seminars and hands-on activities. In this survey (was based on the Theory of Planned Behaviour TPB), 200 teachers participated and attended this formation program selected from schools and cities from all over Greece. A questionnaire was prepared to measure the direct (for example behavior) and indirect (for example control beliefs) variables of the TPB and the findings were analyzed by using SPSS program. Overall, with respect to the TPB variables, teachers had positive values indicating a tendency to be favorable towards using the DGBL material for MMR students in their teaching. The findings of this study suggest that

teachers will not continue to use the DGBL material in their teaching unless they have very positive attitudes towards using the DGBL material in teaching. Therefore, the challenge for the educational policymakers to promote the use of ICT in schools for MMR students is to reinforce the positive attitudes of those teachers who already use the ICT for MMR students in their teaching and to change the attitudes of those teachers who have less positive attitudes towards using ICT for MMR students in teaching.

V. Kirinić, et al, on this paper, in March 2010, provided an overview of examples of good practice in the ways in which persons with developmental disability use the computer. More specifically, its objective is to highlight the beneficial effects of the process of motivation and socialization when these processes are aided by the computer, compared to conventional forms of learning without the use of computers. Assistive technology (AT) can play a major role in overcoming the barriers that persons with developmental disorders have to face. More concretely, assistive technology includes assistive, adaptive, and rehabilitative devices for people with disabilities. By means of assistive technology disabled people can achieve independence in executing routine tasks. Assistive technology can be categorized as follows: AT for learning and studying, for vision, for communication, for access, for hearing. According to the article, another worthwhile use of ICT is that of tools for assessment– in diagnosing the nature of the child’s learning. In addition, the use of computers has also proved beneficial in education of children and adolescents with mental retardation and attention deficits. Finally, using computers (Computer-assisted instruction or CAI programs is a type of teaching with technology helps disabled students feel independent and develop living skills) and specialized software (SymWriter, The Boardmaker Software Family, the Kidspiration tool for learners for developing thinking skills/literacy etc., the Aurora Suite 2005 for augmentative communication, learning disability and dyslexia and the Učimo slušati, which is the first Croatian software package for auditory training of all preened early-school children), is gaining increasing importance in the process of educating persons with developmental disorders. Furthermore, additional training on this specific use of ICT needs to be provided for teachers and parents involved in the education of children with mental disorders.

J. Brodin in Stockholm Institute of Education in June 2004, discuss the meaning of play in children with profound intellectual disabilities. The aim of this research is to highlight studies on play as a tool for learning and early stimulation, and for training of different functions, as these aspects seem to be of great interest in research today. The subject is of interest also with regard to the information and communication technologies where computers generally are seen as excellent tools for training and development of children with disabilities. The research is based on literature and an empirical study. Most literature has been found in databases (e.g. ERIC, Libris, PsychLit), but there is a shortage of studies when children with profound disabilities are concerned. The aim of the empirical study was to investigate the parental views on children’s play as well as children’s preferences of toys and play activities. The empirical study was conducted on play in 38 children with profound intellectual and multiple disabilities. The ages of the children varied between 2.5 and 20 years, and the study was conducted in one of the county councils in Sweden (Brodin, 1991, 1999). All participants were parents of children with profound multiple disabilities and members of the National Association for Children with Mental Handicap. A specially designed questionnaire was made and distributed to all families in the area (n = 45) and this was completed with personal interviews with six families. The results showed that the parents experienced difficulties in activating their children, as they expressed it, ‘in a meaningful way’, that the children quickly lost their interest in objects and

events, that they were passive and that they were worried and restless. Approximately 50% of the children in the study screened themselves off during play. This behaviour affected the mother's motivation to play and communicate with her, child because they enjoyed playing. From the results Jane Brodin declares, that there is no general agreement on the importance of play for these children, however, as it is difficult to assess the level of development of a child with profound multiple disabilities and to access the implication of different steps.

Li- Tsang C.W.P. et al, in 2004 presented the results of an information and communication technology (ICT) training programme in which 106 persons participated with intellectual disabilities. The main features of the programme were a specially designed training curriculum with software designed in the appropriate language and the relevant appropriate levels for people with intellectual disabilities. In the training programme, participants were taught about the operations of mouse and keyboard and browsing the Internet by using Internet Explorer (IE). All participants were assessed on ICT competence before and after the ICT training programme, as well as, after attending an one month follow-up programme by using a skill-based checklist. Results from the repeated measure "ANOVA" and "t-tests" showed that participants acquired a higher level of computer competence after training and retained skills within the one-month follow-up period. Results indicated that persons with intellectual disabilities have the capacity to learn ICT skills in a structured group with appropriate learning assistance and appropriate training tools. The advantages of using computer technology, inter alia, includes: minimizing the effect of disability, enhancing training and skill development, increasing social participation and improving quality of life for persons with intellectual disabilities. The present study was an initial endeavor to explore the effectiveness of ICT training programme for persons with intellectual disabilities in groups, which has not been quantitatively evaluated in the past literature. The purpose of the present study was to systematically evaluate an ICT training programme for people with intellectual disabilities. A total of two intensive training sessions (three-hour session) were conducted. Persons with intellectual disabilities were taught about the mouse and keyboard usage and browsing the Internet by using the Internet Explorer (IE). Specially designed software was incorporated into the ICT training programme to facilitate the learning of the skills. A skill-based checklist was developed to evaluate the effectiveness of the training programme based on the task analysis of computer operation. The value of ICT, in enhancing the quality of life and employment opportunities for persons with intellectual disabilities, has been well-established. ICT has a significant impact on every aspect of one's daily life. The "digital divide", the gap between people who have access and training to computers and internet and those who do not, could significantly impede persons with intellectual disabilities the opportunities for success and chance for full integration to society. The training programme was found to be effective to increase the level of ICT competence among persons with intellectual disabilities.

Lee, Y. C. et al. conduct a research in order to investigate the effects of an ICT-applied program on multiplication, division abilities and task-achieving time of students with mental retardation. Three students with mental retardation were recruited. The students with mental retardation attended special classes at K Technical High School in Kwangju City, Korea. The chronological age (CA) of the students was 18 years old. The IQs of the three students, calculated using the standard score from KEDI-WISC (Park et al., 1987) were 63, 70 and 65. The present multiplication and division abilities of three students were measured using a criterion-referenced test. In order to investigate the effects of ICT-applied programs on multiplication and division abilities, three types of testing tools of ten double digit multiplication problems and ten simple division problems were made. The experimental period was from May 13th to

July 24th, 2004. The experimental phase was divided into four phases called baseline, intervention, break, and maintenance. The ICT program used was “Yahoo Gurugy Multi-Learning” at (<http://www.kr.kids.yahoo.com>). First, each participant executed the power point program on the initial window screen. Second, after each participant shifted from the initial screen to the learning guide screen, they select multiplication problems from the learning guide screen. Third, after the participants practiced their selected problems, they solved the problem in the criterion-referenced test. The procedure of division was the same as for the multiplication procedures. The ICT-applied program had an effect on acquisition and maintenance of each participant’s multiplication and division abilities and the reducing of task-achieving time. This ICT-applied program also seems to have meaningful intervention effects. This research did not attempt to determine whether or not ICT-applied program is the best way to improve multiplication and division abilities in student with mental retardation, but only whether it represents a viable intervention.

UNESCO has become one of the most active international organizations in supporting modern approaches to education. These approaches are related primarily to application of new technologies, which enable to solve a wide range of problems and to process a vast number of information sources. For implementation of this objective, the Institute concentrates its efforts on the activities in four main program areas such as Supporting national capacity-building for ICT application in education, Forming an information environment for education, Improving the quality of education through ICT usage and Promoting ICT usage in education for learning to live together. Children with mental retardation may take longer to learn to speak, walk, and take care of their personal needs such as dressing or eating. They are likely to have trouble learning in school and there may be some things they cannot learn. Though the specific applications of ICTs are extremely diverse and varied they may be grouped into following main categories. *ICTs for compensation uses, ICTs for didactic uses, ICTs for communication uses*. However, students with mental retardation can meet some obstacles when facing the use of the IT tools, as to the concrete management of the instrument. As Cook & Hussey (cit.) stress, «it is generally not our goal to make things *simpler* for someone with a cognitive deficit, but to make them *different*».

Even if many individual differences exist, generally speaking it is preferable to avoid too much icons on the user’s screen desktop, as well as pictures on its background. Images with clear borders and high contrast with the background can be better identified and decoded. The choice of using the PC on an individual basis might be considered attractive – and also more productive – by a teacher working with a student with mental retardation. But putting the PC in a secluded place increases the student’s isolation. In order to provide accessibility of qualitative education for students with disabilities, the primary attention of policy and decision makers should be focused on the providing of such *necessary conditions* as providing appropriate ICT infrastructure satisfied the principles of usability, accessibility, flexibility, affordability, and cost-effectiveness, training and retraining of ICT specialists in special education, that should satisfy quality standards of professional teachers' excellence (including excellence of special needs teachers), and meet the technology standards of teachers' excellence and modifying of all curriculum components (including methods of creating the content, its delivery and ways of assessment of the students' progress) with due account for educational needs of students. ICT infrastructure refers to the telecommunication and information networks through which information is transmitted, stored, and delivered. The infrastructure within special education context embraces a wide range of devices, including hardware, software, and Internet access. Among policy trends within training of ICT specialists in education of persons with mental

retardation the following are of primary importance. Identifying requirements and quality standards regarding training of ICT specialists in the field of mental retardation, Development of special teacher training programmes, Promoting appropriate service delivery methods and suitable conditions for implementation teacher training programmes and Providing monitoring and evaluation for improving training policy. In order to achieve the main objectives of the UNESCO IITE project, focused on reinforcement of national capacities in special education on the basis of application of ICTs, the Institute assumes to hold a number of training workshops and seminars for different groups of specialists, involved in education of persons with disabilities. Within this framework the IITE Specialized Training Course is to be disseminated through a set of face-to-face and online training sessions.

2.3 ICTs as a medium for finding a job by individuals with ID

People with mental disabilities face difficulties in finding an appropriate career due to the fact that they cannot correct choices. For this reason, some ICTs' tools have been created, so that these persons would feel useful to the society.

Stock Steven E. et al. (2003) refer to a study about a working software prototype, called *WorkSight*, in which people at least 18 years of age participate. *WorkSight* helps people with mental retardation to choose their career. Due to the fact that individuals with Intellectual Disabilities are having difficulty to express their job preferences because of their lack of experiences, the researchers suggest a new software prototype (*WorkSight*). This software presents tasks related to specific careers incorporating live-action video and audio of a variety of work situations. Thus, it constitutes a better representation of a career to individual with mental retardation having simultaneously a greater accuracy than the previous softwares. The integrating live video clips and recorded digital voice prompts are combined with twelve job categories, laundry services, food services, janitorial/housekeeping services, warehouse/material handling, clerical/office work, personal/human services, animal care, lawn/outdoor maintenance, store/retail work, automotive repair maintenance, building trades, hand labor/tool use. Each category was represented by five distinct video clips, which concern real world's tasks. Each video clip has length 10-15 seconds. The more they are exposed to information about specific job tasks through multimedia, the more easily they can broaden their career choices. In this way, they have the opportunity to enhance their self-determination. This procedure includes two stages. In the first one there is a pre-test form, which is completed by professionals with data of people with ID, such as previous job history and their personal knowledge of test subjects in order to predict a good job match. In the second one they watch the video clips in order to choose their career. To sum up, this research constitutes a preliminary effort of software creation, which provides the chance to assess the vocational preferences and interests of person with mental disorders.

Subsequently, Johny K.V. and Harish G. (2016), after the success of enabling ICTs in special education, took up the second phase of digital inclusion process of vocational training and evaluation. The researchers developed and tested a web based software solution called 'Prayatna' to provide a digital environment to the special educators to provide vocational training and assessment to the mentally retarded persons above 18 years. PRAYATNA' provides an easy to use integrated environment for the entire workflow of vocational training, including vocational readiness assessment and dexterity assessment of an individual. Based on the results of these assessments, the tool generates a vocational profile and type of employment suited to that individual. The tool also provides a framework for job entry and 'Job analysis' by breaking the job into major tasks and its sub tasks. It automatically matches a suitable job by normalizing the requirement of a job with the strength and needs of an individual by correlating

the job requirements with the strength of the person. Four major innovations are included in the tool. The first one is the vocational profile based on the analysis of skills such as Cognitive, Daily Living, Hygienic, Social, Emotional and survival Skills. The second one is finding out suitable category of job such as Routine, Low precision, Medium precision and High precision based on the Dexterity and eye-hand coordination assessment. Job matching to an individual and scalable job repository, are the other two innovations. This web based tool can be used by any special school that provides vocational training to the person with mental retardation. Any school can add a new job using the job entry framework provided with the tool, which will go to the Job repository of the system. Each of these jobs can be freely selected by any other school at their choice and can be used for training their students. 'Prayatna' tool is integrated with the 'Punarjjani' tool so that a major spectrum of the training and rehabilitation process of a person with mental retardation, above the age of 5years, has been brought into the digital domain. Thus substantial digital inclusion has been attained in this most needed field.

3. ICTs and Down Syndrome

3.1 ICTs as a medium for the self-independence and socialization of individuals with Down Syndrome

Down Syndrome is the world's most common chromosomal disorder and cause of intellectual disability. Most people with Down Syndrome experience low integration with society. ICTs are a new way to help all these children with isolation problems in order to be incorporated into the society's structure and increase their interaction and independence.

Costa, F. et al in March 2015, describe an ICT and Cloud based program that can provide Scaffolding learning for people with DS in order to learn their way in a town. Since people with intellectual disabilities face difficulties in the learning process, including mobility, they rarely live a completely independent life. Nevertheless, with an increasing number of adults with Down syndrome it is important to lay a foundation system that will help them to learn moving with safety in their urban environment. In their paper, they describe a particular program, named Smart Angel, which uses localization systems and ICT technology to create a scaffolding support for the users, to help them move freely and reach a place of interest. Help is provided at any time if needed, since the program monitors in real time the user's movement. Through their Smart Phones, the targeted population can learn paths in a town without the use of maps, which are usually hard to understand, by actually moving along them. All the data, about the program's usage are stored in a central database and the educators and families can understand the users' real abilities to explore and move freely their own town. This approach, takes advantage of the new ICT technologies, and incorporates learning theories in the process of creating more independent individuals. Smart Angel is still in an experimental phase, and the outcomes are yet to be delivered.

K. Stensaeth (2014) in her article talks about how children with severe disabilities interact with some co-creative tangibles. This project is called RHYME and helps these kids defeat their isolation with the method of co-creation, which means together. She compares and finds many similarities but also differences between two children, Petronella with Down syndrome and Dylan with autism, who have interaction with the musical 7-armed carpet called WAVE. It is a carpet with cross-media possibilities which allows the children to interact however they want and it has the potential to shift to be interesting for every child. It has a microphone, a camera, a projector, bend sensors, accelerometer sensors and all with light or vibration responses. Every child interacts with the WAVE but also with his/her close other, a person of his/her trust. The way that the children interact varies with their cognitive level and interests, the flexibility of the WAVE and the potentials of the co-creator. Petronella found the microphone more attractive

and funny when it interacted with unexpected ways and Dylan was attached to the camera but in a more passive way. A focus group structures a video analysis of the sessions with the children and their close others so they can watch it and focus on their reactions and way of communication. This way they can shift the way the WAVE reacts to the kid so it becomes more appealing for him/her. The project tries to make children more social and communicate with their own way so they don't isolate which is really important for their lives.

J. Carlos Augusto et al. (2013) refer to a technological application that will support citizens with DS into their daily interactions as a supporting guidance. Taking into consideration that most people with DS syndrome have low integration with society, they describe a new technological tool that uses the technical advances for their benefit. This application, named POSEIDON project, takes advantage of today's innovation and technology by providing them with a software that will present different scenarios and the possible options and steps that the individual has to make in order to reach a specific goal, such as going from home to school or going to the cinema, etc. The project takes into consideration the different needs and strengths of this specific citizen group and aims into increasing their integration within society. The users will be able to personalize the program, making it more efficient and helpful in order to create an infrastructure that will support them and their circle.

3.2 ICTs as a learning tool for children with Down SyndromeThe DS children use the same learning strategy as the normal children, but their learning stages develop more slowly. DS children suffer from learning problems and most are classified as mildly or moderately disabled. Computer-assisted learning offers particular benefits for children with Down Syndrome and for people with learning disabilities in general, such as visual presentation, self-paced learning, highly motivating graphics and sound, immediate feedback and the opportunity to be in control of their own learning.

There are three types of Down Syndrome that affect 1 out of 800 live births in the United States. The first is trisomy 21, then translocation and mosaicism. The syndrome affects the overall development of the individual. Many of its characteristics are connected to other developmental disabilities such as autism but Down syndrome affects all three channels of human abilities. As for the computer usage, there has been a development in the past decade in order to help people with syndromes or mental illnesses. Researchers in special education claim that computer technology can benefit education of individuals with Down syndrome if the software is appropriate and promote independence. The study between children who used computers in education and others who used the traditional way, showed that the educational software helped children in a significant way. The National Down Syndrome Society designed a web site for people with Down Syndrome called Web Fun Central. A small group of people with DS used it and helped the researchers find some guidelines in web design but the amount was so small that they still don't have a perfect program. The survey had questions that the parents asked about the problems and difficulties their children had when using technology. The children faced cognitive limitations which are language and reading difficulties or writing and communication difficulties, frustration when they couldn't do what they wanted to and they didn't have the patience to do it and physical limitations when they used the mouse or the keyboard. Some other problems were inappropriate software, societal problems such as parents' worries about their children safety when using the web. In the end technology for DS people must be specially designed for each age and level of education and use programs that help them use it in an easy way so they do not give up.

B. Black (2003) in his article presents the new improved software that can be used and benefit children with Down Syndrome. Although it is stated that not much has changed from the first

appeared technology to assist children with DS, the use of interactive boards and resources from the internet have helped schools incorporate this particular group with visual and audio stimulus much needed for their educational development. In particular, he describes three programs (Sound beginnings, Sound beggings2, Speech Viewer) that offer the user the ability to operate them with voice stimulus. In addition, he refers to a number of programs that support the development of word vocabulary, spelling and reading such as Speaking for Myself Plus, See it Say It, Clicker5, Earobics, Wordwork1 and 2. Lastly, he states a catalogue of supporting inclusion software and free resources that can be used from teachers and families with internet access helping children with DS and even creates their own activities.

Shafie A. et al. in Malaysia developed SynMax, a computer software application in order to help children with Down Syndrome (DS) improve their basic numeracy skills. The design of the application was based on some learning theories such as behaviorism, cognitivism and constructivism together with the Dual Coding theory and Schema theory. Dual Coding theory claims that the chance of remembering an item increases if both verbal and visual information is used to represent the information. The application includes three modules; learning, matching and counting. Only single numbers from 1 to 10 are included. The researchers tested SynMax with three (3) children aged between 8 – 13 years old. Subsequently two checklists were given to the teachers and the parents so that researchers can have an assessment of the activities that the DS children performed at the center and at home. The checklists included observable learning skills (cognitive, affective, psychomotor) and occurrence of observable behavioral problems of the DS child. A user acceptance test was also given to be filled up. The results showed that the children accepted the application. There were able to follow the instructions given in the application and their attention span increased when they used the computer. Furthermore the user acceptance evaluation gave positive feedback and suggestions for improvement. Installation of familiar songs, a figure that looks like a teacher, more animation and interactivity, were some of these suggestions.

M. C. Astorgano et al. designed a video game which called “The Magic Stone” that helps people with Down Syndrome to improve communication skills that have been affected due to their disability, especially those related with prosody. The interface of the video game includes a number of elements to motivate the users to practice and train their pronunciation. The usability tests of the system have reported high degrees of satisfaction of users and trainers. Perception tests have permitted to confirm that players improve the use of prosody with the use. Three activity types are defined to practice speech, communication and prosodic skills such as Comprehension activities that are focused on lexical semantic comprehension and on improving of prosodic perception in specific contexts, like making a question or asking something politely, Production activities that are focused on oral production, so the players are encouraged by the game to train their speech, keeping in mind prosodic aspects like intonation, expression of emotions or syllabic emphasis and Visual activities focused on improving specific aspect of prosody, with the corresponding visual response to the user voice input and other activities designed to add variety to the game and to reduce the monotony feeling while the player is playing. The activities are included in the general context of the game and players need to do them in order to progress in the game. All the activities have been planned according to the principles of learning that have proven most effective for teaching and presenting information to people with intellectual disabilities.

In the past century that Down Syndrome was discovered there have been many studies on it but only a few about computer usage. Research showed that people with DS reacts better with visual stimuli rather than audio stimuli because of their lack of hearing. Keyboard and mouse

are two difficulties they face when using a computer so there is an interactive whiteboard that helps them solve mathematical problems either with numeric symbols or with counting balls. Researchers studied 9 pupils with DS when using this whiteboard which was specially designed with all the principles of the Center for Universal Design to help them with all their difficulties. They made some prototypes in order to solve any problems they faced. Results showed that some interaction problems effected the mathematical solution, touch screens helped a lot with eliminating problems. The study population shows that subtraction is more difficult than addition. The results indicate the importance of visual aids (graphics, balls and fingers) in teaching addition and subtraction in people with DS. Finally, it was found that the digital board was a great motivation for students with DS so they didn't even want to use the pencil and paper method. Each student faces some problems which helps the researchers make the program better so it can help lots of people with DS.

4. Discussion

It is a fact that Internet Access by People with Intellectual Disabilities is a further part of life. However, seems to be fundamentally excluded from. So for people with ID, the promise of the Internet requires a long way for full online inclusion. Assistive technology (AT) can play a major role in overcoming the barriers that persons with developmental disorders have to face as it is gaining increasing importance in the process of educating persons with developmental disorders. There is no doubt that education policies must promote the use of ICT in schools for MMR students to reinforce the positive attitudes of teachers who already use the ICT for MMR students in their teaching.

On the other hand, the use of mobile technologies in order to enhance mental health services in the future helps People with Mental Retardation. This research suggested that the ICT program can facilitate the reading, writing ability for students with mental retardation and their suggestion was to be further research in order to find out this aspect. Example is "Puranjjani", a web based software tool in order to provide assistance to special educators working with children with mental retardation (MR).

As far as Individuals with Syndrome Down are concerned, Project like WAVE tries to make children with Syndrome Down more social and communicative with their own way so they do not isolate which is really important for their lives. Another important application, named POSEIDON project, takes advantage of today's innovation and technology by providing to people with Syndrome Down with a software that will present different scenarios and the possible options and steps that the individual has to make in order to reach a specific goal, such as going from home to school or going to the cinema, etc. A number of software programs that support the development of word vocabulary, spelling and reading such as Speaking for Myself Plus, See it Say It, Clicker5, Earobics, Wordwork1 and 2. Lastly, states a catalogue of supporting inclusion software and free resources that can be used from teachers and families with internet access helping children with DS and even create their own activities. Another application SynMax, a computer software application in order to help children with Down Syndrome (DS) improves their basic numeracy skills. The results showed that the children accepted the application and gave positive feedback.

The use of computers and assistive devices strengthens the self-independence and socialization of disabled people. It is obvious that researches have shown that governments should organize ICTs training programs in order to bridge the gap in accessing ICT among different individuals and social groups.

Studies on Information and Communication Technology (ICT), have proved that people with Intellectual Disabilities, influence for the better their everyday life. Furthermore, ICTs like VR

(Virtual Reality) help these people to gradually improve their daily life. Another important issue about VR is the fact that creates conditions in order individuals with ID to acquire skills to support independent living, having self-esteem and motivation. Other ICT tools, like telemonitoring tool, based on computer games, seem to be beneficial for independent and autonomous life. From the other side, another impact of ICTs is that minimizing the effect of disability increase the social participation. It is obvious that the importance of software prototype like WorkSight, helps people with mental retardation to choose their career and have quality of life. In the same category the Prayatna web software, based on the analysis of skills such as Cognitive, Daily Living, Hygienic, Social, Emotional and survival Skills, helps people with mental retardation to find a suitable job.

Finally, video games like “The Magic Stone” could be useful for persons with Down Syndrome to improve communication skills and have a better living conditions. Improving prosperity and have a quality of life and rehabilitation for these people, it is a goal that governments have to take into account. The e-inclusion and the social integration of people with Intellectual Disabilities are fundamental for today and for the future. In addition, there is no general agreement on the importance of the use of ICTs for people with Intellectual Disabilities and mental retardation. Studies are growing around this issue and will open possibilities to increase the world knowledge about them.

5. Conclusion

To sum up, in this work, we analyzed mentally and Down impaired- users interaction with information and communication technology services, with the intent of gathering these individuals’ needs and difficulties. In modern societies, individuals with special disorders should have the same rights, obligations and chances in order to participate in social and private life with the same way. Obviously, technology would not cure intellectual disability or even fully compensate for the difficulties encountered by persons with intellectual disabilities, but, Information and Communication Technology (ICT) can, however improve their abilities to better integrate, changing also the way they learn and improving the lives of these individuals and facilitating participation in society.

Finally we have to underline the role of digital technologies in education domain that is very productive and successful, facilitates and improves the assessment, the intervention and the educational procedures via Mobiles [31-40], various ICTs applications [41-74], AI & STEM [75-85], and games [86-92]. Additionally the combination of ICTs with theories and models of metacognition, mindfulness, meditation and emotional intelligence cultivation [93-120] as well as with environmental factors and nutrition [27-30], accelerates and improves more over the educational practices and results, especially the gifted students with ADHD.

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