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## ENTELIS

### “European Network for Technology Enhanced Learning in an inclusive Society”

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## Executive summary

The ENTELIS- project aims at raising awareness regarding the importance of lifelong learning in ICT and ICT-AT for people with disabilities and older adults and their supporting environments. Regarding the use of ICT/ICT-AT in education the project contributes to the development of pedagogical innovations and inclusive education of all age groups. This report deals with guidelines on innovative pedagogical principles to support ICT/ICT-AT learning and certification of the learned. It is based on the results of earlier work conducted in ENTELIS- project, in particular the State of the art -report, Living lab investigations, the report on the existing certification systems and survey data on needs and barriers of ICT/ICT-AT in learning and education.

The conclusions of those efforts can be formulated as recommendations and summarized as such:

- The development of ICT and ICT-AT skills and competence of PwDs and older adults should be part of the digitization strategies that foster the development of education at all levels and of strategies that enhance participation and digital inclusion.
- Teacher education at all levels should include basic ICT and ICT-AT skills and competence development.
- Teachers should be trained to support inclusion and the use of appropriate ICT and ICT-AT for learning.
- The education of social and health care professionals should include ICT and ICT-AT skills and competence development, and service providers should have continuous education on ICT and ICT-AT products and services.
- The developers of ICT and ICT-AT need to involve users, teachers, care professionals and service providers in the development of existing or new ICT and ICT-AT that could support learning and functioning of PwDs and older adults.
- Societies need to support ICT-AT users and enhance accessibility in education and digital services. An alternative service solution should be offered to persons not able to use digital services or digital learning environments.

This report recommend to take the following principles in account when designing learning programs or certification methods in ICT and ICT-AT for people with disabilities and older adults:

- 1) Personalized learning goals and the definition of outcomes - Personal Learning Paths
- 2) Accessibility to ICT-AT competence certification programmes and examination/assessment procedures for all
- 3) Compliance of ICT-AT certification programmes with the UN Convention on the Rights of Persons with Disabilities
- 4) Co-Learning for educators, carers, end-users
- 5) Education programmes including the use of web and mainstream technology + AT
- 6) Adaptive environments to support individual learning

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## Introduction

In the future various skills related to ICT will be required from all of us: knowhow about and access to the internet, competence in using e-services in different areas of life and awareness of the possibilities of ICT for personal development. The level of 'smooth use' can be described as sufficient skills and knowledge of ICT in order to use it in one's daily life, studying, at work and in leisure time. 'Proactive level', in turn, shows that a person has sufficient skills and knowledge in ICT to have an active impact on one's environment (physical, social, communication and attitude environment) (Tietoyhteiskuntaneuvoston raportti 2005).

However, the European Commission pointed out already in 2008 that there is a constant need to promote e-inclusion, noting that there were 50 million disabled people at risk of e-exclusion in Europe, most often due to the lack of skills and competencies in the use of ICT, besides the lack of personal access to internet-based services and solutions. In addition to people with disabilities, also the older adults have a risk of exclusion. Moreover, it has been evaluated that in Europe 59 % of people 65+ are using the internet and 85% of people aged 56-65 use it (Silver Economy report 2015). About 15% of people over 65 uses ICT on regular bases. There is also a strong correlation between age and disability and the increase is linear which means an expected increase in the number of people with disabilities in the (near) future. (European Commission 2015.) *The World Education Forum 2030* emphasized the need to make the necessary changes in education policies and to focus efforts on the most disadvantaged, especially those with disabilities, to ensure that no one is left behind.

The UN Convention on the Rights of Persons with Disabilities (2006) implies not only a moral obligation to provide accessible and inclusive education environments, but also a legal one where compliance is built into national legislation and associated advice and guidance on how to achieve it. Thus, the use of ICT and ICT-AT can be seen as a tool to participation and equality in society and therefore, the promotion of ICT-skills of the vulnerable groups should be addressed in the education of all age groups. Moreover, according to the Universal Declaration of Human Rights,

the right of freedom to express and to seek, receive and impart information and ideas through any media, as well as the right to education, are perceived as legal entitlements under human rights legislation. For many people appropriate technological solutions and systems could provide a possibility to fulfill these rights.

ICT and ICT-AT have an essential role in education and in the transition from education to employment and career development. However, not only the young generation but also the older adults need to develop their digital skills as more and more public services are turning into e-services in many European countries and worldwide.

The ENTELIS- project aims at raising awareness of lifelong learning among people with disabilities and the elderly, in particular making the opportunities of ICT/ICT-AT better known and more accessible. It contributes to the development of pedagogical innovations and inclusive education of all age groups with a special attention to the use of ICT/ICT-AT in education.

This report on the guidelines on innovative pedagogical principles to support certification (Del 5.4) comprises results of earlier work conducted in ENTELIS- project, such as the State of art - document, Living labs investigations, the report on the certification systems and questionnaire data on needs and barriers of ICT/ICT-AT in learning and education.

## Description of the data used

**The ENTELIS State of art- report (2015)** is based on an extensive literature review and on semi-structured interviews of various stakeholders in the field; people with disabilities and the elderly, teachers, caregivers, and service and product providers. In the literature review in total 150 scientific articles and 13 project reports were analyzed. Of these, 25 articles approach the theme of ICT/ICT-AT in education directly, but several more refer to good practices and present barriers in educating PwDs and the elderly and their proxies in the use of technological devices, systems and solutions.

The interviews were conducted in five countries –Italy, Cyprus, Finland, Former Yugoslavian Republic of Macedonia and the UK. In total 48 individuals were interviewed following an interview protocol that covered four main areas, in addition to the background information of the

interviewee: Daily life, Education, Employment and Community, Social and Civic life. Furthermore, the interviewees were asked to give examples of good practices and general barriers they had experienced or anticipated in regard to the use of ICT/ICT-AT.<sup>1</sup>

**Living Labs** were established in three countries - Italy, Cyprus and Finland. The total number of participants in these Living Labs was 62. The number of the elderly +68 was 16 (Finland, Italy) and the number of ICT-AT end users, people with disabilities, was six (Cyprus, Italy). The number of teachers involved was five (Cyprus, Italy) and the number of researchers involved was nine. Other people involved were clinicians, AT professionals, and service and product producers. Different methods were used for data collection: Structured Dialogic Design, Reminiscence of the Future, Focus group interviews and discussions, Seminars. The Living Labs results can be found in The Foresight Scenario document (retrievable <http://www.entelis.net/en/node/347>)

**The questionnaire on the existent certification systems** was answered by 14 organizations from 11 countries. The respondents were asked whether or not there was a certificated education program for ICT/ICT-AT in their country and to describe the general idea of the given program in brief. The Report on the certification methods in the existence training pathways in ICT and ICT-AT is found (retrievable from <http://www.entelis.net/en/node/346>).

**The survey of present barriers, emergent and future needs** of ICT/ICT-AT was responded to by 51 organizations from 21 countries. The survey was carried out by a questionnaire with Likert-scale statements and some open-ended questions. The questionnaire was in eForm and distributed to organizations and persons involved with ICT and ICT in the education of people with disabilities and older adults by the ENTELIS partners (retrievable from <http://www.entelis.net/en/node/350>).

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<sup>1</sup> [http://www.entelis.net/sites/all/files/entelis\\_stateoftheartreport\\_public.pdf](http://www.entelis.net/sites/all/files/entelis_stateoftheartreport_public.pdf)

## Summary of the results

**State of art report and the Manifesto towards digital inclusion:** Both the literature review and the interview data analysis suggest that the role of AT in promoting independence, social integration, educational success, employment opportunities, and overall quality of life of PwD is vital. All interviewees (end users, providers and trainers) agreed that the use of ICT-AT has expanded the learning opportunities for many learners with disabilities of all ages and has the potential to help PwD fully access, participate and communicate in educational and social environments. However, a number of studies indicate that even with the many forms of assistive technologies that are available, a great percentage of devices are abandoned shortly after their introduction for use. The abandonment of technology is also one of the barriers and considerations expressed by almost all interviewees in the study of ENTELIS. Reasons for failed AT adoption often include a failed understanding of what the technology actually does, why it should be helpful and uncertainty about how to use and configure the technology which is highly related to ICT & ICT-AT competencies and the confidence in using technology. This seems to be particularly true when technology has a high learning curve which makes its adoption difficult. Interview data (i.e. data from Finland) indicate that the failure of ICT and ICT-AT adoption is even higher in older adults, who seem to be more resistant to the acquisition of digital skills and the acknowledgment of the benefits of ICT-AT. There seems to be a general heterogeneity in the way technology is accessed and utilized among different groups of people with disabilities. Data collected from Cyprus and some examples in the literature from Germany indicate that people with visual impairments may have more positive experiences in ICT-AT education and learning than e.g. people with cognitive and intellectual disabilities. However, we must bear in mind that comparisons across groups or between different countries are difficult, if not impossible, due to the differences in legislation, and in educational or other support systems.

The research also shows that there seem to be difficulties in learners' transition from secondary to higher education. In higher and postsecondary education ICT and ICT-AT competencies seem to be much more essential for the effective use of technology in helping learners with disabilities to succeed. These differences in the various educational settings are also underlined in interview data from trainers/educators. Schools serving different age groups should collaborate with each

other in the transition of students with disabilities from one institute to another and also with the families in providing continuity in the digital skills development of the student, including the selection and use of appropriate assistive technologies which can be used in all living environments.

There is an obvious need to improve the ICT/ICT-AT competencies and skills of the teachers (at all levels and forms of education) so that they can help their students enjoy the benefits of the technology as well as reach their academic and vocational goals. According to recent studies, the inclusive approach and the integration of ICT skills in the curricula seems to be the winning strategy in the field of education. The competency training in ICT-AT service delivery should be mandatory also in the education of other professionals who work with PwDs or older adults, i.e. professionals such as occupational and physiotherapists, speech language therapists and other allied health professionals.

**Living Labs and the Foresight report** revealed that the education in ICT/ICT-AT must be based on the needs of each user. When people need a specific skill or competence in their daily life they are very likely more eager to practice and use it independently. Especially the participants in the group of older adults saw that pacing the guidance to suit their learning style and speed was essential in achieving good results. Therefore, some of them highly appreciated the help and guidance provided by peers.

In the educational settings (Cyprus) the major challenge was the lack of educators' professional development in integrating ICT-AT into everyday classroom practice, and this was considered a desirable development for the future. The need for specialized professionals in AT and multidisciplinary teams for the selection and implementation of AT as well as for educating and training people that support PwDs, were also seen as most desirable actions. The ICT-AT skills of parents and families were considered important as well.

In the Living Labs in Italy where the new technology was presented to stakeholders, the robots were not seen as "educators", but as "mediators" between the teacher/clinician and the user (in our case children with intellectual disability). In this view, robots are considered potentially useful tools in improving the outcome of the educational and clinical interventions. It is therefore

fundamental to improve the digital skills of those involved in the education and care of children with disabilities if we want to adopt new technologies in current educational and care activities.

The developers of ICT& ICT-AT estimated that the field will develop towards more user-friendly models of interaction and that the future technology will adapt to humans and not humans to technology. This development would then solve some of the existing demands for ICT and ICT-AT skills and competence among the elderly, their families and service providers.

**The report on the certification methods** revealed that there are some (yet not many) certification methods of ICT/ICT-AT skills acknowledged by the respondents. European computer driving licence (ECDL) was mentioned by several respondents as an example how one could show one's competence in generic ICT-competencies, such as the basic use of a computer, word processing and on-line essentials as well as information on how to use databases or how to create presentations or edit images. In some countries it is possible to accommodate the ECDL exam for persons with disabilities with or without using AT. Most of the other certification methods or certification programs mentioned were conducted by universities or other educational institutes and addressed the ICT-AT competencies of professionals rather than those of PwDs or the elderly. The certification systems that the respondents referred to varied substantially both in content and in extent ranging from certified Bachelor or Master level programs in Assistive Technology to certificates given after a one-week course in ICT-AT.

**Survey results** suggest that learning to use ICT/ICT-AT is not easy for users, and that the lack of ICT competencies among both the PwDs/the elderly and their caregivers restrict the use of technology in their everyday life. More than 80% of the respondents saw that the users develop more self-directed ICT/ICT-AT skills. It was mentioned that peer support models of education and guidance should be strengthened. The users did not expect the language and instructions to assume any previous experience of ICT/ICT-AT as they wanted to be able to train the use of the devices and solutions by themselves. Some respondents emphasized the need for support over time, since the technological development is so rapid that it is difficult to keep pace with it.

Some respondents said that assistive technology devices and solutions are often prescribed at times of stress (e.g. due to decrease in functioning). It is impossible to assimilate information when a person is ill or stressed. Therefore, the timing of education and guidance should be carefully considered. Approximately two out of three respondents thought that there is no official ICT education for the elderly in their country. At the same time the majority of the respondents saw that ICT/ICT-AT skills and knowledge facilitate public involvement of PwDs and the elderly, such as travelling and hobbies or maintaining contact with family members and friends. About 70% of the respondents saw the lack of confident use to be the most important cause for abandoning technology.

It was pointed out that when the supporters or teachers know little about AT or ICT-AT it is literally like “blind leading a blind”. Ninety percent of the respondents supported the idea of training the families in issues concerning ICT and AT. Further education in ICT/ICT-AT skills for the teachers was seen essential by 98% of the respondents. Some respondents noted that ICT is not a part of basic teacher training in their country whereas in some others it is. It was also expressed that ICT/ICT-AT training should be mandatory in teacher education at all levels.<sup>2</sup>

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<sup>2</sup> A full report is available on the ENTELIS website: <http://www.entelis.net/en/node/350>

## Lessons learned and recommendations

Personalised learning is the future learning mode, and it has major importance when considering people with disabilities. The need for special education is increasing and it will set different demands for the learning environment. Inclusive schools and integration challenge the design of schools and learning spaces, and demand adaptability of spaces. The design of these learning spaces and learning models is not created based on the traditional way of thinking concerning education and management, but it demands structural changes (Mattila et al 2010)

The ICT and ICT-AT skills and the competence development of PwDs and the elderly should be part of the digitization strategies to foster the development of education at all levels and enhance the participation and digital inclusion.

The teacher education of all levels should include basic ICT and ICT-AT skills and competence development and the special education of teachers should be developed so that it would support inclusion and use of the most suitable ICT and ICT-AT for learning.

The education of social and health care professionals should include ICT and ICT-AT skills and competence development

- the regulations of professional education should include the demand of skills development

Service providers should have further education on ICT and ICT-AT products and services

- the regulations of professional further education should meet the demands placed by the quality of services provided to people with disabilities or the elderly

The ICT and ICT-AT developers need to involve users, teachers, care professionals, service providers in the development of the existing or new ICT and ICT-AT which support learning and functioning of PwDs and the elderly.

ICT & ICT-AT support need to be offered in the societies to enhance accessibility into the education and digital services which require the ability to use ICT and ICT-AT. There should also exist other service solutions for persons not able to use digital services or digital learning environments.

There should also be some basic principles for ICT-AT learning in the national curricula in the primary and secondary education. Furthermore, lifelong learning of ICT/ICT-AT skills should be ensured for all.

Currently there are four main areas of technology advancement that can help people with disabilities. These areas are: personal support technologies, assisted care systems technologies, virtual technologies, and robotics. (Braddock et al 2004, Mavrou et al 2015.)

#### Personal support technologies in the education

- enhance social interaction in learning
- allow peer support in learning
- allow communication
- allow learning in altered ways
- being advanced they decrease the workload of teachers and education assistants

#### Assisted care systems

- increase the sense of independency in learning and life
- increase task-efficacy in the education
- being more intelligent ICT systems they decrease the load of care givers

#### Virtual technologies

- enable the real life setting resemblance by virtual learning environments and promote the participation of PwDs
- support the learning of the students with cognitive disabilities

#### Assistive robotics

- may offer many possibilities in care and learning
- can be seen as a mediator between the teacher and the learner in the educational setting
- need further development in user-friendliness and usability

## **Guidelines on pedagogical principles to support ICT & ICT- AT learning and competence certification**

On the basis of the outcomes of the activities undertaken the ENTELIS project the consortium recommends the following principles to be taken into account when designing any learning program in ICT-AT and its certification method.

### **Principle 1: The importance of defining personalized learning goals and learning outcomes - Personal Learning Paths**

One of the main conclusions of the work undertaken in the ENTELIS project is that education agencies and other organisations responsible for education planning and provision need to develop or restructure the curricula and education service delivery in order to ensure on an individual basis optimal access to ICT /ICT-AT services, training and devices. In regard to ICT-AT learning (including the basic use of a computer, introduction to the internet etc.), older adults seem to have different learning styles and strategies than the younger generations. They might benefit from simple adaptations of the technology they already use, as well as from the affordability and availability of technology at home (State of Art Report, 14-16). Similarly, the personalisation is important to persons with disabilities, who should have the chance to take full advantage of the digital opportunities to enhance their outcomes in lifelong learning, employment and independence in daily life. The providers of formal and informal education need to do more to improve and extend the supply of high quality learning opportunities aiming at developing digital skills, tailored on the needs of individual adult learners.

### **Principle 2: Accessibility of ICT-AT competence certification programs and examination/assessment procedures for all**

ICT-AT competence certification programs and assessment procedures must be accessible for people with different disabilities or age related impairments. The procedures may need to be adapted differently e.g. for the people with visual impairments in comparison with those with dyslexia or physical disabilities. In compliance with EU Accessibility act, this means that the certification program as such and the examination procedures included in it need to be designed so that they provide all the necessary information via more than one sensory channel. The

instructions must provide alternatives to non-text content and must be understandable and perceivable. Furthermore, alternative ways to control, communicate and navigate in the program or certification exam (such as speech control instead of fine motor control) must be provided.

### **Principle 3: Compliance of ICT-AT certification programs with the UN Convention on the Rights of Persons with Disabilities**

The UN convention on the Rights of Persons with Disabilities (Articles 4 and 9) emphasizes the promotion of the availability of universally designed devices and services needing minimum adaptation to meet the specific needs of a person with disabilities giving priority to technologies at an affordable cost. Furthermore, it underlines the access to information about new technologies and systems, including the Internet, for persons with disabilities. In practice this means providing equal opportunities for all to access digital content and services. These aspects should be in the core of all ICT-AT competence certification programs.

### **Principle 4: Co-Learning involving educators, carers and end-users**

The European Agency for Development in Special Education and UNESCO (2011) have outlined five key propositions in regard to the use of ICTs in education. These are as follows:

- ICT should be considered as a key tool for promoting equity in educational opportunities
- access to appropriate ICTs should be considered an entitlement
- training educational staff in the use of general and specialist ICT must be considered a priority area
- the promotion of ICT research and development requires a multi-stakeholder approach
- data collection and monitoring in the use of ICT in inclusion should be considered an area requiring attention at all levels of educational provision

In addition, the literature review of the ICT4I – project clearly demonstrated the same concerns that we discovered in the Entelis –projects: training the educational staff in the use of general and specialist ICT is one of the major issues that needs to be conducted in the field where we aim to overcome the digital divide in the use of ICT & ICT-AT and to support inclusive education and training. The continuing professional development was also raised into a major role in the development of the teachers' ICT skills.

**Principle 5: The education programs should include the use of web and mainstream technology + AT**

As the amount of e- services necessary for all people, and also particularly important to those with disabilities, is increasing rapidly, the prospective certified educational programs must include the use of Internet. Already now in some countries information about several public services and social benefits can be found in the web and people are encouraged e.g. to fill in applications for benefits or services or to control their finances via Internet. New services and technological applications must be accessible also for people with disabilities to support their independence and participation in the society. Developing mainstream technologies according to the ideas of universal design is plausible, because not only the people with disabilities but all users will benefit from better usability.

It is crucial to include the use of web and mainstream technologies (with minimal adaptations and affordable costs) in the education programs for both the PwDs and their carers and educators. In the certification of the ICT-AT the competence of using internet and internet –based services should be evaluated.

**Principle 6: Adaptive environment to support individual learning** The technology in future needs to be situationally adaptive and in this way support the users’ personal learning strategies. The technology will also be used in efforts to understand one’s own skills, needs and motivation (Kankaanranta 2011). Teachers’ support for each other, administrative support and student support are essential for sustaining the use of technology (Ouston, 2007).

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Entelis Guidelines and recommendations are supported by various other actors and organisations as well as the latest studies in this area.

ENABLE (Network for ICT supported Learning for disabled people) published the principles of good practice, end-user requirements etc., and practical recommendations for good practice in 2014. (Link to [www.enable.eu](http://www.enable.eu)). They already stated that the users’ skills need to be developed and

considered, the users being learners, teachers and other possible users. The demand of personalized education was already pointed out in their recommendation. The Network also listed nine recommendations to educational institutions which could be considered public, private or voluntary organisations. Though their recommendations were more targeted to official public educational institutions, e.g. the demand of a center that supports disable students and consulting associations of PwDs, several recommendations are suitable for every institution, e.g. staff education and the use of standards and regulations of ICT Products and Services (EN 301 549).

There is a general consensus that ICTs play a significant role in ensuring and enhancing learning and life skills among students with special educational needs (Drigas & Ioannidou 2014). The use of ICT has a major role in shaping the knowledge and skills of staff, therapists and special educators. The diagnostic tools (ICT) help them understand the learning differences among children and that the use of ICTs in special education (children with physical and sensory disabilities, learning difficulties, gifted, bilingual) supports children's activities. (Drigas & Kokkalia 2014).

The use of robots and programmable objects can be the tools which will be developed to support young people with special educational needs. The teachers are challenged to use new technologies but they seem to be motivated in their use as the technology is motivating and engaging the young students and as the use of this technology also supports the students' autonomy and creative experiences (Kärnä-Lin et al, 2007).

There is a need in the inclusive education to concentrate on designing approaches and services round the learner, not on the learner's disability as already stated by the report of the ICT4I – project. Moreover, we should keep in mind that there are constantly some people who have the need for accessible technologies to access education and society (European Agency for Development in Special Needs Education and UNESCO IITE, 2011) (available online at: <https://www.european-agency.org/sites/default/files/ICT4I-Research-Literature-Review.pdf>)

**These Guidelines and Implications in to practice will be updated yearly by ENTELIS Network.**

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