e-mentor

SZKOŁA · GŁÓWNA · HANDLOWA · W WARSZAWIE

ICT in education
Lifelong learning
Business and technologies
New trends in management
Teaching methods and programs

An intuitive app generator and accompanying e-learning modules as examples of successful assistive technology

*Magdalena Brzezińska**

Introduction

This paper will begin with two seemingly subversive questions.

In the world where many people without disabilities are not comfortable using new technologies, is there a point of introducing such technologies to people with impairments?

Can a very simple training app and accompanying e-learning material for the trainer be as effective in aiding people with disabilities as advanced assistive technology like screen readers or eye-gaze trackers?

The author of this paper, who was a member of a two-year-long European Union Erasmus+ project named Count Me In Too (CMI2), aimed at people with disabilities (whose main products were a super simple online generator of training apps and a bank of the latter), will try to prove, by providing evidence from general scientific research and studies conducted by partner institutions, that it is in fact justified and effective to equip trainees who have learning difficulties with new technologies, and, in certain specific cases, a very simple training application created in an intuitive and easy-to-use generator can be as beneficial and empowering as advanced AT.

The partners of Count Me In Too project – Teatr Grodzki from Bielsko-Biala, Poland, Eldeberry AB from Sweden, eLearning Studios in Coventry, Great Britain, GAIA Museum – Outsider Art from Randers, Denmark, BEST from Vienna, Austria, and Symbiosis from Miskolc, Hungary – wanted to empower people who are disadvantaged because of disabilities or broadly understood learning difficulties[1].

Importance of e-learning resources

As stressed by Bonk (2016, pp. 6–20), present-day educational leaders should not provide the type of education they themselves used to receive, as nowa-

days it would not be effective. *That would not even get someone a job washing dishes. The real world is far too technologically sophisticated*, states Bonk straightforwardly. This seems to hold true for both learners with and without learning difficulties or deficits.

According to Bonk, who expresses the view of numerous scholars, rather than relying on old-style forms of education, we should take advantage of what the modern world has to offer: technology-enhanced instruction that is less formal and on demand, *sought when and where needed* (see also Song and Bonk, 2016).

Bonk (2016, pp. 8–15) identifies 30 momentous educational changes brought about mainly by the introduction and gradual dissemination of e-learning, and groups them into 3 large categories: learner engagement, pervasive access, and customization. In this paper, special emphasis will be put on learning being more mobile, visual, immersive, digital, adventurous, and (particularly) hands-on (all of these belonging within the learner engagement category); more video-based, immediate, synchronous, and free (the pervasive access category); and finally, more self-directed, competency-based, on demand, modifiable, and personal (the customization category).

Educational and professional situation of people with disabilities in Europe

According to statistics presented in the European Comparative Data on Europe 2020 and People with Disabilities report from December 2013 (Grammenos, 2013, p. 4), in 2011, about 26% persons aged 16+ declared disabilities, 8% of which were severe, and about 18% were moderate. Nearly 47% of persons with disabilities were employed, compared to 72% of persons without disabilities, while the Europe 2020 objective is the employment of 75% of the total adult population. Interestingly, the employment rate of people with a moderate disability (44% for women and

* WSB University in Poznan

[1] To a significant extent, the terms "disabilities" and "learning difficulties" will be used interchangeably in the paper, with the preference of the non-stigmatizing and non-labeling "learning difficulties".

51% for men) was strongly related to the employment rate of non-disabled persons, whereas there was no such correlation between the rates of employment of persons with severe disabilities (28%) and persons without disabilities.

The rate of (un)employment of persons (including ones with disabilities) is correlated with the level – or lack – of education. Eurostat statistics from the year 2017 (Employment Statistics, 2017) state that the employment rate of adults 25+ with primary or lower secondary education was 54.3%. They were also most affected by the crisis: their employment rate *fell 5.1 percentage points between 2007 and 2013, whereas the corresponding number for those with a medium level education was 1.7 pp., and for those with high education 1.8 pp.*.

It is disturbing then to discover from Grammenos's report that 19% of disabled youth in the EU are early school leavers (as opposed to 11% of their non-disabled colleagues). There has been a continuous decrease in this respect (19% in the year 2011 versus 22% in the year 2010); however, what is troubling is that about 21% of disabled adults – compared to 15% of non-disabled ones – are at risk of financial poverty, and 12% (compared to 7%) are living in households which are "severely materially deprived". Also, 37% (compared to 22%) are at risk of social exclusion.

If the percentages do not seem alarming enough, numbers certainly do. According to the Literacy in Europe factsheet of the European Literacy Policy Network project (Literacy in Europe: Facts and Figures, 2015, p. 2), in the year 2013, just the number of adults (16+) with literacy difficulties in Europe equaled 55 million. The editors of the factsheet point to the fact that literacy is "an essential prerequisite for all kinds of learning", and persons with literacy difficulties (as many as 27.9% in Italy, 27.7% in Spain, or 21.7% in France, with a European average of 16.4%) are threatened with unemployment, lower wages, inequality, social exclusion, the feeling of helplessness, health problems, depression, involvement in crime, or a higher death risk. Coincidentally, Grammenos also notes that *the number of young persons with disabilities (…) who have never been in education is relatively high in Spain, Italy and Lithuania* (Grammenos, 2013, p. 89). This may lead to the assumption that the two groups (persons with literacy difficulties and learning deficits and persons with disabilities) overlap, possibly to a significant extent. All these issues not only immediately affect persons with learning or literacy difficulties, but they also have a huge influence on national economies. The editors of the factsheet claim: *Literacy difficulties cost the global economy 1.1 trillion euros each year and the EU economy over 350 billion euros each year (…) due to lost earnings and limited employability, lost business productivity, lost wealth creation opportunities for individuals and businesses, lower technology skills capacity in future, higher spending related to health problems, higher spending on the justice system due to more crime, higher spending on social services and benefits, higher spending on education*

due to students falling behind (Literacy in Europe: Facts and figures, 2015, p. 6).

Thus, there is an economic rationale and justification behind the need to provide persons who have learning difficulties with effective learning tools, and to foster the inclusion of people with disabilities in the education system and job market.

However, there is more. A vital argument that needs to be taken into consideration is what makes our developed European civilization distinct from previous ones and our approach different from those of underdeveloped countries, namely our sensitivity to disabilities, respect for people regardless of their impairments and limitations, and focus on improving the quality of life for everyone, by reducing environmental, social, and attitudinal barriers.

Grammenos's report legitimately emphasizes the European Disability Strategy 2010–2020: *Persons with disabilities have the right to participate fully and equally in society and economy. Denial of equal opportunities is a breach of human rights* (Grammenos, 2013, p. 12).

Therefore, every effort should be made to foster complete and equal participation of persons with learning difficulties in social and economic life, not only for materialistic reasons, but also – more importantly – because of humanitarian ones.

E-learning for persons with disabilities

So far, the importance of online learning resources in 21st century learning and instruction has been established, and the educational and professional situation of people with learning difficulties in Europe (which further influences the economies of whole countries and the overall EU economy, as well as the shape of our societies) has been discussed.

In order to remedy this unfavorable state of affairs, it seems justified to make flexible, on-demand, and personalized e-learning systems accessible to the disabled, bearing in mind that the term "disability" or "learning difficulty" is very broad and can encompass a wide variety of problems and challenges.

In their report, McKnight and Davies (2012, pp. 27–43) distinguish between the following groups of students with learning difficulties:
- individuals with autism and autistic spectrum disorders,
- individuals with dyslexia and literacy difficulties,
- individuals with dyscalculia and numeracy difficulties,
- individuals with ADHD,
- individuals with visual impairments,
- individuals with hearing impairments and deaf learners,
- individuals with mobility impairments,
- individuals with dyspraxia.

As can be anticipated, each of these distinct groups requires a personalized approach, but certain general rules can also be applied to make e-learning content disabled-user-friendly. According to Retova and Polya

(2012, p. 126), these would include, for example, an easy-to-read, comprehensive ("uncluttered"), and consistent display of information, clear references and directions, or providing programs or software supporting assistive technologies already used by persons with learning difficulties. Some features added by Crossland et al. (2016) include adjustment of text colors and backgrounds, changeable color contrast, alterable text size, or captions for videos. The CMI2 partners took all of the above into consideration while creating context-aware assistance tools, including a super-simple generator of training apps, the apps themselves, and e-learning material accompanying the apps, which were further translated into all of the partner languages, including two of the most frequently used European ones, English (38%) and German (11%). In fact, they tried to accomplish what is advertised by Krakower and LePage Plante (2016) or Crossland et al. (2016): they attempted to create a tool that combines assistive technology with differentiated instruction, being aware that customization and personalization allow for significant flexibility and create a framework for student engagement and accomplishment. What the CMI2 partners also strived to achieve by using technology to empower people with disabilities is help persons with impairments and learning difficulties integrate into society and experience independence and equality (Wong, 2016, quoting Stephanie Utzman of Adler's Voice NGO).

Mobile devices in VET training

Mobile devices are more and more frequently used in all aspects of life. Today's smartphones have nearly all the functionalities of stationary devices, and a huge advantage over laptops and desktops: they are portable, handy and convenient (compare McKnight and Davies, op. cit.). In addition to being constantly available, they do not require special space, such as a computer room, which allows learners to use them at their convenience.

Young and MacCormack (2014) indicate that, in completing a task, AT can help learners with disabilities in two distinct ways: by assisting them in accomplishing the task and by helping them to bypass an area of difficulty. This can be more readily done if trainees use convenient and accessible mobile devices.

Kukulska-Hulme (2010, p. 3) adds that mobile devices are particularly beneficial when learning a practical task: they can often be used while performing an activity or practicing a skill. She also discusses additional benefits for learners, some of which are:
- using reasonably-priced technologies
- acquiring skills and knowledge at one's own pace
- a significant degree of desired privacy, or
- applicability to authentic educational needs

Additionally, her Mobile Learning Policy Brief stresses the fact that e-learning and mobile learning strongly foster lifelong learning. *Over time, students become more able to take responsibility and the habits of lifelong learning can take root. This is facilitated by mobile access to social networks that can support a person's learning goals and career development over a lifetime* (Kukulska-Hulme, 2010).

A huge advantage of this type of education is also that it is non-judgmental (compare to Stetter and Hughes, 2010, pp. 1–16), which may not be the case for human-delivered training, especially in the classroom setting. This, in turn, may be crucial for students with learning-related anxiety, learned helplessness, and a history of academic failure, and it can reduce their dependence on the teacher/instructor (see Young and MacCormack, 2014).

Origination of the Count Me In Too (CMI2) Erasmus+ project

In the year 2015, partners from Elderberry AB, Hägersten, Sweden, Teatr Grodzki, Bielsko-Biala, Poland, eLearning Studios, Coventry, Great Britain, GAIA Museum of Outsider Art, Randers, Denmark, BEST Institut für berufsbezogene Weiterbildung und Personaltraining GmbH, Vienna, Austria, and Symbiosis Foundation, Miskolc, Hungary launched an Erasmus+ EU project for people with disabilities/learning difficulties within the lifelong learning framework. The project was built on a previous initiative of several European partners (GAIA Museum Outsider Art, Foreningsfællesskabet Ligeværd from Denmark, Elderberry AB, eLearning Studios, The Herbert Museum from Great Britain, Autism Europe from Belgium, and Debajo del Sombrero from Spain) called Count Me In and focused on Vocational Education and Training (VET) for special needs groups through the arts and cultural sector.

The partners of the new initiative decided that the two with the most significant expertise and know-how in the domain of e-learning and relevant technologies, i.e., eLearning Studios and Elderberry AB, should focus on developing a simple, intuitive tool for the creation of text-based apps and on elaborating e-learning modules to be incorporated into existing VET courses. The remaining partners concentrated on the creation of diverse, personalized applications for mobile devices to facilitate the learning processes of trainees with learning difficulties, to give them more independence and self-confidence (compare Hayes, 2013).

Simple training apps

The theoretical foundation for the creation of all partner applications was built by two partners: eLearning Studios, who brought in their IT expertise and who *aim to design eLearning solutions that excite, delight and work for the modern learner* (eLearning Studios), and Elderberry AB, who had had a long tradition of offering teacher training courses and publishing educational materials and handbooks. Both partners stressed the importance of having a particular user and his/her specific needs in view.

Thus, the first stage of app creation was a very accurate and specific determination of the beneficiary and his/her deficiencies and requirements. Upon clearly defining the user and his/her needs, a storyboard of the application was created. This was necessary to make the product effective, tailor-made, and practical. It also allowed app designers to revise the whole process, sometimes so well-known and intuitive that it obscured the possible difficulties a disadvantaged user might have.

It was at this stage that the makers needed to specify the form of application contents. They had to decide whether their users needed a collection of short videos with a soundtrack/voiceover, and if so, what the props, background, commentary, and length of the videos should be.

Another app option was a collection of photos or other illustrations with accompanying text. In this case, it was vital to determine how to make the photos clearly depict the process, and how to format the text.

At the beginning of the project, the developers of the app generator conducted a very detailed survey, which proved that organizations and educational institutions aimed at persons with learning difficulties usually found the following 5 fonts the most effective:

- Arial,
- Times New Roman,
- Verdana,
- Calibri,
- Georgia.

That is why these fonts were employed in the Count Me In 2 generator and each individual app designer was to decide which one would be suitable for his/her target users. It was also possible to select font size and color, color palette, and button and background color, to make a numbered or bulleted list, or to use up to 4 checkboxes to force the trainee to consciously go through the training process and its stages.[2]

Another option a designer could make use of was sound. Instead of or in addition to uploading videos or pictures and inserting text, it was possible to upload a pre-recorded audio file to each screen, or even to record a file immediately within the generator to voice-describe the desired process, if necessary.

The generator was frequently tested, and certain problems were detected. One problem was the slow upload of relatively large video files, which sometimes resulted in a timeout when saving a content-rich application. Another problem was the initial impossibility of editing pictures uploaded to the generator. eLearning Studios' developers successfully solved the issues and remedied other undesirable limitations

of the tool. After an in-depth discussion with other CMI2 partners, they also decided that instead of the initially envisioned video that would explain how the app generator should be used, a built-in step-by-step tutorial would be created to help the users while they build an application. Another useful functionality added was one of assigning users to the developed app. It was thought to be particularly useful when the trainer wanted to make sure that the users for whom the app was created will get a direct link and be able to download the application to their device.

The mobile applications created by Teatr Grodzki

The first application created in the eLearning Studios-designed generator, and the first application created by the Polish Partner, Teatr Grodzki – "Making Paper Puppets" – was aimed at participants of puppetry and storytelling workshops offered by Teatr, in particular ones taught by Instructor Maria Schejbal.

Firstly, the puppet making process and its stages were carefully examined and studied. Then, a storyboard was created. Next, a short instructional video was filmed, with Maria showing the process of paper puppet creation step-by-step. It was decided that the app would be most effective if only the instructor's hands were filmed, and the necessary materials and subsequent stages of puppet creation were shown against a non-distracting, black background. The next stage was a professional recording of a voiceover in Polish and English. Finally, the voiceover and subtitles were added to the video (two separate language versions of the video were produced).[3]

The stage following the creation of the video was cutting it into manageable chunks to make it comprehensible and easy to follow for learners with learning difficulties. A mobile application was then gradually created online, in the eLearning-Studios-developed generator.

Once ready, the application was presented and advertised online (e.g., on Facebook, Twitter, LinkedIn, or on partner websites), and during EU-funded partner meetings related to other Teatr Grodzki projects, e.g., in Rethymno, Greece, or Palermo, Italy, as well as during workshops taught by Teatr Grodzki. It received very positive reviews, and users stressed its potential and usefulness, and the versatility of the generator, which, users stated, appealed to both visual and auditory learners, and to trainees with various types of learning problems.

At present, the app is used during drama and storytelling workshops taught by Teatr Grodzki instructors. It is considered an interesting and valuable teaching

---

[2] eLearning Studios consulted with the partners about the functionalities at each stage of creation and testing of the generator, and it was agreed that the text should be brief to be clear and understood, hence the limit on the number of checkboxes.

[3] The video can be viewed on YouTube in English at https://www.youtube.com/watch?v=gbFYQTQ0NpU, and in Polish at https://www.youtube.com/watch?v=iyF4TzKXYZ0.

aid that the participants can also refer to outside the course.

The second application for mobile devices created by Teatr Grodzki, "How to Bind a Book",[4] was especially designed for Teatr's Printing and Bookbinding House, which employs 40 adults with special needs and 16 members of staff. The House aims not only to generate profit, but most importantly to assist the employees in social rehabilitation and help them integrate into society.

New employees of the House begin their on-site training by familiarizing themselves with the bookbinding process, which is quite complex and frequently re-taught. It was therefore assumed that the application would be a useful, timesaving tool that would alleviate part of the training burden from the instructor. It was also assumed that the application could allow the learner to be more independent, as s/he could re-view and re-examine the process at his/her own pace.

The application to be created was to help the users make and bind a book in a skillful way, with only limited assistance. Since the process is not only about teaching craft and niche skills, but also about improving fine motor skills, increasing the employees' autonomy and fostering their self-confidence and self-esteem, the social aspect of creation was fundamental.

The basis for this particular app was an extensive interview conducted by the Polish Count Me In 2 partner with several employees of the House, who listed the tools and materials needed and explained the bookbinding process in significant detail. They also agreed to take an active part in the creation. A professional photographer was commissioned, and an on-site photo-shoot took place, with Printing and Bookbinding House employees as actors.

The major problem encountered was complexity of the process itself, which turned out to be much more difficult than initially predicted. Even though an interview with the manager of the House was conducted, and the responses to user questionnaires all proved that the application met everyone's expectations, and therefore it has been used in the House ever since its creation, the authors are considering breaking the process up and creating several shorter applications instead of one long one.

Encouraging feedback regarding the application was received in an interview with Ms. Beata Moskała, the Bookbinding and Printing House Product Manager. It was learned that the app significantly aided instructors at Bookbinding House. For example, when an employee of the House used the How to Bind a Book app, the instructor was able to provide more assistance to other trainees, which obviously made the instructor's job more efficient. The independence aspect was enhanced by the fact that, with the help of the app, it was even possible for employees of the House to make and bind a book outside of the professional setting, as certain substitutes for tools and materials (listed in the app) made it feasible.

Count Me In 2 free educational resources

The partners of the project created 11 training apps in English, with accompanying e-learning material aimed at vocational education and training professionals, trainers, and employers of people with learning difficulties. Eight partner-created apps, selected by each organization according to the beneficiaries' particular needs, were translated into national languages; they constitute a bank of educational resources[5] to be followed or adapted by interested users.

E-learning modules, supplementing the applications and providing explanations for how to use a given app and/or create a new one, which are already incorporated into the existing Elderberry AB courses for educators of persons with special needs, can be accessed at the Count Me In Too platform[6] at http://cmi2elearning.eu.

Each module consists of the following parts:
- Introduction,
- Task Description,
- Process Description,
- Learning Objectives,
- Conclusion,
- Links,
- Documents and Videos.

In the Introduction, VET educators can find information on the entity that created the specific application, its target group, and the reason for creating a particular app. In the next module, the task taught through the app is explained. Then, the whole process is described. It is followed by ECVET[7]-inspired learning outcomes (including knowledge acquired, skills acquired, and competences acquired), and a conclusion. The links, documents, and videos uploaded to the Open Educational Resource platform constitute an addendum to and an extension of the e-learning module content.

CMI2 Partners believe that the app generator, the created applications, and the e-learning modules they built will serve as inspiration for teachers, trainers, managers, and supervisors worldwide, facilitating VET training and other types of e-learning, both for learners with disabilities and those without.

The tools have been widely and successfully tested with over 300 non-disabled and disabled learners during workshops in Denmark, Hungary, and Poland. To assess the project, the partners conducted an impact

---

[4] Retrieved from https://www.cmi2.eu/en-gb/app_generator/app/129/.
[5] Retrieved from https://www.cmi2.eu/en-gb/apps/.
[6] Retrieved from http://cmi2elearning.eu.
[7] European Credit system for Vocational Education and Training.

study focused on effectiveness, impact, relevance, and progress factors. Three types of questionnaires designed by project partners were used to collect feedback from three groups: the project partners themselves, VET educators, and users with disabilities. The partners were to provide feedback, not only on their own experience, but also on the local and national impact of the project.

In all, 6 partner questionnaires, 33 VET professional questionnaires, and 26 questionnaires completed by users with learning difficulties were collected. The findings were as follows: the project was evaluated as having a very high impact in terms of using CMI2 results in the partners' own organizations; new knowledge was gained; and the reputation and image of partner organizations were enhanced.

The survey results showed that final users included organizations within the social sector, disability sector, education sector, art sector, and public and private service sectors, which proved that the CMI2 project results were applicable to a much wider variety of contexts than the partners initially assumed.

The results of final analysis, as compared to the mid-term one, showed that the impact of the project was greater in all the listed areas:

- impact on policy and regulatory environments at the European level,
- impact on policy and regulatory environments at national levels,
- enhanced social inclusion,
- enhanced cohesion,
- enhanced social welfare,
- enhanced level of scientific and technological knowledge.

As regards the opinions of vocational education professionals, 33 feedback forms were collected: 9 from Elderberry AB, 8 from Teatr Grodzki, 6 from GAIA, 5 from BEST, and 5 from Symbiosis. The profiles of respondents varied, which provided the opportunity for a relatively objective assessment of potential impact of the project on various groups of professionals. Thirty respondents represented the education and training sector. Ten represented social services, and 7 represented the arts and culture sector. Eight organizations were governmental, 8 were focused on business, 12 were non-profit, and 4 were independent. Their beneficiaries varied too. They ranged from children and young people to elderly people. They also included people with disabilities, persons of particular ethnic or racial origins, etc.

Eleven respondents viewed the usability of CMI2 educational resources as very high and eighteen of them viewed the usability as high. When asked to what degree CMI2 resources supply people with disabilities with skills needed in the labor market, 10 respondents said that the level was very high, and 18 said it was high. Twenty-three respondents saw the difference made in their services by CMI2 educational resources as varying from rather high to tremendous, especially with respect to motivating and engaging students, being efficient, easy to use, tailored to the needs of a particular user, and practical. It was stressed that workers became more independent while performing tasks. Educators pointed to the fact that CMI2 products could be easily incorporated into their existing training programs. Among the few weaknesses listed, the most underlined one was the need for users' relative proficiency in using a smartphone or a tablet.

Essential feedback came from users with disabilities, who were the most important target group of the project. It was vital for the partnership to determine the direction of possible further development of the project, and it provided vocational education professionals with immediate suggestions for changes and improvement of the materials they created. Of the 26 questionnaires collected, 11 were submitted by Teatr Grodzki. An overall analysis showed that 81% of the respondents used a CMI2 app every day – and of those who did, 80% did not need any help with it. This proved that the tools developed by the partnership were appropriate for the target group. Fifteen respondents viewed the apps as very useful, and 11 viewed them as useful. Ten of them liked learning with CMI2 apps very much, and 16 liked them quite a lot. Thirteen users thought that the app was very successful in saving their time; 12 saw it as successful, and only one person thought it was not helpful in this respect.

Some additional comments of the users are provided below:

- "a very practical instrument",
- "The app is useful. It depends on who is using it. When you learn how to make a paper bag for the first time, usually another person works better than the app. But when you want to remind yourself how to make such a bag, of course the app is very useful",
- "An app is ideal for people who have problems with focusing on a task, and also for those who have problems with acquiring knowledge",
- "A great app generator. Easy to use, useful in professional life, for learning, and for fun."

Conclusions

The author of this paper – a member of the Count Me In Too project, which created a simple and intuitive online generator of training apps and a diverse collection of apps for people with disabilities and learning difficulties – has attempted to demonstrate that it is reasonable and effective to provide learners who have disabilities and learning difficulties with adequate new technologies to facilitate their learning process. By providing evidence from general and partner research, she also endeavored to prove that, in specific instances, a tailor-made training application created in an uncomplicated and easy-to-use, yet refined and deliberately designed, app generator can be as valuable and advantageous as sophisticated AT. What makes it so valuable is the practical and carefully developed generator itself, as much as the sophisticated, yet simple and concise, e-learning modules.

All products created by the partners are shared as open source; Teatr Grodzki, eLearning Studios, Eldeberry AB, GAIA Museum Outsider Art, BEST, and Symbiosis have advertised and promoted them during multiplier events, such as partner meetings, trainings, workshops, and conferences, to make VET educators aware of their existence and value.

Present-day European societies and job markets are gradually opening up to those who have so far been disadvantaged and unable to fully participate in their structures. CMI2 partners decided to go one step further and actually equip people who have broadly understood learning difficulties with custom-made IT tools to assist them and contribute to their personal and professional success.

References

Bonk, C.J. (2016). Keynote: What is the State of E-learning? Reflections on 30 Ways Learning is Changing. *Journal of Open, Flexible and Distance Learning*, *20*(2), 6–20.

Bonk, C.J. (2017). The Fourth Industrial Revolution Meets the Fourth E-Learning Revolution. *Immersive Learning Research Network Proceedings*, 3–4. Retrieved from: http://castor.tugraz.at/doku/iLRN2017/iLRN-2017paper03.pdf.

Crossland, A., Gray, T., Reynolds, J., Wellington, D., Zhou, A. (2016). *Digital Accessibility Toolkit. What Education Leaders Need to Know*. American Institutes for Research.

Europeans and Their Languages Report (2012). European Commission. Retrieved from: http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_386_en.pdf.

Employment Statistics (2017). EUROSTAT. Retrieved from: http://ec.europa.eu/eurostat/statistics-explained/index.php/Employment_statistics.

Grammenos, S. (2013). *European Comparative Data on Europe 2020 & People with Disabilities*. Centre for European Social and Economic Policy (CESEP ASBL). Retrieved from: http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1569&context=gladnetcollect.

Hayes, H.B. (2013). How Technology is Helping Special-Needs Students Excel. *EdTech Magazine*. Retrieved from: https://edtechmagazine.com/k12/article/2013/03/how-technology-helping-special-needs-students-excel.

Lefever, R., Currant, B. (2010). *How Can Technology Be Used to Improve the Learner Experience at Points of Transition? Review of peer reviewed academic literature, national and international resources and examples of projects and initiatives within higher education institutions literature*. Bradford: University of Bradford.

Literacy in Europe: Facts and figures (2015). *ELINET*. Retrieved from: http://www.eli-net.eu/fileadmin/ELINET/Redaktion/Factsheet-Literacy_in_Europe-A4.pdf.

Krakower, B., LePage Plante, S. (2016). *Using Technology to Engage Students with Learning Disabilities*. Thousand Oaks: A SAGE Company.

Kukulska-Hulme, A. (2010). *Mobile Learning for Quality Education and Social Inclusion*. Retrieved from: http://iite.unesco.org/pics/publications/en/files/3214679.pdf.

McKnight, L., Davies, Ch. (2012). *Current Perspectives on Assistive Learning Technologies*. Oxford: University of Oxford.

Retova, J., Polya, A. (2012). The Accessibility of E-learning Systems for Disabled. *Studia Commercialia Bratislaviensa*, Vol. 5, 17(1), 124–130.

Song, D., Bonk, C. (2016). Motivational factors in self-directed informal learning from online learning resources. *Cogent Education*, Vol. 3, Issue 1. Retrieved from: http://www.tandfonline.com/doi/full/10.1080/2331186X.2016.1205838?scroll=top&needAccess=true.

Stetter, M.E., Hughes, M.T. (2010). Computer-assisted instruction to enhance the reading comprehension of struggling readers: A review of the literature. *Journal of Special Education Technology*, *25*(4), 1–16.

Wong, W. (2016). Nonprofits Use Technology to Empower People with Disabilities. *BizTech Magazine*. Retrieved from: https://biztechmagazine.com/article/2016/09/nonprofits-use-technology-empower-people-disabilities.

Young, G., MacCormack, J. (2014). *Assistive Technology for Students with Learning Disabilities*. Retrieved from: https://www.ldatschool.ca/assistive-technology/.

Abstract

In this article, the author, who was a member of the Erasmus+ Count Me In Too project, endeavors to demonstrate that the assistive technology developed within the project provides effective context-aware assistance for people with learning difficulties, for whom the project was aimed. She discusses in detail the intuitive app generator created by eLearning Studios (Coventry, Great Britain), 2 (of 11) training apps designed by Teatr Grodzki (Bielsko-Biala, Poland), and the e-learning modules supplementing the apps, with theoretical foundation laid by Eldeberry AB (Hägersten, Sweden).

The author shows how personalized IT tools facilitate education and improve job performance of people with disabilities, thus helping them achieve personal and professional success. The partners were, among others, motivated by the fact that European societies and job markets are gradually becoming more inclusive towards people with disabilities.

The tools were successfully tested with over 300 learners in Denmark, Hungary, and Poland, and assessed by the project partners and vocational education and training specialists. The research proved that the tools, translated into national languages and forming a bank of educational resources to be followed or adapted by interested users, may inspire teachers, managers, and supervisors, and facilitate vocational training and other types of e-learning.

Keywords: assistive technology, app generator, training apps, e-learning modules, context-aware assistance