



Special Education Teacher's professional development through digital storytelling

Desarrollo profesional de maestros de educación especial a través de la narración digital

- ID** Ozgur Yasar-Akyar. Research Assistant, Dep. of Physical Education and Sports Teaching, Hacettepe University, Ankara (Turkey) (ozguryasar@hacettepe.edu.tr) (<https://orcid.org/0000-0002-9658-8392>)
- ID** Cinthia Rosa-Feliz. Research Assis., Dep. of Science, Tech., and Innov., Federico Henríquez y Carvajal Uni., S. Domingo (Dominican Rep.) (cinthia.delarosa@ufhec.edu.do) (<https://orcid.org/0000-0002-9696-4132>)
- ID** Dr. Solomon Sunday-Oyelere. Assis. Professor, Dep. of Comp. Science, Electrical and Space Engineering, Luleå Uni. of Technology (Sweden) (solomon.oyelere@ltu.se) (<https://orcid.org/0000-0001-9895-6796>)
- ID** Dr. Darwin Muñoz. Professor, Dep. of Science, Tech., and Innovation, Federico Henríquez y Carvajal Uni., S. Domingo (Dominican Republic) (dmunoz@ufhec.edu.do) (<https://orcid.org/0000-0003-4691-2614>)
- ID** Dr. Gıyasettin Demirhan. Professor, Dep. of Physical Education and Sports Teaching, Hacettepe University, Ankara (Turkey) (demirhan@hacettepe.edu.tr) (<https://orcid.org/0000-0002-5370-2036>)

ABSTRACT

This research presents the results of an exploration of special education teachers' understanding of how their participation in workshop-based digital storytelling (DST) would enhance their professional development concerning inclusive education. This study evaluates the usability of the Smart Ecosystem for Learning and Inclusion (SELI) platform for supporting teachers during the workshop-based digital storytelling process. We used a convergent parallel mixed-method research design approach with 47 secondary school teachers working with disabled people in the Dominican Republic. The results of this study indicated that the SELI smart learning platform had shown good usability in supporting teachers during the workshop-based digital storytelling pedagogical process. Besides, two themes emerge regarding how workshop-based digital storytelling can contribute to teacher professional development for promoting inclusive education. The resulting themes are expressing, listening, and learning through digital storytelling; and driving change with digital storytelling to create more inclusive environments. Teachers who participated in the interviews were optimistic about DST implementation. They expressed that the workshop worked for multiple ways of expression, listening from and connecting with other stories, and learning through DST. Teachers could reflect their idea about using DST in terms of its potential impact on inclusion in the classrooms for driving change, building meaningful learning, and influential practice when used in the classroom.

RESUMEN

Este artículo presenta los resultados de un estudio exploratorio de la forma en que los maestros de educación especial comprenden que las narrativas digitales, basadas en talleres, mejorarían el desarrollo profesional en relación con la educación inclusiva. El estudio evalúa la usabilidad de la plataforma Smart Ecosystem for Learning and Inclusion (SELI) para apoyar a los docentes durante el proceso de narración digital basada en talleres. Utilizamos un enfoque de diseño de investigación de método mixto paralelo convergente con 47 profesores de secundaria que trabajan con personas discapacitadas en la República Dominicana. Los resultados de este estudio indicaron que la plataforma de aprendizaje inteligente SELI había demostrado una buena usabilidad para apoyar a los docentes durante el proceso pedagógico de la narración digital basada en talleres. Además, surgen dos temas sobre cómo la narración digital basada en talleres puede contribuir al desarrollo profesional de los docentes para promover la educación inclusiva. Los temas resultantes son la expresión, la escucha y el aprendizaje a través de la narración digital; e impulsar el cambio con la narración digital para crear entornos más inclusivos. Los maestros fueron optimistas respecto a la implementación de narrativas digitales. Los maestros reflexionaron en términos del potencial impacto de las narrativas digitales en inclusión en el aula, como promotoras del cambio, construyendo aprendizaje significativo y promoviendo una práctica influyente.

KEYWORDS | PALABRAS CLAVE

Professional development, teacher training, ICT, inclusive education, digital storytelling, special education. Desarrollo profesional, formación del profesorado, TIC, educación inclusiva, Narración digital, educación especial.



1. Introduction

There has been a long discussion about inclusive education regarding the need to change the assumptions, systems, and procedures in schooling with new ways of thinking and working to support all learners rather than "most and some" (Florian, 2007). A challenging question is how teachers might best be prepared to work better with an increasingly diverse student population. Therefore, continuing professional development opportunities for teachers with a focus on inclusive education is essential. Moreover, innovative training opportunities for mid-career teachers through continuing professional development (CPD) may play a vital role in promoting pro-inclusion changes in education systems (Ba áková & Closs, 2013). Technology-enhanced learning can cover the need for such innovative ways of promoting inclusive education.

Using ICTs for disadvantaged groups to achieve technology-enhanced learning in inclusive education has been an interest of scholars. For example, researchers suggest using ICT-based learning technologies for students with disabilities to support and enable them to access learning (Hersh, 2017; Hersh & Mouroutsou, 2019; Sánchez-Serrano et al., 2020). Moreover, the research highlighted the need for teacher training on ICT use to support students with disabilities (Fernández-Batanero et al., 2019). This study examines the use of digital storytelling (DST) within a smart learning platform for teacher professional development in inclusive education.

In addition, this study reports the outcome of one aspect of the recently finalized international research project called SELI (Smart Ecosystem for Learning and Inclusion). The SELI project aimed to identify the challenges in using ICTs as tools for learning and inclusion and initiating a broad stakeholder dialogue and consultation to screen potential educationally, technical, and business solutions for the challenges (im ek et al., 2021). In this scope, one of the main aspects of the project is the implementation of workshop-based DST for enhancing teacher training through integrating innovative pedagogical practices of using ICTs for inclusive education (Akyar et al., 2020; Tomczyk et al., 2020).

Hwang (2014) highlighted that knowing more about learners' learning performances and perceptions is valuable research for developing more effective smart learning environments. Moreover, a recent study reported a need to investigate the views and perceptions of teachers on smart learning technologies (Li & Wong, 2021). Based on this previous research, the present study advances the field by exploring how special education teachers' participation in workshop-based DST through the innovative learning platform supports professional development in inclusive education in the Dominican Republic. We acknowledge the need to know more about the technologies used to support teachers' continuing professional development based on teachers' actual experiences in the context of inclusive education. In line with this need, we adopted a mixed-methods approach to understanding teachers' perceptions better. In particular, the study focused on the following research questions (RQs):

- RQ 1: To what extent do teachers find the SELI smart learning platform usable?
- RQ 2: How can workshop-based DST be used as an educational strategy for teacher professional development in inclusive education?

Although DST for teacher education in the context of inclusive education can provide a creative showcase for teachers, the literature is scarce regarding delivering continuing professional development of teachers to enhance teachers' use of ICT for inclusive education. Mainly there is a lack of research on understanding the impact of DST to support continuing professional development of teachers based on the actual experiences of teachers in the context of inclusive education. This article aims to address the gap in the literature by exploring special education teachers' understanding of how their participation in workshop-based DST through the SELI smart learning platform supports professional development in the context of inclusive education.

2. Materials and methods

2.1. Research design

In this study, we used a convergent parallel mixed-method design. According to Creswell and Clark (2011), a convergent parallel mixed-method design entails that the researcher concurrently conducts the quantitative and qualitative elements in the same phase of the research process. We have chosen an

embedded mixed-method design to understand the results of our intervention with teachers using the SELI smart learning platform by incorporating perspectives of participant views within the context of inclusive education. After the workshop, we surveyed for quantitative analysis for usability of the platform and a case study as qualitative research to understand how workshop-based DST can contribute to teacher professional development as an educational strategy for inclusive education.

2.2. Participants

A total of 47 special education teachers who volunteered to attend the Dominican Republic workshop between 22-24 January 2020 comprised the participants in the present study. Participants were secondary school teachers working with students with hearing disabilities in special education schools. These teachers consisted of 38 females and nine males in their mid-career (5 to 15 years' experience). In addition, within the qualitative part of the research, three female and one male volunteer participated in the study. Then we had face-to-face semi-structured interviews with a total of four special education teachers.

2.3. Data collection tools

We collected quantitative and qualitative data after the workshop through two data collection tools. As a quantitative data collection tool, we administered the USE questionnaire developed by Lund (2001) with the author's permission to understand the general overview usability of the SELI smart learning platform. The USE questionnaire comprises four dimensions; including usefulness, ease of use, ease of learning, and satisfaction, on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) with one (N/A) option. Native Spanish speakers among the authors translated questionnaires based on scale adaptation suggestions (Dantas et al., 2017). The USE questionnaire is a widely used, valid, and reliable tool for assessing self-perceived usability in different cultural settings. Studies that examined psychometric properties of the USE questionnaire reported that it is a valid and reliable instrument (Gao et al., 2018). In addition, we looked at Cronbach's alpha values to test reliability in order to ensure that the questionnaire provided stable and consistent results by using SPSS 21.0. The instrument is reliable as the Cronbach's alpha's cutoff value is at least 0.7 (Landauer, 1997). According to Table 1, all construct items (usefulness, ease of use, ease of learning, and satisfaction) had a value greater than 0.7. Thus, Cronbach's alpha values show good values for all constructs of the USE questionnaire.

Table 1. USE questionnaire reliability examination		
Variables	Cronbach's Alpha	N of Items
Usefulness	.795	8
Ease of Use	.886	11
Ease of Learning	.940	4
Satisfaction	.830	7

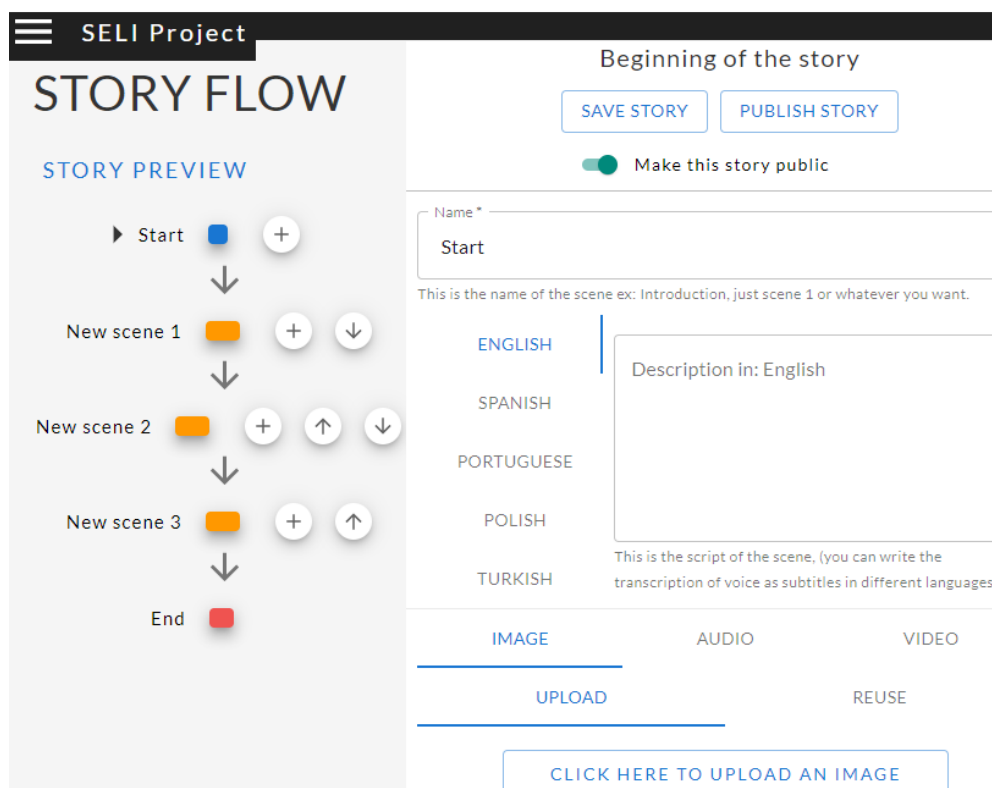
The second data collection tool was qualitative and based on the DST process. The research team created it to explore teachers' experiences in the DST workshop process as one of the tools offered by the SELI smart learning platform. The questions aimed at insights of participants based on their experiences in workshop-based DST, including feelings about one's personal story, the process of creation and sharing, DST role for personal/professional change, watching others' stories.

2.4. Procedure

We worked with the teachers to understand their experience of creating digital stories through the SELI smart learning platform. A lead facilitator who is a certified DST facilitator joined the workshop online and shared the background regarding workshop-based practices adopted by Lambert and Hassler (2018). Later, we created small groups among teachers, including a co-facilitator in each group. All the groups involved a maximum of 8 teacher participants. During this workshop, teachers first listened to the online facilitator's story projected in the workshop room. Then teachers told their stories face to face in the story circle. After that, teachers continued digital processes through a DST tool in the SELI smart learning platform. The SELI smart learning platform allowed functionalities of using DST as well as accessibility module. Details of the open-source application are reachable in the open-source project platform. Co-facilitators focused on listening to the participants. Co-facilitators lead six phases of the workshop within the

groups. Story circle was the first phase that aimed at establishing trust by telling inclusion-related personal stories in small groups. There were participants with hearing disabilities, however, and a sign language interpreter could express personal stories to them. The second phase was text writing as a dialogic stage where participants wrote down their text and discussed similarities and differences among their accounts. The third phase of image search allowed participants to use their mobile phones for collecting personal images from WhatsApp or other applications. Some others preferred to search the Internet. The co-facilitators considered the ICT skills of participants and provided help when needed. The fourth phase was for recording the audio throughout the SELI smart learning platform. The fifth phase allowed users to merge image and audio through a storyboard on the SELI smart learning platform. Figure 1 is a screenshot of the storyboard used in the SELI smart learning platform.

Figure 1. View of storyboard in the SELI smart learning platform



The sixth phase was publishing the created stories and sharing final versions of the story, which allowed further discussions before the data collection.

2.5. Data collection and analysis

In this study, we analyzed both quantitative and qualitative data after data collection. Firstly, the research team distributed the printed version of the USE questionnaire (Lund, 2001) to teachers at the end of the workshop process for quantitative data collection. Based on the suggestion of Nielsen (1994), we calculated the mean value of each variable to describe the outcome of the usability measurement. The qualitative collection involved participatory observation and semi-structured interviews because of the nature of the qualitative analysis. We carried out an inductive thematic analysis to code the data without fitting it into a pre-existing coding frame explained by Braun and Clarke (2006). We then gathered data in an online document.

As facilitators of the workshop, we collected observational data regarding the implementation of the process and participants' attitudes. At the end of the workshop, we conducted semi-structured interviews.

Open-ended questions of the interview were oriented toward the process of the DST workshop (Lambert & Hessler, 2018). The university ethical commission provided ethical approval, and participants gave informed consent throughout the SELI smart learning platform to participate in the study. We made constant comparisons of data within the research team through online collaborative documents and video conference discussions. Codes with example quotes from data analysis are provided in the Appendix.

3. Results

This paper focuses primarily on special education teachers' understanding of how their participation in workshop-based DST through the SELI smart learning platform supports professional development in the context of inclusive education. Besides, the study explores the usability of the SELI smart learning platform and teachers' perceptions of using workshop-based DST for inclusive education. We present our findings according to two research questions based on quantitative and qualitative results.

3.1. Usability of SELI learning platform

The first research question focuses on the usability of the SELI smart learning platform. We identified the usability of the SELI smart learning platform used in the workshop based on the data analysis. The mean scores for usefulness, ease of use, ease of learning, and satisfaction in the current study are 6.61, 6.07, 5.90, 6.40 on a seven-point Likert scale (Table 2). The scores converted from the mean for usefulness, ease of use, ease of learning, and satisfaction are 94.43, 86.71, 84.29, and 91.43, respectively.

Variables	Mean Score	0-100 Score
Usefulness	6.61	94.43
Ease of Use	6.07	86.71
Ease of Learning	5.90	84.29
Satisfaction	6.40	91.43
Average Score	6.25	89.60

Based on these results, the SELI smart learning platform has shown good usability. The high results of usefulness, ease of use, ease of learning, and satisfaction prove that the users accept the SELI smart learning platform.

3.2. Workshop-based DST as a way of enjoyment for driving change for inclusive education

The second research question focuses on the use of workshop-based DST for inclusive education. Data analysis resulted in overarching themes as (a) enjoyment of expressing, listening, and learning through DST and (b) "Driving change" with DST to being "able to create more inclusive environments."

3.2.1. Enjoyment of expressing, listening, and learning through DST

In analyzing the responses from interviews with teachers regarding the workshop-based DST process, findings revealed the contribution of DST when used for the professional development of teachers in the context of inclusive education. All the teachers were optimistic about the DST implementation. More specifically, teachers highlighted three aspects regarding how DST workshops worked for (a) Multiple ways of expression, (b) Listening from and connecting with other stories, and (c) Learning through DST.

Notably, most of the teachers shared their appreciation about the DST process they were able "to express ideas" (P1), "never participated in a workshop like this before" (P2), "to see how to relate what I like and don't like" (P3), to "learn new things and refine them" (P4) when reflecting about the process of workshop-based DST. For instance, P1, who is a mid-career female teacher, explained how DST allows expressing ideas and feelings in multiple ways: "Sometimes it is not easy to understand or express ideas, but in that way, it is possible to understand how to deliver the message you want to achieve. It was interesting because you can express ideas, not necessarily textually. My story was completely conceptual, but working with images and audio enables people to understand the feelings in the story. I liked that other people felt identified with it, accepted the message. ...I wouldn't change the story as it was extremely open to get the message across and get people to identify with the story." (P1)

Not only sharing stories but also listening to and connecting with other stories was also highlighted by teachers. A male teacher stated: "I identified with the story of the little black bean, where the person

felt discriminated because of the color of their skin, and over time you learn that it wasn't a disability but just things of life." (P2) Besides personal stories, work-related stories allowed us to build connections for teachers by listening to and learning from colleagues. A female teacher stated: "I identified myself with the story of inclusion, as this is what I experience every day in my center." (P4) These personal and professional stories made P3 connect with stories and construct her understanding of inclusion: "I like to see how to relate what I like and don't like and to understand the stories of inclusion. I identified with my CONADIS colleagues' stories. I could see how the work environment is part of our daily knowledge. As everyone tells and listens to a story, a person can see the disparity that exists in society." (P3)

Teachers could also learn something related to inclusive education throughout stories by identifying themselves with others' stories as a surprisingly educational experience "how something simple leads you to find great learning." (P1) Teachers participating in the DST workshop connected to each other through diverse stories, which opened various understandings in a comfortable atmosphere. Engagement in telling and listening to stories served to negotiate different points and diverse definitions of inclusion: "Well, it was interesting to hear and see others' perspectives and see how the word inclusion is defined in different ways, which allowed me to add a plus to my previous knowledge. I felt comfortable, and I found it easy." (P3)

Moreover, conversation through stories enhanced professional engagement for mutually extending knowledge as "It helped me to learn new things and refine them. I was able to see the development very well, where good tools were used, and we had excellent facilitators." (P4) Besides storytelling benefits, the digital aspect of DST is rarely mentioned by teachers as P2 shared when discussing the DST workshop process, "Yes, I'd've never participated in a workshop like this before. the new technologies for education nourished me."

3.2.2. Driving change with DST to create more inclusive environments

As a result of participation in the workshop-based DST, teachers could reflect on their idea about using DST in terms of its potential impact on "inclusion in the classrooms," "driving change," "building meaningful learning," and finding it as "influential" when used in the classroom. Two aspects are highlighted as (a) DST for an inclusive learning process and (b) Increasing awareness through stories. Most of the teachers highlighted DST as providing an inclusive learning process. Participating in DST embodied interest in increasing their professional competencies by becoming aware of knowledge deficits. Trust built during the story circle allowed teachers a space where they could share obligations without feeling deficient, "I learned that it is easy for me to tell a story to promote a learning process for the children" (P3). Ultimately, the DST workshop facilitated a safe environment in which participants got inspired to improve their practices. When asked about the meaning of her story, P4 connected it with topics that must be considered to ensure the quality of teaching and learning. "My story is related to what we do, what we want to do, and to be able to differentiate what is integration with inclusion, to guarantee a quality of teaching and learning. I learned I must handle ICTs better to have them as accessible tools." (P4)

The value of DST for the learning process is emphasized by teachers not only focusing on its digital dimension but also creating an interactive, social, collaborative environment. DST workshop practice provided a space for constructing collective knowledge and professional growth that teachers thought could be transferred to the classroom. The teachers' wish to transfer what they learned in the workshop to the classroom setting was clear when P2 spoke about her commitment to contributing to education: "I have learned that it is necessary to give more from ourselves to continue helping and contributing to education so that the classes are interactive and generate an environment of collective knowledge construction. I understand that (DST) was very good for inclusion in the classrooms, as it allows the classes to be more dynamic and interactive for students with different disabilities. I learned about new technologies that can be applied in the classroom to innovate lessons." (P2)

It is possible to associate the inclusiveness of DST with the diversity of formats, with content provided as both audio and visual. The strength of multimodal communication and the ability to spread content through digital stories made teachers feel empowered to innovate. P1 shared the motivation to drive change with DST: "it (DST) is an audiovisual content, many people with disabilities can learn from this

kind of tool to achieve meaningful learning.... I can now drive change since now I know a new tool, which I can work not only in person, but I can make content to be observed by various people in the world... (I learned) that we have many tools available to transform traditional education processes and introduce them in our campuses where students can integrate and positively see the learning process." (P1)

Teachers found the workshop-based DST process inclusive. In addition, digital stories as a product are considered helpful in improving inclusion. Most of the teacher's saw the potential of stories to increase awareness about inclusion. Indeed, there was an unmistakable sense of inclusion in all the stories as the DST workshop built around the context of inclusion. For example, P1 highlighted the need for accepting each other and getting united in diversity when asked about the meaning of her story, "the (meaning of my story) is that we are all special in one way or another, so we must all accept and understand each other to break down barriers for diversity, no matter what special circumstances or conditions exist, it is all a matter of the mind" (P1).

Teachers considered personal examples in stories related to exclusion cases to increase awareness about inclusion. When asked whether she considers changing the story and the meaning of her story, P2 stated: "I wouldn't change it (my story) since I suffered bullying against my personality many times... and I would like more people to know about my story and become aware... so that people don't try to bully disabled people. My story reflects how one person's lack of knowledge about a disability can denigrate another person. It (DST) allows us to use our example as a strategy for learning through DST, and the testimony will serve as a model for others. I enjoyed giving a message from my perspective of how it is the most direct inclusion to help students with disabilities." (P2)

Similarly, P4 was also happy about her story as it is, since the report highlights the uniqueness of every person and increasing awareness about this to achieve inclusion: "It is very influential because it shows that there are no barriers for students to feel included. ... I would not change it because I like the one I use, and I do not see any problem with it. (My story) ... makes it clear that each person is different, and if we are aware of this, we will create more inclusive environments. ...I must be open to change, and acknowledge that the process and handling of ICTs are important, to use them with people who have disabilities, and I must handle ICTs better." (P4)

However, keeping the story as it is being not always the case because there are multiple stories one might tell in the context of inclusion, "Yes, I would change it because there are many stories to tell and much global information" (P3). Diversity of stories can also be considered an essential characteristic that allows participants to increase awareness about inclusive education. While these teachers realized the DST workshop process and product as a story, significant commitment shaped their motivation to "drive change" with DST to be "able to create more inclusive environments."

4. Discussion and conclusions

4.1. Discussion

Acknowledging short-term educational workshops is an essential part of continuing professional development. Our study explored special education teachers' perceptions about implementing workshop-based DST as an educational strategy through the SELI project. The study provides significant findings regarding the usability of the SELI smart learning platform and an in-depth understanding of the workshop in the context of inclusive education. Teachers in this study evaluated the usability of the SELI smart learning platform well in all dimensions of the USE Questionnaire. Although this workshop included only limited use of the SELI smart learning platform, involving DST in a short period that lacks extended user experience, these results are significant as the first usability results of the SELI smart learning platform. Some other studies that have assessed the usability of educational systems reported similar good usability results (Faria et al., 2016; Filippidis & Tsoukalas, 2009; Lattie et al., 2017; Hariyanto et al., 2020).

Teachers valued workshop-based DST to allow enjoyment for expressing, listening, and learning. This finding is similar to the result of the research conducted by Park (2019), which aimed to identify experiences of graduate students in a program for Teaching English to Speakers of Other Languages (TESOL) when completing DST. DST facilitated the participants' dialogic hybrid learning, which Park (2019) defines as learning via traditional and technologically assisted methods with internal and external dialogic interactions.

Participants explained dialogic interaction as "I like to see how to relate what I like and don't like and to understand the stories of inclusion. ...I identified with the stories of my colleagues" (P3) and "how something simple leads you to find great learning" (P1). Similarly, the results of another short teacher professional development study offer optimistic insights regarding the effectiveness of dialogic teaching and learning practice (Rapanta et al., 2021). Therefore, dialogue towards DST can foster an inclusive dialogic stance among teachers.

Participants enjoyed sharing their stories, and they felt motivated and empowered when listening to the stories of others. This finding is similar to the result of another study that aimed to examine the effect of the DST process on the digital literacy skills of pre-service teachers and examine the creation process in detail (Çetin, 2021). Çetin (2021) reported that pre-service teachers found digital story creation makes a course fun and attractive as it increases participation, motivation, interaction and provides better learning and permanence. Differently from previous studies that had an emphasis on the improvement of digital literacy skills (Ranieri & Bruni, 2018; Çetin, 2021) through DST, in this study, teachers perceived DST as a way of using "new technologies for education" (P2) to "have in hand and thus be able to adapt it to the context of the students" (P8). The findings of the present study are in line with the studies reported use of DST in inclusive methodologies as an instrument of constructive and experiential learning based on the diversity of each student (Kouvara et al., 2019) and a way of starting up different learning channels (Albano & Iacono, 2019).

Moreover, in this study, we implemented DST with teachers who work with students with hearing disabilities. Therefore, inclusive education was the main topic of the DST workshop, which aimed to provide learning opportunities through teachers' stories. Similarly, DST is also applied in a different context of students as a strategy for children's and adolescents' self-expression, particularly immersed in unequal and ethnically diverse educational contexts (Valdivia, 2017). Although the Covid 19 circumstances revealed inequalities in access to education caused by access to technology and online delivery, where teaching approaches may not always address the student voice with an appreciation of their culture (Isteni, 2021), DST can be a solution for teachers learning to make sense of inclusive education. Apart from this technical or technological aspect, implementing workshop-based DST facilitates the value of listening, as it provides multiple ways of expression, which allows connecting with other stories in a specific topic such as inclusion. Therefore, teachers valued DST beyond improving digital skills to learn from each other in the context of inclusion. As facilitators of the workshop, we experienced using DST flexibly by implementing workshops with two participant teachers with hearing disabilities. During the implementation of the DST workshop, participants had a collaboration in terms of interpreting sign language. Facilitators in small groups joined the conversation in an equal participation principle. This dialogue allowed a collaborative, co-creative learning environment between participants and facilitators. Creating such learning environments and co-creative habits gains importance for both students and educators (Tomczyk et al., 2019). In addition, digital story creation was not limited to only one-way communication and focused on sharing experiences that provided multimodal communication, including at least one of text, audio, and visual elements.

Teachers expressed open curiosity about each others' stories by "identifying" themselves with the stories of inclusion related to their work contexts. Sharing stories allowed collaboration with and learning from peers throughout sharing stories of inclusion which provided an endless opportunity for teachers to align technology with meaningful context for learning which can be called a meaningful technology-integrated approach (Sadik, 2008). Therefore, the DST workshop provided an inclusive example for teachers to use in their setting. For example, P1 highlighted "DST as an audiovisual content which many people with disabilities can learn to build meaningful learning. I can now drive change since now I know a new tool."

A previous study reported that reforms have failed to significantly improve access to regular schools and classes for students with a disability (De-Bruin, 2019). However, the teachers in the present study look for new ways to change traditional practices. Therefore, workshop-based DST can provide a promising approach for improving inclusive education. Several other studies highlighted DST as being a source for social change in different areas such as women's participation (Imek, 2012; Hlalele & Brexa, 2015), teaching to Children with hearing disabilities (Flórez-Aristizábal et al., 2019). Like these studies, teachers in this study considered DST to drive change in the context of teacher education as it promotes "inclusion

in the classrooms,” “building,” meaningful learning” when used in the classroom. The participants in the study did not have any experience in using DST; therefore, a step-by-step DST workshop process was implemented. Participants joined a story circle where they listened to facilitators’ stories and had dialogic interactions about their inclusive education experiences. Unlike studies which focus on acquiring digital competencies by the teacher or the student through DST implementation, workshop-based DST adopted in this study may contribute to the development of teachers’ emotional intelligence as it “was interesting to hear and see the different points of the others”, thereby establishing enhanced professional development in inclusive education. For teachers to be effective co-agents, they need “the capacity to act purposefully and constructively to direct their professional growth and contribute to the growth of their students and colleagues” (Calvert, 2016). To achieve this, teachers need continuing professional development in designing learning environments that support student agency. The present findings show that workshop-based DST can be an engaging, inclusive approach to achieving meaningful learning outcomes to contribute professional development of teachers for promoting inclusive education.

4.2. Conclusion and suggestions

This study provides the first usability results of the SELI smart learning platform. Further studies which focus on the usability of the SELI Learning platform might give detailed information for validation of results. To achieve sustainability in inclusive education, Vanderpuye et al. (2020) call for intensive staff training and continuing professional development to sufficiently prepare teachers for inclusive education. Our example of using DST to enhance teachers’ professional development demonstrates the benefits of sharing stories for reflecting and understanding inclusion through diverse stories from the Dominican Republic. We experienced a case of inclusion through the inclusion of two participant teachers with hearing disabilities in the DST workshop. This experience provided learning from diverse stories and provided a practical example of implementation for participants and facilitators.

When facilitating DST workshops, there are restrictions and risks as facilitators need to be confident with the process and technologies to help solve technical problems and support participants through ethical issues. Much can be solved initially through good preparation and setting specific ground rules and by actively promoting dialogic mechanisms such as story circles and digital processes like sound and image merging. The SELI smart platform fosters the inclusion of disabled people through DST by facilitating participation in ICT-enhanced learning. In addition, ICT use for inclusive education should be considered beyond disability research and focus on quality education for all students with diverse backgrounds.

Workshop-based DST goes beyond the dominant discourses and initiatives of digital inclusion, focusing mainly on the use and acquisition of digital devices and digital competence development. Nevertheless, workshop-based DST was one of the strategies of the SELI project to allow different levels of communication among teachers, technology experts, and teacher educators to use the potential of digital technologies to trigger a transformation in education. We used workshop-based DST as an educational strategy to understand and use digital technologies in teachers’ professional development with an active, respectful, and critical perspective. Teachers can experience inclusive ways of using ICT-based technologies to transfer inclusive competencies to their classroom settings. This practice allowed listening differences among various levels of stakeholders for promoting inclusive education.

Authors’ Contribution

Idea, O.Y.A., C. R, S.S.O., D.M., G.D.; Literature review (state of the art), O.Y.A., C.R, S.S.O.; Methodology, O.Y.A., C.R, S.S.O., D.M., G.D.; Data analysis, O.Y.A., C. R, D.M.; Results, O.Y.A., C. R, S.S.O, G.D.; Discussion and conclusions, O.Y.A., C.R, S.S.O., D.M., G.D.; Writing (original draft), O.Y.A., C. R, S.S.O.; Final revisions, O.Y.A., D.M., G.D.; Project design and funding agency, O.Y.A., C.R, S.S.O., D.M., G.D.

Funding Agency

This work was supported by the ERANET-LAC project which has received funding from the European Union’s Seventh Framework Programme. The project entitled Smart Ecosystem for Learning and Inclusion (SELI)– with number ERANet17/ICT-0076 was also supported by the Scientific and Technological Research Council of Turkey (118K447) with the project number and Ministerio de Educacion Superior, Ciencia y Tecnologia, MESCyT.

References

- Akyar, O.Y., Demirhan, G., Oyelere, S.S., Flores, M., & Jauregui, V.C. (2020). Digital storytelling in teacher education for inclusion. In A. Rocha, H. Adeli, L. Reis, S. Costanzo, I. Orovic, & F. Moreira (Eds.), *Trends and Innovations in Information Systems and Technologies. World Conference on Information Systems and Technologies* (pp. 367-376). Springer. https://doi.org/10.1007/978-3-030-45697-9_36
- Albano, G., & Iacono, U.D. (2019). Designing digital storytelling for mathematics special education: An experience in support teacher education. *The Mathematics Enthusiast*, 16(1), 263-288. <https://bit.ly/399uYj3>
- Bacakova, M., & Closs, A. (2013). Continuing professional development (CPD) as a means to reducing barriers to inclusive education: Research study of the education of refugee children in the Czech Republic. *European Journal of Special Needs Education*, 28(2), 203-216. <https://doi.org/10.1080/08856257.2013.778108>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Calvert, L. (2016). *Moving from compliance to agency: What teachers need to make professional learning work*. Learning Forward and NCTAF. <https://bit.ly/2VDvqTR>
- Çetin, E. (2021). Digital storytelling in teacher education and its effect on the digital literacy of pre-service teachers. *Thinking Skills and Creativity*, 39, 100760. <https://doi.org/10.1016/j.tsc.2020.100760>
- Creswell, J.W., & Clark, V.L.P. (2011). *Designing and conducting mixed methods research*. SAGE. <https://bit.ly/3ymZPom>
- Dantas, C., Jegundo, A.L., Quintas, J., Martins, A.I., Queirós, A., & Rocha, N.P. (2017). European portuguese validation of usefulness, satisfaction and ease of use questionnaire (USE). In A. Rocha, A. Correia, H. Adeli, L. Reis, & S. Costanzo (Eds.), *Recent advances and ease of use questionnaire (USE)* (pp. 561-570). World Conference on Information Systems and Technologies. Springer. https://doi.org/10.1007/978-3-319-56538-5_57
- De-Bruin, K. (2019). The impact of inclusive education reforms on students with disability: an international comparison. *International Journal of Inclusive Education*, 23(7-8), 811-826.
- Faria, T.V.M., Pavanelli, M., & Bernardes, J.L. (2016). Evaluating the usability using USE questionnaire: Mindboard system use case. In P. Zaphiris, & A. Ioannou (Eds.), *Learning and Collaboration Technologies* (pp. 518-527). Springer. https://doi.org/10.1007/978-3-319-39483-1_47
- Fernández-Batanero, J.M., Cabero, J., & López, E. (2019). Knowledge and degree of training of primary education teachers in relation to ICT taught to students with disabilities. *British Journal of Educational Technology*, 50(4), 1961-1978. <https://doi.org/10.1111/bjet.12675>
- Filippidis, S.K., & Tsoukalas, I.A. (2009). On the use of adaptive instructional images based on the sequential-global dimension of the Felder-Silverman learning style theory. *Interactive Learning Environments*, 17(2), 135-150. <https://doi.org/10.1080/10494820701869524>
- Flórez-Aristizábal, L., Cano, S., Collazos, C.A., Benavides, F., Moreira, F., & Fardoun, H.M. (2019). Digital transformation to support literacy teaching to deaf children: From storytelling to digital interactive storytelling. *Telematics and Informatics*, 38, 87-99. <https://doi.org/10.1016/j.tele.2018.09.002>
- Florian, L. (2007). Reimagining special education. In L. Florian (Ed.), *The SAGE handbook of special education* (pp. 1-4). SAGE. <https://doi.org/10.4135/9781848607989.n2>
- Gao, M., Kortum, P., & Oswald, F. (2018). Psychometric evaluation of the use (usefulness, satisfaction, and ease of use) questionnaire for reliability and validity. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 62, 1414-1418. <https://doi.org/10.1177/1541931218621322>
- Hariyanto, D., Triyono, M.B., & Köhler, T. (2020). Usability evaluation of personalized adaptive e-learning system using USE questionnaire. *Knowledge Management & E-Learning: An International Journal*, 12(1), 85-105. <https://doi.org/10.34105/j.kmel.2020.12.005>
- Hersh, M. (2017). Classification framework for ICT-based learning technologies for disabled people. *British Journal of Educational Technology*, 48(3), 768-788. <https://doi.org/10.1111/bjet.12461>
- Hersh, M., & Mouroutsou, S. (2019). Learning technology and disability-Overcoming barriers to inclusion: Evidence from a multicountry study. *British Journal of Educational Technology*, 50(6), 3329-3344. <https://doi.org/10.1111/bjet.12737>
- Hlalele, D., & Brexa, J. (2015). Challenging the narrative of gender socialisation: Digital storytelling as an engaged methodology for the empowerment of girls and young women. *Agenda*, 29(3), 79-88. <https://doi.org/10.1080/10130950.2015.1073439>
- Hwang, G.J. (2014). Definition, framework and research issues of smart learning environments-a context-aware ubiquitous learning perspective. *Smart Learning Environments*, 1(4), 1-14. <https://doi.org/10.1186/s40561-014-0004-5>
- Istemic, A. (2021). Shifting to digital during COVID-19: Are teachers empowered to give voice to students? *Educational Technology Research and Development*, 69, 43-46. <https://doi.org/10.1080/0022027980280601>
- Kouvara, T.K., Karasoula, S.A., Karachristos, C.V., Stavropoulos, E.C., & Verykios, V.S. (2019). Technology and school unit improvement: Researching, reconsidering and reconstructing the school context through a multi-thematic digital storytelling project. *Social Sciences*, 8(2), 49-49. <https://doi.org/10.3390/socsci8020049>
- Lambert, J., & Hessler, B. (2018). *Digital storytelling: Capturing lives, creating community*. Routledge. <https://doi.org/10.4324/9781351266369>
- Landauer, T.K. (1997). Behavioral research methods in human-computer interaction. In M. G. Helander, T. K. Landauer, & P. V. Prabhu (Eds.), *Handbook of human-computer interaction* (pp. 203-227). Elsevier. <https://doi.org/10.1016/B978-044481862-1.50075-3>

- Lattie, E.G., Duffecy, J.L., Mohr, D.C., & Kashima, K. (2017). Development and evaluation of an online mental health program for medical students. *Academic Psychiatry*, (5), 642-645. <https://doi.org/10.1007/s40596-017-0726-0>
- Li, K.C., & Wong, B.T.M. (2021). Review of smart learning: Patterns and trends in research and practice. *Australasian Journal of Educational Technology*, 37(2), 189-204. <https://doi.org/10.14742/ajet.6617>
- Lund, A.M. (2001). Measuring usability with the use questionnaire12. *Usability Interface*, 8(2), 3-6. <https://bit.ly/3GL5Jmi>
- Nielsen, J. (1994). Enhancing the explanatory power of usability heuristics. In *Proc. ACM CHI'94 Conf.* (pp. 152-158). <https://doi.org/10.1145/259963.260333>
- Park, H.R. (2019). ESOL pre-service teachers' experiences and learning in completing a reflection paper and digital storytelling. *Australasian Journal of Educational Technology*, 35(4). <https://doi.org/10.14742/ajet.4117>
- Ranieri, M., & Bruni, I. (2018). Digital and media literacy in teacher education: Preparing undergraduate teachers through an academic program on digital storytelling. In *Handbook of Research on Media Literacy in Higher Education Environments* (pp. 90-111). IGI Global. <https://doi.org/10.4018/978-1-5225-4059-5.ch006>
- Rapanta, C., Garcia-Mila, M., Remesal, A., & Gonçalves, C. (2021). The challenge of inclusive dialogic teaching in public secondary school. [El reto de la enseñanza dialógica inclusiva en la escuela pública secundaria]. *Comunicar*, 66, 9-20. <https://doi.org/10.3916/C66-2021-02>
- Sadik, A. (2008). Digital storytelling: A meaningful technology-integrated approach for engaged student learning. *Educational Technology Research and Development*, 56(4), 487-506. <https://doi.org/10.1007/s11423-008-9091-8>
- Sánchez-Serrano, J.L.S., Jaén-Martínez, A., Montenegro-Rueda, M., & Fernández-Cerero, J. (2009). Impact of the information and communication technologies on students with disabilities. A systematic review. *Sustainability*, 12(20). <https://doi.org/10.3390/su12208603>
- Simsek, B. (2012). Enhancing women's participation in Turkey through digital storytelling. *Journal of Cultural Science*, 5(2), 28-46. <https://doi.org/10.5334/csci.45>
- Simsek, B., Akyar, O.Y., Oyelere, S.S., & Demirhan, G. (2021). *Reflections on inclusion and ICT in the context of smart ecosystem for learning and inclusion project*. Hacettepe University. <https://bit.ly/3DV3KtD>
- Tomczyk, L., Jáuregui, V.C., Amato, C., Muñoz, D., Arteaga, M., Oyelere, S.S., Akyar, O.Y., & Porta, M. (2020). Are teachers techno-optimists or techno-pessimists? A pilot comparative among teachers in Bolivia, Brazil, the Dominican Republic, Ecuador, Finland, Poland, Turkey, and Uruguay. *Education and Information Technologies*, 26, 2715-2741. <https://doi.org/10.1007/s10639-020-10380-4>
- Tomczyk, L., Oyelere, S.S., Puentes, A., Sanchez-Castillo, G., Muñoz, D., Simsek, B., Akyar, O.Y., & Demirhan, G. (2019). Flipped learning, digital storytelling as the new solutions in adult education and school pedagogy. *Adult Education 2018-Transformation in the Era of Digitization and Artificial Intelligence*, (pp. 69-83). <https://bit.ly/3DN0tMW>
- Valdivia, A. (2017). What was out of the frame? A dialogic look at youth media production in a cultural diversity and educational context in Chile. *Learning, Media and Technology*, 42, 112-125. <https://doi.org/10.1080/17439884.2016.1160926>
- Vanderpuye, I., Obosu, G.K., & Nishimuko, M. (2020). Sustainability of inclusive education in Ghana: Teachers' attitude, perception of resources needed and perception of possible impact on pupils. *International Journal of Inclusive Education*, 24(14), 1527-1539. <https://doi.org/10.1080/13603116.2018.1544299>