Developing Teachers' Competences for Designing Inclusive Learning Experiences

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ABSTRACT

Inclusive education, namely the process of providing all learners with equal educational opportunities, is a major challenge for many educational systems worldwide. In order to address this issue, a widely used framework has been developed, namely the Universal Design for Learning (UDL), which aims to provide specific educational design guidelines to ensure accessibility of all learner types to the learning environment. On the other hand, nowadays teachers are provided with ample opportunities for freely accessing a wide number of Open Educational Resources (OERs) that are available through existing OER initiatives. Within this context and following the UDL principles, teachers are expected to be able to select and transform and/or augment, OERs to fit their learners' diverse needs towards delivering inclusive learning experiences. This calls for developing specific teachers' competences that are aligned with existing competence frameworks such as the Competence Framework for Inclusive Teachers (CFIT) towards effectively engaging them in the aforementioned process. To this end, the scope of this paper is to present the design, implementation and evaluation of a teacher professional development program (PDP) aligned with CFIT for designing inclusive OERs by applying the UDL principles. The evaluation results of the teacher PDP demonstrated its added value for developing teachers' competences towards designing inclusive learning experiences for their students.

Keywords

Inclusive learning, Inclusive education, Universal design for learning, Teacher training, Teacher professional development, Competence framework, Inclusive teacher

Introduction

Inclusive education has been the focus and a major challenge for many educational systems worldwide (Srivastava et al., 2015). Inclusive education aims to ensure that learners with diverse needs and preferences (such as learners with disabilities) can have equal opportunities in accessing learning resources, services and experiences in general (Florian & Linklater, 2010). Therefore, inclusive education can reduce inequalities and increase the competences of all people, independently from their diverse needs and preferences, leading to increased innovation and productivity and, subsequently, to long-term economic viability (Hanushek & Woessmann, 2010; UNESCO, 2005).

In order to support inclusive education, specific educational design frameworks have been proposed such as Differentiated Instruction (Tomlinson & McTighe, 2006) and the Universal Design for Learning (UDL) (Meyer et al., 2014; CAST, 2014; Rose & Meyer, 2002). These frameworks recognize the broad diversity of learners with respect to ability, language, culture, gender, age and other forms of human difference and they provide specific educational design guidelines to ensure accessibility of all learner types to the learning environment. UDL has been recognized as the mostly used framework for the design and development of curricula that is effective and inclusive for all learners (Hall et al., 2012).

At the same time, teachers are provided with ample opportunities for freely accessing a wide number of Open Educational Resources (OERs) that are available through existing OER initiatives developed by large organizations/institutions such as UNESCO OER Community, Open Education Europa, Carnegie Mellon Open Learning Initiative, MIT's OpenCourseWare, Stanford's iTunes and Rice University's Connexions or by communities/consortia such as MERLOT and OER Commons (Zervas et al., 2014a; Conole, 2013; UNESCO, 2012). Within this context, teachers are expected to be able to select and appropriately transform and/or augment (following the UDL principles), OERs to fit their learners' diverse needs towards delivering inclusive learning experiences (Treviranus et al., 2014). This calls for developing specific teachers' competences towards effectively engaging them in the aforementioned process. The essential competences that are needed in order for a teacher to be considered as

"*inclusive*" have been identified in the Competence Framework for Inclusive Teachers (CFIT), which has been developed by a major European initiative namely "The Teacher Education for Inclusion (TE4I)" (Watkins & Donnelly, 2013). As a result, teacher professional development programmes that aim to train teachers in the process of designing inclusive learning experiences should be aligned with CFIT.

The main goal of this paper is to present the design, implementation and evaluation of a teacher professional development program (PDP) aligned with the CFIT, for designing inclusive OERs by applying the UDL principles. The proposed teacher PDP has been developed in the context of a European initiative, namely the Inclusive Learning Project (Zervas et al., 2014b). The results from the evaluation of the teacher PDP demonstrated its added value for developing teachers' competences towards designing inclusive learning experiences for their students.

The remainder of the paper is organized as follows: following this introduction, the background section provides an overview of UDL and its main principles, as well as an overview of the CFIT framework and its main competence areas. The next section presents and discusses existing teacher professional development programmes on inclusive education, in order to identify their limitations in terms of scope and appropriately inform the scope of the proposed teacher PDP. Afterwards, we present our proposed teacher PDP and more specifically the delivery method adopted, the training modules developed and how they are aligned with CFIT, as well as the assessment method selected. Then, we present the methodology that was followed for evaluating the proposed teacher PDP. The next section presents and discusses the evaluation results from the implementation of proposed teacher PDP. Finally, we discuss our main conclusions and our future work in this agenda.

Background

Universal Design for Learning (UDL)

UDL has been developed by the Centre for Applied Special Technology (CAST) as a framework of lesson planning that helps teachers to create lessons that are inclusive for a broad range of learners in their classrooms (CAST, 2014). UDL involves the proactive application of educational design concepts, pedagogical knowledge and technology to create learning experiences that is accessible and engaging to learners with diverse needs (King-Sears, 2009). More specifically, UDL introduces teachers to three principles for overcoming barriers that are particularly presented within a learning environment, namely (Meyer et al., 2014; CAST, 2014; Rose & Meyer, 2002):

- *Representation:* It refers to modifications that can be made to educational resources that would make them accessible to learners with diverse needs. This means that teachers must learn how to present educational resources so that it is not just oral or in print, but so the educational resources is represented through a variety of modalities and methods such as videos, websites, pictures etc.
- *Action and Expression:* It refers to alternative methods of communication for learners with diverse needs. More specifically, UDL requires teachers to provide learners with a variety of options to communicate and demonstrate what they have learnt, so that to move beyond traditional tests and papers to include options, which allow learners to capitalize on their special abilities or talents.
- *Engagement:* It refers to the use of strategies that involve learners with diverse needs in the learning process. More specifically, teachers need to implement different classroom strategies that empower their learners and draw them into the learning by providing choices, reducing anxiety, and rewarding effort.

Along with the three aforementioned principles, the UDL framework, presents 9 guidelines and 33 specific checkpoints under the aforementioned main principles, detailing how to overcome the barriers inherent in most existing curricula and serve as the basis for building in the options and the flexibility that are necessary to maximize learning opportunities for learners with diverse needs (CAST, 2014). Following this overview, it should be mentioned that UDL is a general framework which can be also applied in technology–enhanced learning environments. As a result, UDL has been selected to be the foundation of the proposed teacher PDP.

Competence Framework of Inclusive Teachers (CFIT)

The essential competences that are needed in order for a teacher to be considered as "inclusive" have been proposed by a major European initiative namely "The Teacher Education for Inclusion (TE4I)" (Watkins & Donnelly, 2013).

The TE4I project has involved policy makers (responsible for teacher education and inclusive education), as well as general and specialist teacher trainers from 25 European countries towards identifying a Competence Framework for Inclusive Teachers (CFIT). The overview of this competence framework is presented in Table 1.

Table 1. Competence framework of inclusive teachers (Watkins, 2012)

Core values	Competence areas
1. Valuing Learner Diversity: Learner difference is considered as a resource and an asset to education	1.1 Conceptions of inclusive education 1.2 The teacher's view of learner difference
2. Supporting All Learners: Teachers have high expectations for all learners' achievements.	2.1 Promoting the academic, practical, social and emotional learning of all learners 2.2 Effective teaching approaches in heterogeneous classes
3. Working With Others: collaboration and teamwork are essential approaches for all teachers	3.1 Working with parents and families 3.2 Working with a range of other educational professionals
4. Personal Professional Development: teaching is a learning activity and teachers take responsibility for their lifelong learning.	4.1 Teachers as reflective practitioners 4.2 Initial teacher education as a foundation for ongoing professional learning and development

As the Table 1 depicts, the framework proposed by TE4I was based upon multi-faceted areas of competence linked to agreed core values for inclusive education. Furthermore, each competence area is comprised of three elements, namely a certain attitude, a certain piece of knowledge or level of understanding and the skills in order to implement these in a practical situation (Watkins & Donnelly, 2013). Table 2 presents the number of competences in terms of knowledge, skills and attitudes that underpins each competence area of CFIT.

Table 2. Number of competences underpinning each competence area of CFIT

Competence areas	Description per competence area	# Competences per element	Total competences
1.1 Conceptions of inclusive education	The competences in this area includes understanding that inclusion is based on access to education, participation and educational attainment of all learners	Knowledge: 5 Skill: 6 Attitude: 4	15
1.2 The teacher's view of learner difference	The competences underpinning this area are related to providing value to differences and identify the best ways to respond to diversity	Knowledge: 5 Skill: 5 Attitude: 5	15
2.1 Promoting the academic, practical, social and emotional learning of all learners	The competences in this area include adopting teaching approaches, which encourage social development and interaction among learners	Knowledge: 3 Skill: 8 Attitude: 7	18
2.2 Effective teaching approaches in heterogeneous classes	The competences underpinning this area are related to understanding the process of differentiation of teaching approach and educational resources to address learners preferences and diverse needs	Knowledge: 9 Skill: 13 Attitude: 6	28
3.1 Working with parents and families	The competences underpinning this area are related to the efficient communication with parents and family members of different cultural, ethnic, linguistic and social backgrounds.	Knowledge: 3 Skill: 2 Attitude: 3	8
3.2 Working with a range of other educational professionals	The competences in this area include contributing to wider school partnerships with other schools, community organizations and other educational organizations	Knowledge: 6 Skill:8 Attitude:3	17
4.1 Teachers as reflective practitioners	The competences in this area are related to methods and strategies for evaluating teachers' own work and performance	Knowledge: 5 Skill:3 Attitude:4	12
4.2 Initial teacher education as a foundation for	The competences underpinning this area include understanding time management strategies that	Knowledge: 2 Skill:4	11

ongoing professional learning and development	will accommodate possibilities for pursuing in-service development opportunities	Attitude:5

As we can notice from Table 2, a total number of 124 competences are included in the CFIT. These competences can be used as a guide for the design and implementation of teacher PDPs, namely identifying appropriate training modules that specifically address these competences.

Related work: Existing teacher professional development programmes on inclusive education

A comparative analysis of the characteristics of 13 teacher PDPs on inclusive education has been already presented in Kurniawati et al. (2014). In the context of the present study, we re-visit these 13 teacher PDPs and we present their main scope in terms of teachers' competences addressed (i.e., knowledge, skills and attitudes). The main aim of this meta-review was to identify limitation of their scope and accordingly inform the scope of our proposed teacher PDP.

Table 3. Existing teacher PDPs on inclusive education

No.	Authors	Purpose
1	Allday et al. (2012)	Focus on improving teachers' skills regarding on-task behaviour, task completion and correct academic responses when teaching students with emotional/behavioural disabilities
2	Carroll et al. (2003)	Focus on improving teachers' attitudes regarding the inclusion of students with different disabilities in their classrooms
3	Edwards et al. (2006)	Focus on improving teachers' attitudes and knowledge regarding the inclusion of students with different disabilities in their classrooms
4	Gürsel (2007)	Focus on improving teachers' attitudes regarding the inclusion of students with physical disabilities in their classrooms
5	Leblanc et al. (2009)	Focus on improving teachers' attitudes and knowledge regarding the inclusion of students with autistic spectrum disorder in their classrooms
6	Lieberman & Wilson (2005)	Focus on improving teachers' attitudes regarding the inclusion of students with visual impairment and deaf-blindness in their classrooms
7	Male (2011)	Focus on improving teachers' attitudes regarding the inclusion of students with different disabilities in their classrooms
8	Miller et al. (2000)	Focus on improving teachers' knowledge regarding the inclusion of students with different disabilities in their classrooms
9	Rae et al. (2011)	Focus on improving teacher knowledge and understating regarding the defining criteria of intellectual disability
10	Renshaw et al. (2008)	Focus on improving teachers' knowledge regarding the inclusion of students with behavioural and attention problems in their classrooms
11	Sari (2007)	Focus on improving teachers' knowledge regarding the inclusion of students with hearing impairments in their classrooms
12	Sharma et al. (2008)	Focus on improving teachers' attitudes regarding the inclusion of students with different disabilities in their classrooms
13	Wolery et al. (1997)	Focus on improving teachers' skills regarding their instruction in the classroom towards addressing students with different disabilities

As we can notice from Table 3, most of the teacher PDPs (namely 7 out of 13) focus on developing teacher's competences related to dealing and interacting with students with specific disabilities in the classroom. On the other hand, there are also teacher PDPs (6 out of 13) that focus on developing teacher's competences related to dealing and interacting with students with different disabilities in the classroom. However, none of these teacher PDPs addresses the pedagogical perspective of facilitating teachers to design their lessons, so as to be effective for students with different disabilities in their classrooms. Next, we aim to address this issue in the teacher PDP arena by presenting our proposed teacher PDP that focuses on designing inclusive learning experiences aligned with UDL and CFIT.

Design and development of a teacher professional development program

The proposed teacher PDP has been developed in the context of a European initiative, namely the Inclusive Learning Project (Zervas et al., 2014b) and the target group were teachers and trainers of primary/secondary schools and vocational training institutions. The main objective of the proposed teacher PDP is to facilitate teachers/trainers to design technology-supported inclusive lessons in the form of OERs by following the UDL principles and the ADDIE Educational Design Model (Dick et al., 2005). Next, we describe the delivery method adopted for the proposed teacher PDP, the training modules developed, as well as the assessment method selected.

Delivery method

The proposed teacher PDP was designed in a blended learning modality. The duration of the program is 30 hours, comprising 18 hours of face-to-face learning activities and 12 hours of online learning activities. The online learning activities of the proposed teacher PDP were implemented with the use of a customized version of ATutor (Gay et al., 2009). ATutor is an open source accessible Course Management System (CMS), developed by the Adaptive Technology Resource Centre of the University of Toronto and it has been developed following ISO/IEC Standard 24751 "Individualized Adaptability and Accessibility in e-Learning, Education and Training" (ISO/IEC, 2008a; ISO/IEC, 2008b) and W3C Web Content Accessibility Guidelines 2.0 (Caldwell et al., 2008). To this end, the selected CMS can demonstrate to the participated teachers/trainers how accessibility preferences can be applied in the system towards supporting people with disabilities.

Additionally, ATutor provides access to collaboration tools enabling participating teachers/trainers to easily communicate and collaborate with other teachers for sharing ideas. These tools include a forum, as well as a private messaging tool.

Finally, ATutor provides access to a web content authoring tool, namely TinyMCE (Gay, 2004), which allows teachers to create their own web-based educational resources. TinyMCE has been customized in order to provide with better support when participated teachers/trainers are developing accessible web-based educational resources, by following the W3C Web Content Accessibility Guidelines 2.0. Moreover, TinyMCE has been adapted to integrate a plugin, which uses the AChecker (Gay & Li, 2010) automatic validation service in order to present the participated teachers/trainers with a report of possible errors or warnings about the accessibility of the web-based educational resources that they are developing with TinyMCE (Avila Garzón et al., 2014).

Training modules

Table 4 presents the training modules of the proposed teacher PDP, their mapping to the competence areas of CFIT, as well as the number of CFIT competences addressed per competence area by each training module. This mapping ensures that our proposed teacher PDP is fully aligned with the CFIT. Moreover, as we can notice from Table 4, 47 total competences are addressed by the training modules of the proposed teacher PDP, which constitute the 37.90% of the total CFIT competences. Furthermore, the focus of the proposed teacher PDP specifically addresses competences which were not explicitly aimed at in the existing teacher PDPs.

Table 4. Teacher professional development program training modules

Training modules	Description	Competence areas addressed	Number of competences addressed per competence area
1. Inclusive Education	This module aims to introduce teachers the importance of designing learning experiences for learners with diverse needs. Moreover, it aims to presents policies at national and international level for addressing learners' diversity.	1.1 1.2	3 out of 15 4 out of 15
2. Universal Design for Learning	The purpose of this module is to present to the teachers the concepts related to the UDL, its main principles and guidelines per principle. Moreover, it provides examples of	2.1 2.2 3.1	2 out of 18 2 out of 28 3 out of 8

	successful implementation of the UDL principles.	3.2	5 out of 17
3. Designing Inclusive Lessons as Open Educational Resources (OERs)	This module presents to the teachers the process of designing inclusive lessons in the form of OERs following the ADDIE educational design model (Dick et al., 2005) and the UDL principles	2.1 2.2	2 out of 18 3 out of 28
4. Accessibility of OERs	This module engages teachers in the process of developing accessible OERs following the W3C Web Content Accessibility Guidelines 2.0 and with the use of TinyMCE web content authoring tool	2.1 2.2 4.1 4.2	2 out of 18 4 out of 28 3 out of 12 2 out of 11
5. Validating OERs' Accessibility	This module engages teachers in the process of validating the accessibility and inclusiveness of OERs created in the previous training module	2.1 2.2 4.1 4.2	4 out of 18 5 out of 28 2 out of 12 1 out of 11

Assessment method

The assessment method that was selected for the proposed teacher PDP was the development of a project with intermediate deliverables. More specifically, the participated teachers/trainers are requested to design and develop a technology-supported inclusive lesson as OER by following the UDL principles, as well as the W3C web content accessibility guidelines 2.0.

The technology-supported inclusive lesson is being designed and developed with intermediate deliverables that follow the five (5) phases of the ADDIE educational design model (Dick et al., 2005). Additionally, for the preparation of each intermediate deliverable, the participated teachers/trainers can collaborate by using the collaboration tools offered by ATutor. More precisely, the phases that are followed are summarized below:

- *Analysis Phase:* During this phase, the educational problem of the inclusive lesson is identified and the contextual parameters of the educational environment are analyzed. Moreover, the targeted students' characteristics and their existing competences (knowledge, skills and ideally attitudes too) are defined. The outcome of this phase is two deliverables, namely: (a) a narrative description of the inclusive lesson and (b) a description of the profile of the targeted students following the UDL principles.
- *Design Phase:* During this phase, the educational objectives to be achieved are defined, an appropriate teaching approach for attaining these objectives is selected, and appropriate assessment methods are decided towards evaluating whether and to what extent the educational objectives have been met. Two are also the main deliverables of this phase, namely: (a) description of the teaching approach to be followed, as well as the relevant learning activities and (b) analysis of possible barriers for executing these learning activities and how these barriers can be overcome based on UDL principles.
- *Develop Phase:* During this phase, the development or selection of appropriate educational materials and the arrangement of the delivery setting is performed for the inclusive lesson that has been designed in the previous phase. More specifically, during this phase the participated teachers/trainers prepare the learning activities of their lesson with ATutor and they develop accessible web-based educational resources to support these activities by using the TinyMCE web content authoring tool following the W3C web content accessibility guidelines 2.0. The main outcome of this phase is (a) the inclusive lesson developed in ATutor, along with accessible web-based educational resources and (b) a report describing the process followed for developing the lesson in ATutor.
- *Implement Phase:* During this phase, the technology-supported inclusive lesson is delivered to the targeted students. The main outcome of this phase is a report with the results from the implementation and emphasis on the application of the UDL principles during the delivery of the lesson.
- *Evaluation Phase:* During this phase, an evaluation of the technology-supported inclusive lesson is performed by the students. The outcome of this phase is two deliverables, namely (a) a report with feedback from the students regarding the accessibility of the educational resources used in the lesson and (b) a report with feedback from the students regarding the impact of the UDL principles during the delivery of the lesson.

The first three phases and their accompanying deliverables were prepared by the participating teachers/trainers during the delivery of the PDP, namely within the 30 hours. The deliverables that correspond to the next two phases (namely implementation and evaluation) were prepared by the participating teachers/trainers within one month after the end of the PDP, so as to be able to implement and evaluate their lessons with their students.

Finally, it should be mentioned that the intermediate deliverables per phase were assessed by a group of experts, who provided feedback to the participated teachers/trainers after the assessment of each deliverable. Moreover, each participating teacher/trainer was assigned a score in a range of 0 to 5, based on the submitted deliverables per phase. An overall score in a range of 0 to 5 per participating teacher/trainer was calculated as the average from the individual scores assigned to the five (5) phases of the ADDIE educational design model. Finally, the score was distributed to the following performance levels: (a) inadequate performance [0, 2], (b) adequate performance (2, 3], (c) (3, 4] satisfactory performance and (d) excellent performance (4, 5].

Evaluation method

The scope of the evaluation was to assess the impact of the teacher PDP on the participant's competence development. The PDP was offered in a single run as part of a MSc programme on ICT hosted by the Universidad Pontificia Bolivariana in Colombia between April 2014 to June 2014.

Participants

The evaluation was conducted with $N = 47$ primary and secondary teachers, as well as trainers for initial vocational education. This diversity was important towards ensuring that the proposed teacher PDP can address the particularities of different educational levels. Moreover, 65.96% ($N = 31$) of our sample was female participants, whereas 34.04% ($N = 16$) was male participants. This distribution can be marginally considered as an adequate gender balance in our sample. The majority of the participants were experienced teachers/trainers (69% of the participants had more than 6 years of teaching experience). Furthermore, the majority of the teachers/trainers in our sample were moderately experienced in using ICT for their daily teaching activities (72.34% of the participants). Thus, overall we consider that our sample is well selected for the purpose of our evaluation. Finally, the participants' prior experience in designing inclusive lesson plans were low, as indicated by the pre-test which was conducted as part of the evaluation process (see following section).

Methodology

The participants were divided in three (3) cohorts following the policy of the university, which does not allow more than 20 students to participate to a single run of a training programme. Moreover, in order to equally distribute the participants of our sample based on their demographics to the different cohorts, the distribution presented in Table 5 was decided.

Table 5. Number of participants per cohort

Cohort no.	*N*
Cohort #1	16
Cohort #2	17
Cohort #3	14
Total	47

The methodology used for the evaluation included the following steps, which have been proposed in a similar study by Spooner et al. (2007):
- *Pre-test:* Participating teachers/trainers per cohort were presented with a case study to design in narrative format an inclusive lesson plan with a clear description of how they would use the three principles of UDL to address people with disabilities. Moreover, as aforementioned the pre-test results were used in order to define the participants' prior experience in designing inclusive lesson plans.
- *Post-test:* After the completion of the PDP, a similar case study with the same complexity was presented to the participated teachers/trainers per cohort and they were asked to repeat the process executed during pre-test.

The inclusive lesson plans prepared by the participants were assessed by a group of experts after the pre-test and post-test using the same assessment rubric defined by Spooner et al. (2007) and presented in Table 6. More specifically, the assessment rubric consisted of a 3-point scale and assessed the participants' inclusive lesson plans using the three principles of UDL. There was a maximum number of 6 points available on the rubric. Points were distributed based on three given criteria: (a) 1 points if there was not a clear description of each component, (b) 2 points if one or two modifications were discussed, and (c) 3 points if three or more modifications were discussed.

Table 6. UDL assessment rubric (Spooner et al., 2007)

| UDL principle | Score | | |
	1 point	2 points	3 points
Representation	No clear description of equal access to all students	Introduce one or two options of materials to provide equal access, but needs to be explained more in depth	Introduce three or more options of material to provide equal access to all students; give clear and precise explanations.
Expression	No clear description of providing alternative communication methods for all students	Introduce at least one alternative communication method, but needs to be explained more in depth	Introduce two or more alternative communication methods, gives clear and precise explanations
Engagement	No clear description of strategies to involve or engage all students including those with disabilities	Introduce one or two strategies to involve all students including those with disabilities, but needs to be explained more in depth	Introduce two or more strategies to involve students including those with disabilities, gives clear and precise explanations

Another important indicator for the evaluation of the PDP is the scores achieved by the participants of each cohort to the intermediate deliverables of the project of designing and developing a technology-supported inclusive lesson by following the ADDIE educational design model, as well as the UDL principles and the W3C web content accessibility guidelines 2.0.

Evaluation results

Table 7 presents quantitative data analysis results of the pre-test and post-test scores received by the participated teachers/trainers at each cohort related to the application of UDL principles for designing inclusive lesson plans.

Table 7. Mean scores and standard deviations on the pre-test and post-test for the different cohorts

| | Cohort #1 ($N = 16$) | | | | Cohort #2 ($N = 17$) | | | | Cohort #3 ($N = 14$) | | | |
| | Pre-test | | Post-test | | Pre-test | | Post-test | | Pre-test | | Post-test | |
UDL principles	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Representation	1.06	0.25	2.88	0.34	1.47	0.51	2.94	0.24	1.29	0.47	2.86	0.36
Expression	1	0	2.88	0.34	1.53	0.51	2.82	0.39	1.07	0.27	2.71	0.47
Engagement	1	0	2.88	0.34	1.53	0.51	2.94	0.24	1.07	0.27	2.21	0.43

As we can notice from Table 7, all cohorts demonstrated a considerable amount of growth between pre-test and post-test and this is applicable for all UDL principles. This clearly demonstrates the added value of the proposed teacher PDP in terms of developing teachers' competences in the process of applying UDL principles for designing inclusive lesson plans.

Table 8 presents quantitative data analysis results of the scores achieved by the participating teachers/trainers to the intermediate deliverables per ADDIE phase at each cohort.

As we can notice from Table 8, all cohorts achieved scores within the excellent performance level for all phases of the ADDIE educational design model. This highlights that the proposed teacher PDP can significantly develop teachers' competences for designing, developing implementing and evaluating a technology-supported inclusive

lesson. Additionally, it is worth mentioning that the highest scores have been achieved by participating teachers/trainers of cohort #2. This is aligned with the results of Table 7, which demonstrate the significant growth between pre-test and post-test of Cohort #2.

Table 8. Mean scores and standard deviation on the intermediate deliverables prepared by the different cohorts

Phase	Cohort #1 ($N = 16$)		Cohort #2 ($N = 17$)		Cohort #3 ($N = 14$)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Analysis	4.69	0.48	4.76	0.4	4.36	0.50
Design	4.38	0.50	4.50	0.56	4.21	0.43
Develop	4.13	0.34	4.38	0.41	4.07	0.29
Implement	4.31	0.48	4.71	0.40	4.29	0.47
Evaluate	4.25	0.45	4.50	0.32	4.21	0.43
Total	4.35	0.30	4.57	0.31	4.21	0.23

Finally, we can notice that during the development and evaluation phases the lowest scores were achieved across all cohorts. This can be possibly explained by the fact that these phases require the usage of technical tools (namely, TinyMCE and ATutor) for the development of accessible web-based educational resources, as well as for the evaluation of their accessibility. This process requires technical skills and it might have been tricky for our sample taking into account that they were moderately experienced in using ICT.

Conclusions and future work

Within the landscape of the inclusive education, teachers are recognized as key players in supporting the process of leading to inclusive educational systems. As a result, teachers need to be equipped with appropriate competences for addressing the diverse needs and preferences of their students and providing them with equal educational opportunities. In this paper, we presented the design, implementation and evaluation of a teacher PDP for supporting teachers in the process of designing inclusive learning experiences for their students. The design of the teacher PDP was based on applying UDL principles for designing inclusive OERs. Moreover, the teacher PDP was aligned to support the competences as proposed by CFIT. The evaluation results of the teacher PDP showed that participants demonstrated a considerable amount of growth between pre-test and post-test when designing an inclusive lesson plan. Finally, participants' scores to the assessment activity of the teacher PDP were considerably high and within the excellent performance level. In conclusion, the lessons learnt from this study were that: (a) training on the application of the UDL principles should be associated and contextualized within the phases of the ADDIE model, so as to facilitate more efficiently teachers to design, develop and evaluate inclusive lesson plans for their students and (b) the proficiency level of teachers' ICT competences might affect their performance to the development and evaluation phases of the ADDIE model, namely when developing and evaluating their inclusive lesson plans since these phases require the usage of technical tools (namely, TinyMCE and ATutor) for the development of accessible web-based educational resources, as well as for the evaluation of their accessibility. The results of our study could be useful for PDP designers, in order to design and develop effective teacher PDPs in the area of technology-supported inclusive education, as well as for appropriately implementing them towards achieving increased learning outcomes. Future research will include: (a) semi-structured interviews with the participants in order to gain qualitative feedback and reflections on the proposed teacher PDP's design and delivery and (b) longitudinal studies with the participants of the teacher PDP, so as to analyze the impact of their acquired competences via the teacher PDP to their teaching practice.

Acknowledgements

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