Training Preservice Science Teachers to Teach Inclusively

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Abstract

The United Nations Convention on the Rights of Persons with Disabilities was adopted in 2006. Since its ratification, the educational landscape has rapidly changed because inclusion requires a radical restructuring of mainstream schooling. At the classroom level, adaptations must be made to course materials, teaching approaches, testing, and other aspects of classroom teaching to meet the needs of an increasingly heterogeneous student body. To prepare future teachers to meet the objectives set forth in the United Nations Convention on the Rights of Persons with Disabilities (2006), it is necessary to develop preservice course modules that specifically cultivate sensitivity toward students with disabilities and train preservice teachers in how to adapt their teaching to accommodate students with disabilities or chronic illnesses. This type of training is critically important for preservice science teachers. The idea of inclusive education can be particularly daunting because of the complexity of science topics and the variety of educational activities that would require adaptation (e.g., course materials, experiments, and excursions). This article outlines an online, project-oriented module that effectively increased preservice science teachers' positive views on inclusion and their self-efficacy in terms of accommodating effectively.

Introduction

In 2011, the World Health Organization (WHO) reported that approximately 15% of the world's population live with some form of disability, and around 2–4% of the population 15 years and older have disabilities that cause "significant difficulties in functioning" (p. 29). Persons with disabilities are currently the largest group of minorities in the world (United Nations Department of Economic and Social Affairs: Disability, n.d.), and the number of persons with disabilities continues to increase in part due to changes in demographic trends (WHO, 2021). To address the needs of persons with disabilities, the United Nations Convention on the Rights of Persons with Disabilities (2006) was adopted on December 13, 2006, at the United Nations Headquarters in New York. Article 24 specifically describes inclusive education as the best educational environment for children with disabilities because it helps to break down barriers and challenge stereotypes. It also specifically states that the ratifying state shall ensure that persons with disabilities be included in the general education system and be given the opportunity to participate fully and equally in education and as members of the community (see Article 24, Sections 2 and 3). The *World Report on*

Disability, however, shows that persons with disabilities continue to "experience significantly lower rates of primary school completion and fewer mean years of education" (WHO, 2011, p. 206).

Since the ratification of the United Nations Convention on the Rights of Persons with Disabilities (2006), the inclusion of students with disabilities into regular schools has become one of the most significant goals and challenges facing the education community (Sharma et al., 2008; Woodcock & Woolfson, 2019). In accordance with the convention, inclusion does not conclude with placing students with special education needs (SEN) into mainstream schools; rather, it aims to meet the social and academic needs of students with SEN (Göransson & Nilholm, 2014). The success of restructuring mainstream schooling in order to accommodate students with disabilities relies largely on the actions that teachers perform at the classroom level because teachers are needed to create differentiated curricula and personalized learning approaches that meet different needs and help learners to develop autonomy in their learning (European Agency for Development in Special Needs Education, 2012).

A teacher's attitude toward inclusion will ultimately influence how they implement learning activities in the classroom and how they respond to students (Staub & Stern, 2002) because a positive attitude toward inclusion is believed to accompany a teachers' willingness to make the adjustments necessary to accommodate all students in the context of inclusive education (Lautenbach & Heyder, 2019). Many experts have therefore voiced the opinion that the implementation of inclusion reform often depends largely on the educators' own goodwill and positive attitudes toward inclusion (Avramidis & Norwich, 2002; Krischler & Pit-ten Cate, 2019; Weiner, 2003; Weisel & Dror, 2006).

In addition to positive attitudes toward inclusion, proper preparation plays a key role. Studies have shown that the success of inclusion lies in the successful training of teachers (Alghazo et al., 2003; Cook, 2002; McHatton & Parker, 2013; Saloviita, 2020). Along this same line, the *World Report on Disability* (WHO, 2011) stressed that: "The appropriate training of mainstream teachers is crucial if they are to be confident and competent in teaching children with diverse educational needs" (p. 222).

Despite the central role for teachers in the implementation of inclusive education, preservice teachers still do not feel adequately prepared to meet the challenge (Shippen et al., 2016). Furthermore, classroom teachers often feel overwhelmed by the degree of heterogeneity in the classroom (Markic & Abels, 2014). Thus, teacher educators are now challenged to develop new course programs to prepare teachers to educate a diverse group of learners (Kim, 2011). Regarding teacher training, studies have shown that preservice training may be the optimal time to address educators' concerns and alter any negative attitudes about inclusive education (Sharma et al., 2006). It is therefore imperative that new preservice teacher training modules be developed to specifically focus on how to adapt teaching approaches to accommodate all students.

Science Teacher Training Modules

The success of inclusion depends not only on funding and capacity in schools but also on how well future teachers are prepared to meet the challenge of inclusive teaching (Kramer, 2015). This is particularly important for future science teachers due to the complexity of topics and activities that must now be differentiated to meet the needs of increasingly heterogeneous classes. However, most preservice science teachers receive little to no professional training in inclusive education (Abels, 2017). Therefore, it is necessary to develop new preservice and inservice teacher training opportunities, particularly in those countries that are in the infancy of developing inclusive education strategies. Germany, for example, has a long tradition of teaching students with SEN in segregated, special schools (Miesera et al., 2019), and, even after the ratification of the United Nations Convention on the Rights of Persons with Disabilities (2006), Germany continues to place a relatively small percentage of students with SEN in mainstream classes (Ramberg et al., 2017). In the 2012–2013 school year, for example, only 30% of students with SEN attended mainstream classes in Germany, which is far below the EU average of approximately 50% (Ramberg et al., 2017) and the U.S. rate of 62% in 2014 (McFarland et al., 2017). According to Heyder et al. (2020), Germany represents an ideal location to study factors that impede and foster successful inclusive education. The ongoing transition of the German school system requires a parallel shift in teacher training programs (Miesera et al., 2019). The purpose of this article is to provide international readers with an improved understanding of the challenges facing teachers and teacher trainers in countries where inclusive education systems are still developing.

Despite the clear need to address the inclusion of students with disabilities into science education, only five of the 132 papers published over a 5-year period (2011–2016) focused on equity-related issues in science education dealt with the topic of special education (Kang & Martin, 2018). For that reason, the decision was made to create a unit that specifically looked at the needs of students with SEN to ascertain the need for such courses at the university.

Pilot Study

To address the need for specific preservice teacher training for inclusive science education, a new single 90-minute unit on inclusive science education was integrated into an interdepartmental course, *Angewandte Naturwissenschaftsdidaktik* (Applied Science Didactics), during the winter 2019 semester. This course was obligatory for preservice chemistry teachers but optional for the biology and physics preservice teachers.[1] This difference was reflected in the makeup of the course (15 chemistry education students, one physics education student, and one biology education student).

The 90-minute unit began by asking the preservice teachers two anonymous general questions using MentiMeter to assess their amount of previous coursework on inclusion, their sense of preparedness, and their confidence in their own ability to successfully create inclusive learning environments in their own future courses. Eight of the 15 preservice teachers participated in the survey (*N* = 8). Regarding previous coursework, the results from MentiMeter showed that the preservice teachers had had between 1.5 and 10 hours (*M* = 5.2, *SD* = 3.1) of coursework on inclusion prior to the current module. The second question was to determine how prepared and how confident the preservice teachers felt at the given point in their studies to successfully teach inclusively. Although the results form showed that the preservice teachers unanimously felt that their formal training had not yet adequately prepared them to teach inclusively, despite their perceived lack of formal training, the group was split in their personal assessment of their ability to teach inclusively (see Table 1).

Table 1

Preservice Teachers' Self-Reported Level of Preparedness and Confidence in Teaching Inclusively in the Pilot Study (*N* = 8)

Responses	Number of responses (%)
How prepared do you feel to offer inclusive instruction in your field?	
a. I feel prepared.	0
b. I do not feel prepared, and I am very anxious about my ability to teach inclusively.	3 (37.5%)
c. I do not feel prepared, but I believe that I can figure it out.	5 (62.5%)

Following the short MentiMeter survey, the first half of the 90-minute unit focused on giving preservice teachers an authentic look at SEN, which consisted of examining a testimonial written by a student with hearing impairment about her experience learning science in a mainstream school and a sample Individualized Education Program (IEP). The second half of the 90-minute lesson was devoted to practicing how to adapt laboratory experiments to allow all students to participate regardless of their disabilities. Preservice teachers were broken up into four groups, and each group randomly drew a disability card. This random distribution was done to reflect the unpredictability of class composition regarding abilities. The card set reflected the general presence of particular disabilities in the population.[2] Preservice teachers were then asked to adapt a particular chemistry lab protocol to allow students with the drawn disability to successfully participate in the experiment. After the preservice teachers had adapted the experimental protocol, they moved to the lab, and each group presented their adaptation plans (Figure 1).

Figure 1

Preservice Teachers Present Adaptation Ideas for Chemistry Experiments

(Photo credit: Clemens Hoffmann)

Following the time in the lab, a quick informal discussion took place to allow the preservice teachers to reflect on the 90-minute unit focused on inclusion. Overall, they found the experience to be very positive and voiced the opinion that such courses should be offered more often. Because the interdepartmental course *Angewandte Naturwissenschaftsdidaktik* (Applied Science Didactics) was not offered after the winter 2019 semester, a new attempt was made to incorporate content specific to inclusive learning into the core biology education teaching program. This was initiated in the 2020 summer semester.

Online Course Module on Inclusion

To address the need for subject-specific training on inclusive instruction, two new 90-minute units were to be integrated into the state exam preparation course *Vorbereitungsmodul Fachdidaktik Biologie* (Preparatory Module Didactics of Biology) at the Friedrich-Schiller-Universität Jena. This is the last biology education course before preservice teachers take their state exam to become certified as mainstream high school biology teachers. Due to the global pandemic, this course took place entirely online in the summer of 2020. Prior to beginning the course, the preservice teachers were asked about their previous coursework on inclusion, sense of preparedness, and general confidence. Rather than using MentiMeter, the preservice teachers responded to these questions anonymously via Moodle using the survey function (see Table 2 and Table 3).

Table 2

Overview of the Numbers of Hours of Coursework on Inclusion Prior to Course in Online Module (*N* = 22)

Hours of coursework dedicated to inclusion	Number of responses (%)
0	4 (18%)
1–2	8 (36%)
3–9	7 (31%)
10+	3 (14%)

Similar to the pilot study, the majority of the preservice teachers reported having had a wide range (0–10+ hours) of previous coursework focused on inclusion. All preservice teachers in the pilot study had had at least 1 hour of coursework on inclusion; however, 18% of the preservice teachers in the online module reported having had 0 hours of inclusion coursework. This difference in the number of course hours may partially explain why the online group reported feeling more apprehensive about their ability to prepare inclusive lessons (see Table 3).

Table 3

Preservice Teachers' Self-Reported Level of Preparedness and Confidence in Teaching Inclusively in Online Module (*N* = 22)

Responses	Number of responses (%)
How prepared do you feel to offer inclusive instruction in your field?	
a. I feel prepared.	2 (9%)
b. I do not feel prepared, and I am very anxious about my ability to teach inclusively.	14 (63%)
c. I do not feel prepared, but I believe that I can figure it out.	6 (27%)

To date, there is limited research in the field of science education specifically addressing science teachers' beliefs and attitudes toward students with SEN (Kang & Martin, 2018). To assess these views, all preservice teachers were also requested to complete a survey based on the Kurzskalen zur inklusiven Einstellung und Selbstwirksamkeit von Lehrpersonen (Single Item Scale for Attitudes Toward Inclusion and Self-Efficacy Among Teachers;

KIESEL; Bosse & Spörer, 2014). This survey was embedded in the Moodle room. Of the 29 preservice teachers in the course, 22 completed the survey prior to the beginning of the course (*N* = 22).

The results of the KIESEL questionnaire showed that the preservice teachers in the course held largely positive attitudes toward inclusive learning yet lacked confidence in their own ability to create inclusive learning environments (see Table 4). In general, we see that the preservice teachers' attitudes toward inclusion were positive for Categories A, B, and C, with a mean above 3.0 across the board. The highest beliefs existed in Category B (beliefs about the effects of inclusive education) with a category mean of 4.0. Despite the preservice teachers' conservative response to the question in Table 3, their self-efficacy recorded by the KIESEL questionnaire was neutral in Category D (category mean of 3.0) and slightly positive in Category E.

Table 4

Results of KIESEL Questionnaire by Category via Moodle Survey Function in Online Module (*N* = 22)

Categories	Mean[a]	*SD*
Category A: Beliefs about the design of inclusive lessons.	3.6	0.19
Category B: Beliefs about the effects of inclusive education.	4.0	0.54
Category C: Beliefs about the influence of student behavior in inclusive instruction.	3.5	0.29
Category D: Self-efficacy in relation to the organization of inclusive instruction.	3.0	0.18
Category E: Self-efficacy related to dealing with classroom disruptions.	3.5	0.21

[a] The KIESEL questionnaire uses a 5-point Likert scale: *agree* (5), *somewhat agree* (4), *neither agree nor disagree* (3), *somewhat disagree* (2), and *disagree* (1). The values 4 and 5 are considered positive, 3 is considered neutral, and the values 1 and 2 are considered negative.

The values from the KIESEL questionnaire showed that the preservice teachers participating in the online module began the course with a generally positive attitude toward inclusion but were somewhat hesitant about their own ability to successfully implement inclusive instruction. The Appendix contains the results of that survey with English translations of the questions.

Online Unit on Inclusive Learning for Preservice Biology Teachers

The course was designed using the online-learning platform Moodle. The course consisted of three major components: a theoretical component (general and subject-specific), a practice-oriented project, and peer-feedback on project results. The theoretical component of the course was set up using the lesson function in Moodle. The lesson began with a review

of the general theory and legal parameters of inclusive learning by integrating videos of the 90-minute lecture “Umgang mit Heterogenität und Inklusion” (Addressing Heterogeneity and Inclusion) from the course “Einführung in die Pädagogische Psychologie des Lernens und Lehrens” (Educational Psychology: Introduction to Learning and Teaching), which is taught by the chair of Educational Psychology at Friedrich-Schiller-Universität Jena. The German concept of “Umgang mit Heterogenität und Inklusoin” (Addressing Heterogeneity and Inclusion) is similar to the Universal Design for Learning framework[3] in that it focuses on reducing barriers to learning by increasing flexibility and the use of a variety of teaching methods that can be adjusted for a variety of students’ strengths and needs. Although the course is required for all education majors, not all preservice teachers attend all lectures in the series. The video of the 90-minute lecture was therefore embedded in the Moodle lesson for the preservice teachers to either view for the first time (if they missed the lecture) or as a review for those who had already completed the course on learning and teaching. Preservice teachers could advance in the Moodle lesson only after correctly answering questions related to the content of the lecture. An example of such a question would be: “When was the United Nations Convention on the Rights of Persons with Disabilities ratified in Germany?” (Answer: *2009*).

After watching (or rewatching) the lecture from Educational Psychology, the preservice teachers advanced in Moodle to the second part of the theoretical lesson focused on subject-specific inclusive learning. Here the focus went beyond the principles of universal design to specifically address adaptations necessary for particular SEN. This is in line with suggestions made by Bell (2019) in his proposed equity and justice projects whereby the disruption of ableism occurs through leveraging an extension beyond universal design. As in the pilot study, the preservice teachers were introduced to a sample IEP and a testimonial written by a student with hearing impairment about her science learning experience in a mainstream school. In her testimonial, the student, Katharina, gave a detailed description of her difficulties in learning science in high school and made numerous concrete suggestions on how science teachers can best meet the needs of their students with disabilities. For example, she described the difficulty of learning new vocabulary that is used in science courses and how students who are hard of hearing or deaf have to actively learn this vocabulary because they cannot just pick it up naturally. Moreover, she talked about how the increased use of visuals in science class meant that she had to choose between looking at the visual offered by the teacher or reading the teacher’s lips while she spoke. Regardless of the decision that she made, information was lost because she could not process both sources of visual information simultaneously. This reflects similar statements made in the literature (e.g., Dembouski, 2018). Lastly, she spoke of teachers’ willingness to try to make adaptations as the most important aspect. In her words,

It is important to find solutions to problems together and to signal that one understands the position of the person with disabilities. If the goodwill of the teacher is recognizable, this is the most important thing for me personally and is a real relief.

Upon completion of the theoretical part of the Moodle lesson, preservice teachers moved on to the project part of the unit. A virtual meeting with the instructor was offered to answer any questions about the lesson and to explain the process and purpose of the project. As in the pilot study, the project part of the lesson focused on providing preservice teachers with the opportunity to practice developing adaptation plans to accommodate a specific hypothetical student's needs. In preparation, the preservice teachers were asked to choose an activity such as an examination, experiment, or excursion that would theoretically require adaptation. All three of these topics (i.e., testing, informal learning, and experimentation) are part of the state exam for which these preservice teachers were actively preparing. Once the preservice teachers had chosen a specific activity (i.e., exam, experiment, or excursion), they were randomly assigned a particular disability or chronic illness based on the first letter of their last name. The project was planned to address the specific skills that science teachers require for successful implementation of inclusive education: the ability to adapt subject-specific activities (experimentation) and the ability to meet the needs of individual students in these complex environments (Holstermann, 2019).

Based on the disability that the preservice teachers were assigned, they were to develop a specific profile for a hypothetical student, for instance, a seventeen-year-old female student with visual impairment causing 60% loss of her visual field. Based on this hypothetical student's profile, they were to conduct research into the specific needs that that hypothetical student could have. Preservice teachers were told that they could contact the instructor for more information via email or telephone to simulate the same sort of dialogue that could occur with a special education instructor at their future school. Once they had obtained information about what accommodations would be necessary to ensure that the student could participate in the planned activity, the preservice teachers were to come up with an adaptation plan for their exam, experiment, or excursion. The majority of the preservice teachers created adaptation plans for excursions, and some created adaptation plans for experimental protocols. None of the preservice teachers designed an adaptation plan for an examination.

The preservice teachers presented their adaptation plans by creating videos and uploading them to Moodle using the workshop function, and they were randomly assigned five projects to review. They were given a series of questions that should act as a guide for their feedback as well as space for additional comments. At the conclusion of the course, they were invited to share their videos on the class Vimeo channel so that future preservice teachers could also view their plans (https://vimeo.com/showcase/7475265).

Evaluation of Course Effects on Preservice Teachers' Views and Efficacy

After completing all components of the course (i.e., theoretical, practical, and peer feedback), preservice teachers were asked to respond to a series of anonymous questions via Moodle. These questions focused on how various course components had affected their views of

inclusive learning and their perception of their own ability to create inclusive learning environments and also asked for additional comments in the form of open questions.

Only seven preservice teachers participated in this survey, so these results are not generalizable, but they do give clear feedback about preservice teachers experiences in the course. Based on the answers from the selected-response and open-ended questions in the postcourse questionnaire, it was possible to ascertain that the course had had a positive effect on the preservice teachers' general views on inclusion and their sense of self-efficacy. Regarding the most effective course components, 100% of the preservice teachers chose at least one course component that had had a positive effect on their views of inclusion. In Table 5, we can see that the course components that had the greatest effect on the preservice teachers' views on inclusion were the course components most closely related to classroom practice, namely the online lesson on the specifics of inclusion in biology education, the project portion focused on creating their own adaptation plan, and the review of other preservice teachers' adaptation plans.

Table 5

Course Components That Had an Effect on Preservice teachers' Beliefs About Inclusion

Course components	Number of responses (%)
General education lecture on inclusion	3 (42.9%)
Zoom meeting describing the project	1 (14.3%)
Moodle lesson on inclusion in biology education	6 (85.7%)
Personal testimonial from a student with a disability	4 (57.1%)
Creation of an adaptation plan	7 (100%)
Review of other students' adaptation plans	6 (85.7%)

There were noticeably fewer course components that the preservice teachers reported as having a positive effect on their level of self-efficacy (see Table 6). All the preservice teachers reported that the creation of their own adaptation plan had positively affected their self-efficacy. Only two other components were listed at all, the general lecture on inclusion and the Zoom meeting.

Table 6

Course Components That Had a Positive Effect on Preservice teachers' Level of Efficacy

Course components	Number of responses (%)
General education lecture on inclusion	1 (14.3%)
Zoom meeting describing the project	1 (14.3%)
Moodle lesson on inclusion in biology education	0 (0%)
Personal testimonial from a student with a disability	0 (0%)
Creation of an adaptation plan	7 (100%)
Review of other students' adaptation plans	0 (0%)

What these results show is that for this particular group of preservice teachers, affecting change on attitude toward inclusion is possible through a wider variety of approaches, but the most effective means of increasing preservice teachers' sense of self-efficacy is through the opportunity for practical training: practice adapting lesson plans to accommodate students with disabilities. This skill must be mastered to make science lessons accessible and equitable for all students.

Learning Outcomes

The learning outcomes from this course can best be recognized through the responses of the preservice teachers to the open-ended questions. In response to the question "How, if at all, were your overall views on inclusive education impacted by this course?" (translated from German), we see answers such as the following.

The course showed me that inclusive learning environments can be created with simple tools and methods and do not necessarily have to be a burden for the teacher. (translated from German)

I believe that it is possible to allow students who require special arrangements to participate in class through inclusion. However, it is necessary to deal with the different impairments so that the lessons can be well organized for students with impairments. However, this is not as much effort as I had imagined and can be achieved through some adapted activities. (translated from German)

In response to the question, "How, if at all, were your views about your own ability to create an inclusive learning environment impacted by this course?" (translated from German), we see answers such as the following.

I definitely feel better prepared now to create an inclusive learning environment. This is mainly because we were asked to create our own lesson plan here, and we independently explored inclusion as well. Also, we didn't just deal with one impairment but learned about several through the videos from other students. (translated from German)

I was put in a position to independently develop a solution for a specific student, which I didn't even get to do in my practice semester. I think that the course has helped me in this respect; I now feel more able to develop such materials, also with the help of colleagues or those in other disciplines. (translated from German)

These example responses point to the importance of practical work closely tied to realistic school scenarios. This increase in self-efficacy based on practice-oriented activities is also supported by psychological studies, which have shown that levels of self-efficacy rise when individuals gain new skills that allow them to manage what are seen as threatening activities (Bandura, 1982). Furthermore, by viewing other preservice teachers' work and receiving feedback on their own work, they were able to recognize various solution paths and the value of cooperating with colleagues and working in cross-disciplinary teams, which is identified as a major step toward successful inclusive education implementation (European Agency for Development in Special Needs Education, 2012).

Improvements for Future Courses and Evaluation of Course Efficacy

Although the course appeared to be effective, there is room for improvement. In the open-response questions, preservice teachers requested that more information be given about the specific disabilities and chronic illnesses. For upcoming courses, a new literature section has been added to the Moodle room that includes the central documents from Kultusministerkonferenz (the Conference of the Ministers of Education and Cultural Affairs) regarding recommendations for students with SEN. Moreover, plans are being made to develop a cooperative seminar with a local university with a teaching program for special education teachers. The goal is to have both sets of preservice teachers collaborate in order to create such adaptation plans in the future. This type of cooperation would not only be useful during the preservice training, but it would also be the first step toward strengthening communication pathways between both groups of teachers, which is another key to successful inclusive education implementation (European Agency for Development in Special Needs Education, 2012).

During this module, the effect of the course was measured only through self-reported data (see Tables 5 and 6). For the subsequent course cycle, a quantitative questionnaire will be implemented as a pre–post questionnaire so that we can see which aspects of the preservice teachers' attitudes were affected most and to what degree. Moreover, instead of only relying on the KIESEL survey (Bosse & Spörer, 2014), components from the MESS-H self-efficacy scale (Junker et al., 2020) will also be integrated to look more broadly at classroom heterogeneity.

Despite these changes to the data collection methods, two problems remain when analyzing teachers' attitudes. On the one hand, there is a problem with using explicit attitude questionnaires to measure attitudes about inclusion because they can be strongly biased due to social desirability and thus have a low predictive power regarding future behavior (Lüke & Grosche, 2018). For that reason, future studies would optimally include both explicit and implicit attitude measuring tools such as the Inclusion Single-Target Implicit Association Test (Inclusion-ST-IAT) proposed by Lüke and Grosche (2018). Moreover, long-term follow-ups should be considered because studies have shown that positive attitudes among classroom teachers can significantly regress over time (Tournaki & Samuels, 2016).

Conclusion

Inclusion requires nothing less than the entire restructuring of mainstream schools so that every school can accommodate every child, irrespective of disability, to ensure that all learners belong to a community (Avramidis & Norwich, 2002). Not only does this require major institutional changes in administrative structure, but it also catapults teachers into the role of the great facilitator of inclusion. Due to the central role that teachers must play in the successful implementation of inclusion, it is necessary to provide preservice and inservice teachers with practical training that allows them to develop positive views about inclusion and their self-efficacy.

Although some universities have already developed exemplary programs to prepare preservice teachers to teach inclusively, there are still many universities across the world that are just beginning to do so. The course described here offers a look at how this training can be provided without making large-scale adaptations to degree programs or course modules. The online nature of this class, as well as the use of prerecorded lectures, self-assessment tools (i.e., quizzes), and peer feedback, means that this course could also be offered with minimal active teacher hours. Although such a brief online course will never replace full semester programs, it does offer a way of preventing any preservice teacher from completing a teacher training program with a complete lack of training on how to teach effectively for students with SEN.

The module described here was only a single unit within the context of a larger noncompulsory exam preparatory course. However, initial feedback from the preservice teachers shows that even this relatively small intervention led preservice teachers to think more positively about inclusion and increased their own sense of efficacy with regard to creating inclusive learning environments. This increase in positive beliefs about inclusive education, coupled with increased self-efficacy, is essential for the successful implementation of inclusion. What this means is that teacher training programs can help meet the goals set forth by the United Nations Convention on the Rights of Persons with Disabilities (2006), even though relatively short interventions, as long as the focus of the instruction is subject-specific and offers preservice teachers the opportunity to practice skills necessary for successful inclusive instruction.

[1] Degree program course requirements are dependent on a preservice teacher's primary and secondary subject focus.

[2] Percentage of students with special education needs in Germany in the 2018–2019 school year according to Kultusministerkonferenz: learning (34.6%), emotional or social development (17.2%), language development (10.1%), physical disability (6.8%), unspecified or multiple disabilities (3%), hearing impairment (3.9%), chronic illness (2.1%), and visual impairment (1.7%) (https://www.kmk.org/fileadmin/Dateien/pdf/Statistik/Dokumentationen/Dok223_SoPae_2018.pdf).

[3] There are multiple frameworks for inclusive education that were inspired by the universal design movement in architecture and product development (Rose & Meyer, 2002). These include universal instructional design (UID), universal design for instruction (UDI) and universal design for learning (UDL). The basic goal of all of these frameworks is to increase accessibility to learning for all students by accommodating the needs and abilities of all learners and eliminating unnecessary hurdles in the learning process. For more information and on ideas of how to apply UDL principles see cast.org.

Supplemental Files

Appendix-A-Watts-2022.docx

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