



Educational guidance for functional visual diversity in Nicaragua. Design and evaluation of a teacher-training program

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ABSTRACT

The article exposes the process of design and implementation of a training program for teachers that teach people with Visual Functional Diversity (VFD), taking into account their needs both in training and in the provision of resources in Nicaragua. To verify the effectiveness of the program, a quasi-experimental design was carried out with a non-equivalent pretest and posttest control group. The experimental group received training while the control group did not receive training. The evaluation of the results obtained after the application of the program was carried out through two instruments: an efficacy questionnaire and a satisfaction questionnaire. The results showed significant differences between the experimental and control group after the application of the program ($Z = -4,383$; $p = 0.000$) in favor of the experimental group. It is confirmed that the program is effective in training teachers on inclusive education for the visually impaired as the teachers who took part in the training program significantly increased their knowledge in that issue.

1. Introduction

Inclusive education in Nicaragua remains a distant reality and is even more so when it comes to those with visual functional diversity, supposing an impairment in the struggle for equal rights and participation of this group. If we consider education as the central development axis of a country, rather than as a right, it is an individual and social benefit. By knowing the educational reality of a country like Nicaragua, together with its social problems, we can observe that the educational system as it is applied suffers some deficiencies concerning students with special educational needs. The following deficiencies stand out: lack of investment in school infrastructure, lack of adequate and adapted resources to the needs of students, poorly paid teachers often without adequate training to face the needs of students and finally, difficulties when it comes to locating students with special educational needs, especially those students with visual impairment. All of the above generates obstacles regarding the implementation of Educational Inclusion.

According to Bustela (1998), Cordero (2004), and Delgado (2007), it is necessary that Latin American governments consider a reduction in poverty a primary objective, since it is considered as the main reason for social exclusion. Nevertheless, in studies carried out in Spain by Álvarez,

Castro, Campo-Mon, and Álvarez-Martino (2005), Doménech, Esbrí, González, and Miret (2003) in Costa Rica, Artavia (2005) in Colombia, and the study developed by Díaz and Franco (2010) concerning teachers' attitudes towards inclusive education, there is a common agreement that the attitude of teachers is a decisive element in the success of inclusion policies.

1.1. Theoretical framework

Firstly, we start by considering some data related to Functional Diversity (FD), in Nicaragua and aspects related to teacher training in the country that allow us to justify the motivation of our training program.

The results found in the Nicaraguan Survey for People with Disabilities (Spanish acronym "ENDIS") published in 2004 (Government of Nicaragua, 2004) showed that 10.3 % of the population over the age of six had some limitation or disability (approximately 500,000 individuals). As far as the area of residence is concerned, 56 % live in urban areas whereas 44 % live in rural areas. The prevalence level was 10.4 % in urban areas and 10.1 % in rural areas, respectively. Concerning gender, 11.3 % of women had some type of disability while in men the prevalence was 9.1 %.

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According to the census of People with Disabilities conducted by the program of the Nicaraguan Ministry of Health (Spanish acronym "MINSa") in 2009 "All with voice", and according to data from the National Institute of Development Information (Spanish acronym "INIDE"), Nicaragua had a population of 5.7 million inhabitants. The prevalence of people with FD nationwide is 2.43 %, which represents 126,316 people with physical, sensory or intellectual disabilities. Of these, 49 % are male and 51 % are female.

Regarding the types of FD, people with physical FD predominate (36.9 %), possibly because of war and continuous and numerous traffic accidents. They are followed by people with intellectual FD (25.9 %) and to a lesser extent sensory FD. Within the last group, visual and auditory disabilities have quite similar prevalence, 12.7 % and 10.1 % respectively (Table 1).

Depending on the age, the study indicates that the highest percentage of people with FD are older adults or senior citizens: That is, those who are 60 years of age or older, representing 33.3 % of the total. Those people with disabilities whose age is between 40 and 59 years also have an important weight since they correspond to 20.4 % of the total. Children and adolescents with FD represent 24.1 % of the total.

As stated by the Nicaraguan Ministry of Labor (Spanish acronym "MITRAB") in its situational report of the population with different capacities (Government of Nicaragua, 2004), there are other studies conducted to investigate the population with any kind of FD in Nicaragua, revealing that there is a disability prevalence of 12 % of the total population (600,000 inhabitants). Table 2 shows the origin of the typology of such diversity.

Official studies are complex and sometimes confusing. According to the ENDIS survey (Government of Nicaragua, 2004) and other official studies conducted by MITRAB, MINSa and INIDE, the prevalence and causes of disability are different according to existing studies in the country. We show a comparative table (Table 3) with the three official data on disability reports made in the country and their contributions.

As we analyze in Table 3, if we take the ENDIS survey (Government of Nicaragua, 2004) survey as a reference, the prevalence is 10.3 % of the population, the study of the MITRAB of 2004 figures the prevalence in 12 %, and the census of People with Disabilities of 2009 calculates prevalence around 2.43 %. On the other hand, if we only look at the types of FD we observe according to MITRAB (Government of Nicaragua, 2004) that the most common disability is the visual one, with 63 % but this kind of disability scores below 13 % in the study carried out by the MINSa. That disparity in numbers invite us to think that these statistics are taking different references and must be considered unreliable when it comes to specifying the possible solutions that the government must propose.

With regard to education received, 41 % of people with FD lacked schooling, 19.1 % had pre-school education, and 25.7 % had primary education. By assuming that 85.8 % had less than basic training, only 7 % had a basic high school and only 2.7 % had completed higher education studies. If we consider the access to the labor market, there was a high percentage of unemployment (48.58 %).

In Nicaragua, numerous programs are being developed aimed at improving the quality of life of people with VFD sponsored by international and national health, social and educational organizations, intended for people with VFD. In both initial and continuing education,

Table 1
Percentages of people with FD in Nicaragua.

People with disabilities according to type of disability	Number	%
Intellectual	32,741	25.9
Physical	46,611	36.9
Visual	16,042	12.7
Hearing impairment	12,783	10.1
Mental	7,402	5.9

Source: MINSa and INIDE.

Table 2
Types of functional diversity.

Type of FD	%
Visual damages	63.8
Hearing damages	9.2
Physical damages	4.9
Mental damages	4.4
Apoplexy	4.2

Source: Government of Nicaragua (2004).

Table 3
Comparison of functional diversity according to the different studies analyzed in Nicaragua.

	ENDIS (2003)	MITRAB (2003)	MINSa and INIDE (2009)
Prevalence of Functional Diversity	10.3 %	12 %	2.43 %
Gender	Women 11.3 % Men 9.1 %		Women 49 % Men 51 %
Type of FD	Domain valuation according to CIF	Visual 63.8 % Hearing 9.2 % Physical 4.9 % Intellectual 4.4 % Apoplexy 4.2 %	Visual 12.7 % Hearing 10.1 % Physical 36.9 % Intellectual 25.9 %

specific training in special education issues, especially with regard to action methods with students with VFD, is very limited. Hardly any educational dissemination improves the quality of teaching performance with this type of student body. On the other hand, technical aids and resources that allow students to achieve educational purposes, such as Perkins machines, computers with technology adapted for Visual Functional Diversity, embossed material or in audio, etc., are restricted. The educational field is essential to establish an inclusive culture, and teachers are in charge of promoting quality education that enables all students in general to achieve a global development. Therefore, we conclude that it is crucial to train teachers to carry out their profession with students with visual disabilities.

The goal of this work is to provide the a step-by-step process of the design, implementation and evaluation of a training program for teachers who teach students with Visual Functional Diversity, taking into account their needs in terms of both training and the provision of resources in Nicaragua.

2. Methods

We have focused the entire action process through the different phases that Fernández, Morales and Molero (2011) proposed. Concurrently, we integrated the evaluation objectives and instruments into those phases.

2.1. General objectives and phases of the study

The general objectives of the empirical study were six:

- To evaluate the training needs of teachers who teach students with visual disabilities.
- To design a training program based on psychological, methodological and didactic aspects that increase the knowledge of teachers with students with visual impairment.
- To implement the training program for teachers in methodologies adapted to the education of people with visual disabilities in six

educational centers in order to increase the knowledge of teachers when working in the classroom with people with this disability.

- To evaluate whether the designed program improves the knowledge of teachers that participated in the training program.
- To evaluate teacher satisfaction with the training program.

These objectives were developed and evaluated in each of the different phases of the study. Namely:

- Phase I. "Problem identification". In this phase, we evaluated if teachers needed training and what kind of training was necessary for the program to be truly successful.
- Phase II. "Program Formulation". In this phase, a training program "Course on methodologies adapted to students with visual disabilities" was designed aimed at increasing the skills of teachers. The adequacy of the program was also evaluated.
- Phase III. "Program Implementation". The procedure used and the results of the evaluation are shown through the basic knowledge questionnaire on visual impairment. Likewise, progress was evaluated through the continuous analysis of the development of the program. Open evaluations were carried out in each of the content modules, to assess the degree of knowledge acquisition.
- Phase IV. "Evaluation of the results of the Program". A quasi-experimental design was carried out through a questionnaire that provided us with the knowledge that teachers had about the treatment of students with visual disabilities. This same questionnaire was applied before and after the course to both the experimental and control groups. The evaluation was carried out through the analysis of the effectiveness of the program (Fernández-Ballesteros, 1996). In addition, an evaluation was included on the degree of satisfaction of the training program.

Table 4 shows the different phases of the study, the evaluation, the judgment, and the evaluation instruments. In turn, we were based on the evaluation phases established by Chacón, López, and Sanduvete (2004), in order to carry out an evaluation under continuous interaction. These phases are needs assessment, evaluation of objectives, evaluation of design, evaluation of implementation and evaluation of results.

To carry out Phase I, we tried to extract information about the training offered for prospective teachers in the field of Attention to Diversity and Inclusive Education. Several techniques and instruments were used. Namely:

- Direct observation of the situation in the country.

- Inclusive Education Survey in Nicaragua. This is a survey designed by us and composed of 13 questions, on aspects related to attention to diversity, the inclusive mentality of teachers and their specific needs. It was completed by 63 teachers in 2011.
- Survey and report Data on the employment status of teachers for people with visual impairment. This is a study prepared by the ONCE Foundation in Support of the Blind in Latin America (Spanish acronym "FOAL") in 2009 that aimed to discover and document the situation of special or differential education professionals who work with children with visual disabilities in some Latin American countries, specifically in the Dominican Republic, Ecuador, Paraguay and Nicaragua. The sample mostly contains data from public centers except for one that is subsidized and one that is private. A total of 37 centers were surveyed.
- "Teaching and visual disability in Nicaragua" form. It was a needs identification questionnaire completed by 27 participating teachers in 2015.
- Interview with the person in charge of the Departmental Delegation of Special Education in León.
- Interview at the the CRECI.
- Interview with the director of a teacher training college.
- Interview with a student with visual impairment. We used an adaptation of the semi-structured interview for the Evaluation of Attitudes towards Disability or Integration proposed by Aguado, Royo, and Martínez (1995). It allowed us to discover some aspects such as the inclusion of the student and her educational history.
- Interview with a person without visual functional rest. We realized the enormous needs derived from an unadjusted educational process.

For Phase II (Program Formulation), we used:

- "Teaching and visual disability in Nicaragua" form. It allowed us to know the needs of teachers to whom we would apply the training program. This form was completed in 2015 by the 27 people who later participated in our research, drawn from both the experimental and control groups.

For Phase III (Implementation of the program), we used:

- Basic knowledge assessment questionnaire "Inclusive Education for visual impairment". It consisted of 25 items related to knowledge about inclusion and teaching methodology for the education of students with visual disabilities.

Table 4
Evaluation instruments for the different phases of the evaluation (adaptation of Fernández, Morales, & Molero, 2011).

Phase	Evaluation	Judgment	Evaluation instruments
PHASE I: IDENTIFICATION OF THE PROBLEM			Inclusive Education Survey in Nicaragua. Data on the employment status of teachers for people with visual disabilities. ONCE foundation for latin America (Spanish acronym FOAL). "Teaching and visual disability in Nicaragua" form. It allowed us to know the needs of teachers to whom we would apply the training program.
Diagnostic evaluation	Context and needs assessment.	Relevance	Interview with a person in charge of the Departmental Delegation of Special Education in León. Interview at the Blind Resource Center of Nicaragua (Spanish acronym "CRECI"). Interview with the director of a teacher training college. Interview with a student with visual impairment. Interview with a person without functional visual rest.
PHASE II: PROGRAM FORMULATION	Design evaluation	Sufficiency and adequacy	"Teaching and visual disability in Nicaragua" form.
PHASE III: PROGRAM IMPLEMENTATION	Evaluation of program implementation	Progress and Continuous Evaluation	Basic knowledge assessment questionnaire "Inclusive Education for visual impairment"
Continuous procedural evaluation			Final evaluation of content modules belonging to the training program for teachers in methodologies adapted to the education of people with visual disabilities.
PHASE IV: EVALUATION OF PROGRAM RESULTS	Evaluation of the results	Efficiency and Satisfaction	Basic knowledge assessment questionnaire "Inclusive Education for visual impairment"
Final evaluation			Program satisfaction questionnaire

- A final evaluation of each content module (six overall) of the training program for teachers in methodologies adapted to the education of people with visual disabilities.

Finally, for Phase IV (Evaluation of the results of the program) two questionnaires were administered:

- A basic knowledge assessment questionnaire: “Inclusive Education for visual impairment”.
- A satisfaction questionnaire to evaluate the degree of teacher satisfaction with the program. It consisted of 29 items, seven of which evaluated the contents, nine evaluated the methodology, five evaluated the mentoring action and eight evaluated the virtual platform, respectively. A Likert scale was chosen for the evaluation, ranging from 1 (strongly disagree) to 5 (strongly agree).

2.2. Data analysis

Statistical analysis was carried out with SPSS 21. To verify homogeneity in the experimental and control groups a statistical analysis was done by means of the non-parametric Mann-Whitney’s *U* test and the exact Fisher test. In the same way, the Mann-Whitney’s *U* test and Wilcoxon’s T-test were used for inter-group and intra-group comparisons, respectively. As far as the rest of the instruments are concerned, a content analysis was carried out since most of them were semi-structured surveys and interviews. Significance level was set to 0.05.

2.3. Design

For the evaluation of the effectiveness of the training program, an experimental group consisting of 16 teachers and a control group consisting of 11 teachers were used. A questionnaire (“Inclusive Education for Visual Impairment”) was delivered to both the experimental and control groups at two time points: at baseline and after finishing the training. Before the administration of the questionnaire, the research team explained to the teachers (both the control group and the experimental group) what the evaluation instrument consisted of.

At the beginning of the study, we found that there was no difference between the two groups by gender, experience with students with visual impairment, complementary training on visual impairment, age, years of experience with students with visual impairment and years of teaching experience. The analyses were carried out through the non-parametric Mann-Whitney *U* test and Fisher’s exact test. Based on the verification that both groups were similar, the intervention was carried out. Table 5 shows the results of the analysis performed to reach the previous conclusions.

Table 5
U Mann-Whitney and Fisher tests to check the similarity of the two groups.

	Experimental N = 16	Control N = 11	Fisher/ U	P value
Gender (%)				
Women	87.5	54.5	3.68 ^a	0.084
Experience in VFD (%)				
Yes	81.3	54.5	2.23 ^a	0.206
Further training				
Yes	31.3	36.4	0.077 ^a	1.000
Age (M/SD)	33.44 (9.01)	37.27 (9.82)	-0.989 ^b	0.342
Experience disabilities (M/SD)	3.31 (3.13)	2.09 (2.16)	-1.027 ^b	0.304
Yes				
Experience teaching (M/SD)	9.19 (8.19)	14.45 (10.40)	-1.636 ^b	0.102
Yes				

^a Fisher’s exact test.

^b U Mann-Whitney test.

To verify the effectiveness of the program, a quasi-experimental design was used with a non-equivalent pre-test and post-test control group (Buendía, Colás, & Hernández, 1998). In the design, the teachers of the experimental group and subsequently those of the control group were selected non-randomly. The design of the program is shown in Fig. 1, in which the two groups can be seen: control (no training) and experimental (with training).

Before conducting the training in the pretest, content knowledge (C1) for both groups was analyzed. After completing the training, in post-test, the contents (C2) of both groups were measured again. These results were compared (pretest and posttest) as follows:

- a) Content knowledge between the experimental group and the control group before the intervention.
- b) Content knowledge within the experimental group before and after the intervention.
- c) Content knowledge within the control group before and after the intervention.
- d) Content knowledge between the experimental group and the control group after the intervention.

The evaluation of the program was carried out in both the Application Phase and in the Results Phase, responding to the criteria of effectiveness. On one hand, the Program Implementation Phase was evaluated through a Basic Knowledge Evaluation Questionnaire (“Inclusive Education for Visual Impairment”) administered to both the experimental group and the control. On the other hand, at the Results Phase, the effectiveness was analyzed through individual evaluations of each content module and at the end; the basic knowledge questionnaire was completed again. Participants’s satisfaction was assessed by means of a program evaluation questionnaire. The contents were taught through the online training platform, through an active, participatory and reflective methodology. Different activities were designed: introductory activities, search for previous knowledge activities and evaluation activities. The resources used were available online to all participants.

For all of the above, we consider that the elaborated design of the training program complies with the judgment of sufficiency and adequacy, since it is based on the teachers’ needs detected in the “Teaching and visual disability in Nicaragua” form. We also consider that its contents are adequate and that the program complies with the adequacy judgment since they are previously based on the contributions of researchers and authors recognized in the field we are concerned with, such as Gardner (1995, 2006), Latorre, Bisetto, and Teruel (2010), Martín-Blas (2000), Stainback and Stainback (1992).

3. Results

For the evaluation of the results obtained after the application of the program, two instruments were used: the questionnaire developed to assess the effectiveness of the program “Course on methodologies adapted to students with visual disabilities” and the questionnaire of satisfaction with the program.

3.1. Evaluation of the effectiveness of the program: “course on methodologies adapted to students with visual impairment”

The effectiveness of the program was verified through the analysis of the results obtained by participants in the basic knowledge questionnaire on “Inclusive Education for visual impairment”. The following analyzes were conducted:

- a) Knowledge between the experimental group and the control group before the intervention. The probability associated with the value of the Mann-Whitney *U* statistic was greater than 0.05 ($Z = -0.745$; $p = 0.481$), so we concluded therefore that there were no statistically

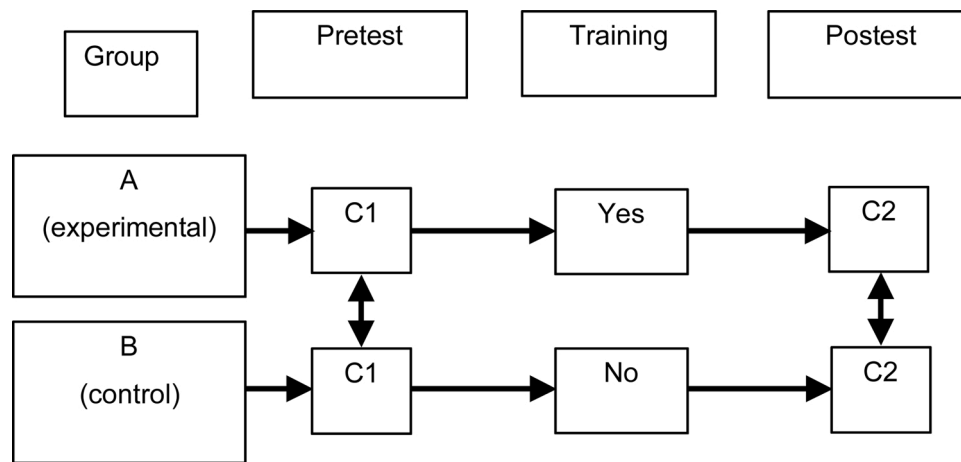


Fig. 1. Quasi-experimental design with an equivalent pretest and posttest control group.

significant differences in knowledge between the experimental group and the control before the participation in the program. That is to say, both groups had similar knowledge.

b) Knowledge within the experimental group before and after the intervention

The results of the Wilcoxon test showed that there were differences in knowledge before and after the application of the training program ($p < 0.05$). Therefore, there was an improvement in knowledge in this experimental group.

c) Knowledge within the control group before and after the intervention

The results of the Wilcoxon test showed that there were no differences in knowledge in the pretest and posttest. Therefore, there was no improvement in knowledge after participation in the program.

d) Knowledge between the experimental group and the control group after the intervention.

The results of the Mann Whitney U test showed that there were differences in the knowledge scores between both groups. The probability associated with the Mann-Whitney U statistic ($Z = -4.383$; $p = 0.000$) shows that there were statistically significant differences in knowledge after participation in the training program. After finishing the program, the experimental group had more knowledge in Inclusive Education for visual impairment than the control group. Note that the maximum score to be achieved was 25. Table 6 summarizes all the data belonging to the comparisons between/within groups before and after intervention, respectively.

All the results that we have just shown indicate that the program was effective to train teachers in Inclusive Education for the visually impaired and increased their skills to become better professionals, as the teachers who were given training had significantly increased their

Table 6
Summary of comparisons between/within groups before/after the intervention.

	Experimental (n = 16)	Control (n = 11)	Z	p Value [‡]
Knowledge (M/SD) before intervention	9.37 (3.64)	8.45 (3.38)	-0.745	0.481
Knowledge (M/SD) after intervention	20.68 (1.25)	8.81 (2.40)	-4.383	<0.001*

[‡] U Mann Whitney test.
* Statistically significant.

knowledge after the training program. Those who did not receive any training (control group) did not improve their knowledge. The completion of a final evaluation of the course was relevant as it offered us the possibility of learning those aspects to improve and modify in the future, for the benefit of a future implementation in other contexts.

3.2. Program satisfaction questionnaire

The results of the satisfaction questionnaire are depicted in Table 7, where average and standard deviation values are shown by categories (content, methodology, mentoring and platform) for both experimental and control groups, respectively. Please note that maximum scores were: contents (35), methodology (40), mentoring (25), and online platform (45). Table 7 also shows that there were no significant differences between the groups regarding the evaluation of the contents, methodology, mentoring and platform, respectively ($p > 0.05$).

As far as the contents is concerned, we find that the probability associated with the value of the Mann Whitney U statistic is 0.195 (>0.05), so we conclude that there were no statistically significant differences in the evaluation of the contents according to group (experimental or control). In addition, we observe that with respect to the probability associated with the value of the Mann Whitney U statistic (0.318) for the methodology area, so we conclude that there were no statistically significant differences between groups in the evaluation of the course methodology. We conclude that there were no statistically significant differences between groups in the evaluation of the tutoring, because the Mann Whitney U statistic value was 0.753 ($p > 0.05$). We finally conclude that there were no statistically significant differences in the evaluation of the online platform of the course between groups (Mann Whitney U statistic value was 0.753, $p > 0.05$). The results of the satisfaction questionnaire were very good in general, except in the use of the Moodle online platform.

Table 7
Comparison of the level of satisfaction between the experimental and control group.

	Experimental (n = 16)		Control (n = 11)		Z	p value
	Mean	Std. Deviation	Mean	Std. Deviation		
Contents	33.25	(1.065)	33.72	(0.786)	-1.384	0.195
Methodology	37.31	(1.815)	37.72	(2.102)	-1.030	0.318
Mentoring	23.06	(1.181)	23.18	(1.25)	-0.356	0.753
Online platform	33.06	(1.843)	33.54	(3.174)	-0.051	0.981

4. Discussion

Our work describes in detail the design and implementation of a training program intended for teachers who teach students with Visual Functional Diversity in Nicaragua. To the best of our knowledge, there are no such studies, so to compare ours with other similar studies we have taken as a reference studies such as the one carried out by [Arteaga and García \(2008\)](#), in which they concluded that there was a need for an adaptive training program aimed at secondary school mathematics teachers (Spain). They were aware that the direct involvement of teachers in the reformulation of objectives and development of pedagogical materials adapted to the needs of students, as we did in our study, offering teachers strategies to face the challenge of teaching students with VFD. The study conducted by [Amaro, Méndez, and Mendoza \(2014\)](#) analyzed the professional characteristics of university professors to attend to diversity. After examining the results, they concluded that the collaboration between the teachers, as well as sharing their educational experiences in their own context, encouraged and increased inclusive practices in the classroom. This conclusion was strengthened by the results of our study. The study of [Correa, Bedoya, and Agudelo \(2015\)](#), was aimed at developing a training program on inclusive education for teachers in Colombia. Their research confirmed that the innovation process generates greater interest when context problems are taken as an axis, as an alternative to guide the process of teacher training. Therefore, the analysis of the context is vital when developing any training program.

On the other hand, and taking into account the contributions of [Anguera, Chacón, and Sánchez \(2008\)](#), for an adequate evaluation of the implementation of a program, aspects such as quality and goodness, resolution of possible discrepancies and degree of evaluability must be assessed. With regard to quality and goodness, the actions formulated in the training program have been adequately developed in accordance with the different evaluations carried out (partial and final). As far as the solution of possible discrepancies is concerned, we have given a solution to the questions, doubts or problems that arose through a forum within the online platform. Finally, the program was subjected to evaluation by experts in the field and to the evaluation of the participants by means of a program satisfaction questionnaire. Therefore, our program meets the necessary requirements in its implementation, according to the aforementioned authors.

The evaluation of the effectiveness of the program was carried out through a knowledge questionnaire on Inclusive Education for visual impairment. The results showed that there were significant differences in knowledge within the experimental group before and after the training. It was also observed that there was no change within the control group after comparing the pretest and posttest results. Before the training, there were no significant differences in terms of knowledge between groups. After training, there were significant differences, and the experimental group had more knowledge in visual impairment than the control group. Consequently, we can validate our initial hypothesis by which the application of a training program for teachers in methodologies adapted to the education of people with visual disabilities increases the competencies of teachers participating on it.

Concerning the satisfaction questionnaire, the results were good in general, except in the aspects related to the use of the teaching platform. We observed that there were no significant differences between groups, in the assessment of the satisfaction questionnaire regarding the evaluation of content, methodology, mentoring action and teaching platform, respectively. According to the studies of [Tavukeu, Anap, and Ozcan \(2011\)](#) and [Marín, Reche, and Maldonado \(2013\)](#), the development of the information and communications technologies (ICT) and the Internet has facilitated a new form of communication, providing learning opportunities with people without sharing any physical space. [Marín et al. \(2013\)](#), affirm that training systems supported by online platforms go beyond presenting a series of contents, as they involve helping to develop skills such as teamwork, leadership, learning to learn,

etc. These premises will guide virtual education to openness and flexibility ([Palloff & Pratt, 2001](#)).

The research carried out in the six educational centers has allowed us to have knowledge of how to improve different methodological aspects to optimize the educational quality of students with VFD. Therefore, it is important to consider the possibility of replicating this program in other centers, as long as we adapt it to the educational and social context in the country in which it will be implemented.

We have confirmed that one of the main causes of the shortage of application of inclusive education is the lack of teacher training in this field. Thus, we can find some on line courses such as the one offered by the Spanish National Organization of the Blind (Spanish acronym "ONCE") or that of the Ministry of Education of Spain on "Inclusive Education. Students with VFD". These on line courses may be complementary to our training program, but in our opinion, they are not very well adapted to the specific needs of students with VFD and teachers in a country like Nicaragua. However, if we focus on impoverished or low-income countries, we observe that the number of these investigations is very small, as well as the application of inclusive practices being far from being adequate.

5. Limitations

Although the results are positive after applying the program in six different centers, we are aware of the limitations of our research. From the reflections throughout the implementation process, as well as in the evaluation of the program, we have detected a series of limitations:

- Difficulty in locating students with VFD in the inclusive centers. We found little help from the Ministry of Education and specifically the Department of Special Education of the country, when trying to contact them. We were only able to obtain this information through the request made to FOAL in order to get more relevant data that would shed light on our research.
- The technological gap has also been a difficulty when taking an online course. Many teachers had limited access to the Internet so the use of the virtual platform has been an added problem.
- The impossibility of conducting face-to-face classes or a blended course has made it difficult to have a greater participation of students while systematizing some knowledge and inclusive practices with students with VFD.
- The application of the program was carried out only in special or specific centers with students with VFD, as we were unable to do it in inclusive centers.

Therefore, before replicating the program in any other center, be that ordinary or Special Education, it will be necessary to adapt the program according to its contextual characteristics, interests and needs. The same applies to some terminological aspects of the program since they are adapted so that Nicaraguan teachers could better understand all the concepts. If we apply this program to another country, we should make a new revision of the language used therein.

6. Conclusions

The results obtained from the evaluation of the program showed a fulfillment of both the general objective (increasing teachers' knowledge in methodologies adapted to the education of people with VFD) and the specific objectives. Our hypothesis has been fulfilled, because the participating teachers increased their knowledge, skills and attitudes in terms of methodologies adapted to teaching with students with VFD after the application of the designed training program. Although the sample is not significant, the results obtained in this study allow us to advance in the field of intervention through programs designed "ad hoc" to improve the educational response of people with VFD.

7. Lessons learned

The evaluation team wants to reflect their experience in a series of lessons learned. That is why we have focused our lessons learned on three relevant aspects.

7.1. Legislative aspects

It should be noted that there are institutional departments that favor educational inclusion, coexisting inclusive policies in the international scope and support from the government and from different associations that favor inclusion. There are, however, legislative aspects that require improvements, for example, insufficient and complex management structure, lack of institutional support and lack of adequate financing models.

7.2. Procedural aspects

Other notable positive procedural aspects are the existence of a motivation to improve educational quality, as well as the existence of external support such as associations that favor educational inclusion. There are also changes generated by a dynamic environment and institutional support such as those offered from the CRECI or from the MINED. As negative aspects, we highlight the lack of adaptation to social demands and resistance to change, an insufficiency of stable records of students with FD in the country and the lack of an inclusive philosophy in the country.

7.3. Proposals for improvement

We point out some proposals that should be considered and implemented as far as education in general and teacher training in Nicaragua are concerned.

7.3.1. Proposals for improvement in Education in general

Assessments of the implemented policies are scarcely carried out and they are sometimes modified without having carried out the pertinent analyzes. Therefore, an exhaustive assessment is necessary, with the objective of including new criteria that help to improve the educational quality of the country as well as to achieve a greater coordination between the different educational subsystems.

7.3.2. Proposals for practicing evaluators

We find that, in general, the teacher knowledge in relation to attention of students with specific educational needs (e.g. VFD students) is scarce and insufficient. Therefore, it is advisable to take into consideration the following aspects:

- Any training program should start taking into account the real needs and start from the most basic level.
- The lack of didactic material adapted to the educational needs of students with FD is an added difficulty for the teachers who serve these students. That is why the programming must be adapted to the individual reality, seeking sufficient alternative options with commonly used material that is easy to acquire in the country where the course is held. When dealing with online teaching programs, it should be taken into account that many teachers do not have an Internet connection at their homes; therefore, the materials must be easily downloadable.
- Greater support and pedagogical monitoring is needed, especially for novice teachers. The teaching career is very little recognized in the country, and not many efforts or resources are put to strengthen the formation of teachers.
- It is necessary to progressively influence the attitudinal aspects towards the inclusion of the entire educational community, so that it has its influence in other areas. In particular, it is necessary to make

teachers aware of inclusion as well as management teams, who must promote and ensure a real inclusive education in order to foster an inclusive society.

Author statement

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Declaration of Competing Interest

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