

# Elaboration and Validation of an Individualized Education Plan for Students with Autism: Contributions from a Teacher Training Program

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## Abstract

The aim of this study was to develop and validate an Individualized Educational Plan (IEP) model for use by teachers working with students with autism spectrum disorder (ASD). The study, designed as a collaborative action research, involved school administrators, teachers from the public school system of Rio Grande do Norte (RN), and researchers in the field of special education. Interview data conducted with the group of school administrators revealed the lack of an IEP model for use in schools. The questionnaires answered by 23 teachers revealed a lack of knowledge in the field of ASD. Based on these findings, a theoretical-practical course on the IEP was designed for the group of teachers. Subsequently, the teachers and researchers collaboratively developed an IEP model to be integrated into an electronic platform. Finally, the instrument was validated by 5 external judges (researchers) and 13 internal judges (teachers who participated in the course). The proposed model served as the foundation for the IEP structure created by the educational system of RN.

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## Elaboração e validação de um Plano Educacional Individualizado para alunos com autismo: contribuições de um programa de formação docente

## Resumo

O objetivo do presente estudo foi elaborar e validar um modelo de Plano Educacional Individualizado (PEI) a ser utilizado por professores que atendem alunos com Transtorno do Espectro do Autismo (TEA). O trabalho, delineado como uma pesquisa-ação de cunho colaborativo, contou com a participação de gestores, professores da rede estadual de ensino do Rio Grande do Norte (RN) e pesquisadores do campo da Educação Especial. Dados de entrevista conduzida com o grupo de gestores revelaram a inexistência de um modelo de PEI a ser utilizado nas escolas. Registros dos questionários respondidos por 23 docentes indicaram lacunas formativas no campo do TEA. Com base nas demandas evidenciadas, foi delineado um curso teórico-prático sobre o PEI ao grupo de docentes. Em seguida, os professores e pesquisadores elaboraram, de forma colaborativa, um modelo de PEI a ser inserido em plataforma eletrônica. Por fim, o instrumento foi validado por 5 juízes externos (pesquisadores) e 13 juízes internos (cursistas). O modelo proposto serviu de alicerce para a estrutura de PEI criada pelo sistema de gestão educacional do RN.

Palavras-chave: Transtorno do Espectro do Autismo (TEA). Plano Educacional Individualizado (PEI). Validação; Formação docente.

## Elaboración y Validación de un Plan Educativo Individualizado para Alumnos con Autismo: Contribuciones de un Programa de Formación Docente

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### Resumen

El objetivo de este estudio fue elaborar y validar un modelo de Plan Educativo Individualizado (PEI) destinado a ser utilizado por profesores que trabajan con estudiantes con Trastorno del Espectro Autista (TEA). La investigación, delineada como un estudio de acción colaborativa, contó con la participación de directores, profesores de la red estatal de educación de Rio Grande do Norte (RN) e investigadores en el campo de la Educación Especial. Datos de una entrevista realizada al grupo de directivos, revelaron la falta de un modelo de PEI para ser utilizado en las escuelas. Los registros de cuestionarios respondidos por 23 docentes indicaron lagunas formativas en el campo del TEA. Basándose en las demandas evidenciadas, se delineó un curso teórico-práctico sobre el PEI para el grupo de docentes. Posteriormente, los profesores y los investigadores elaboraron en colaboración, un modelo de PEI que se insertaría en una plataforma electrónica. Finalmente, el instrumento fue validado por 5 jueces externos (investigadores) y 13 jueces internos (participantes del curso). El modelo propuesto sirvió como base para la estructura de PEI creada por el sistema de gestión educativa de RN.

Palabras clave: Trastorno del Espectro Autista (TEA). Plan Educativo Individualizado (PEI). Validación; Formación docente.

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### Introduction

Brazil has approximately two million people diagnosed with autism spectrum disorder (ASD), a neurobiological condition characterized by socio-communicative and behavioral impairments. The presence of this population in Brazilian schools has significantly increased in recent decades. Records show the enrollment of over 400 thousand children and adolescents with ASD in the school system, accounting for nearly 25% of individuals who receive special education services (Inep, 2023). In the state of Rio Grande do Norte (RN), out of 5,841 enrollments of learners with special needs, 977 had a diagnosis of ASD (Sigeduc, 2021). In line with national data, students with ASD represent the second-largest group receiving special education services in the state of RN.

Despite their presence in schools, these students often exhibit deficient academic performance in regular teaching contexts. Contributing to these challenges are gaps in teacher training and a lack of curricular differentiation

(Azevedo; Nunes, 2018; Marin; Braun, 2020). In response to this situation, teacher training in the use of the Individualized Education Plan (IEP) emerges as a solution to address curricular and pedagogical challenges. The IEP is a collaborative methodology that serves as a planning and evaluation tool. It outlines academic and functional goals for students receiving special education services, taking into consideration the regular curriculum (Pereira; Nunes, 2018; Silva; Camargo, 2021; Swain; Hagaman; Leader-Janssen, 2022).

While the Individualized Education Program (IEP) is widely recognized as public policy in various countries, it has received minimal attention in official Brazilian documents (Tannús-Valadão; Mendes, 2018). As a result, a significant number of teachers and administrators in Brazil are not familiar with this tool. Additionally, there are few studies specifically analyzing the impact of the IEP on the education of students with ASD (Costa; Schmidt, 2019; Pereira; Nunes, 2018; Silva; Leão; Martins; Crespo; Camargo, 2020). Considering these circumstances, the primary goal of this study was to develop and validate an IEP model tailored for teachers serving students with ASD.

## Method

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This study utilized a collaborative action-research methodology, characterized as a socially and formatively oriented approach involving joint actions between researchers and community members with the goal of problem-solving (Tripp, 2005; Franco, 2020). In the context of this study, researchers served as expert consultants, responsible for integrating a scientific approach into a change process already initiated by educators.

The research progressed through four distinct phases: problem identification, solution planning, action implementation/monitoring, and effectiveness evaluation.

**Setting** – The study was conducted within classrooms at a federal public university that served as the research site.

**Participants** – Participants in the study were divided into three groups: administrators, teachers, and researchers. The first group included the sub-coordinator of special education (SE) for the State and the pedagogical mentor supporting SE teachers. The second group, active in phases 2 to 4, consisted of 23 elementary school teachers working with ASD students in both regular classrooms

and multifunctional resource classrooms (MRC). They were associated with the 1st Regional Directorate of Education and Culture of Natal (DIREC/Natal). The third set of participants, responsible for IEP validation, was selected through convenience sampling (Castanheira, 2013). This group included 5 external judges and 16 internal judges. The first group comprised university professors who worked in the field of special education and IEP researchers, while the second group consisted of teachers who had undergone the training course—10 specializing in special education, 3 from regular classrooms, and 5 from MRC.

**Course instructors** – Six faculty members and two education master's students from the institution hosting the research, all experts in special education (SE) and related fields with a research focus on ASD and/or IEP, conducted the course. Additionally, two undergraduate students worked as project collaborators.

**Instruments and Materials** – (1) Interview scripts for administrators; (2) Professional profile questionnaires for course participants; (3) Multimedia equipment; and (4) Iramuteq® software

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**Procedures** – The project was submitted and approved by the Research Ethics Committee of Universidade Federal do Rio Grande do Norte (No. 3.440.89). Following the collaborative action research model, the study was developed in 4 stages:

(1) Problem Identification (Formative Demands) - the purpose of this stage was to (a) identify formative demands related to the IEP through interviews with the administrators, and (b) recruit teachers to participate in the study

(2) Teacher Training - In response to the identified needs in stage 1, a 52-hour theoretical-practical training course was developed and implemented. The classes were conducted in person, and course materials were accessible on a digital platform (Moodle) at the university where the research was conducted.

(3) Collaborative Construction of the IEP - Following the training course, 3 meetings, each lasting 4 hours, were held with teachers to develop an IEP guide for the state. During these sessions, researchers presented IEP models covered in the course and engaged in discussions about materials posted by teachers on the digital platform.

(4) IEP validation - In this stage, the effectiveness of the implemented practice was assessed. Following the methodology employed by Munster, Lieberman,

Samalot-Rivera, Houston-Wilson (2014), the IEP model underwent content validation by 21 judges. The evaluation form was designed based on three criteria proposed by Santos & Munster (2012): clarity of language, theoretical relevance, and application feasibility.

**Data Analysis** – Data from field notes and class activities conducted during the course were analyzed using the Iramuteq® 0.7 alpha 2 software (Camargo & Justo, 2013).

## Results

### Stage 1. Formative Demands

Aligned with the action research methodology, the aim of this phase was to identify the problem. Data for this stage were gathered from interviews conducted with administrators. Given that the IEP was the focal point of the research, the special education vice-coordinator was queried about how schools perceived the instrument. According to her the IEP was:

[...] a planning tool that provides strategies for the special education teachers to mediate the teaching and learning process of the students who may have this need given their specific learning conditions (SE Vice-Coordinator, 2018).

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The vice-coordinator's statement highlights two crucial aspects. Firstly, the concern about the exclusive involvement of a single professional in conducting the IEP process, despite national and international literature defining it as a collaboratively constructed instrument (Costa; Schmidt, 2019; Herr; Bateman, 2006; Silva; Camargo, 2021; Swain; Hagaman; Leader-Janssen, 2022). Secondly, the emphasis is on the role of special education teachers in mediating the learning process of students with special needs. Notably, in the state of RN, this responsibility falls on a special educator who works with students with disabilities in regular classrooms. This professional role, established through Technical Note No. 19 published on September 8, 2010 (Brazil, 2010), was primarily designed to support students with ASD and intellectual disabilities in regular schools. It's important to highlight that, as per the latest

census, 100% of students with disabilities in the state of RN are enrolled in regular K-12 classrooms (Inep, 2023).

Given the challenges encountered by special education teachers in mediating this process in the state, the Department of Education launched continuing education programs on the IEP in 2018. In this context, the pedagogical mentor disclosed that training programs primarily took place:

[...] through forums that are training sessions that have brought together education professionals in a way that can strengthen, mainly, the educational support for students with ASD due to the considerable demand in the school network from the state. Another strategy is IEP training through WhatsApp, where they guide each other, exchange information and experiences; I consider it a very productive forum (Pedagogical Mentor supporting Special Education Teachers, 2018).

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The aim of these training sessions was to create an IEP model based on national literature, given the absence of guidelines in the state of RN or even in Brazil. Due to limited regulation, documents concerning IEPs published in the country mainly feature models centered on existing educational services, such as the Specialized Educational Support (SES) (Pereira, 2021). In line with this perspective, the Department of Education in RN guided MRC teachers to develop the SES Plan using a template provided by the "Fascicle 1 – Inclusive Regular School" (Brazil, 2010b). No specific guidelines were provided to support teachers in developing IEPs.

These data indicate the coexistence of two planning models in the state's educational system: the SES Plan "[...] under the responsibility of teachers working in MRC or SES centers, in coordination with other regular education teachers" (Brazil, 2009, p. 2); and the IEP "[...] under the responsibility of support teachers (special education teachers) in coordination with other regular education teachers and MRC teachers" (Pedagogical mentor supporting EE Teachers, 2018). It is worth noting that the former was already widely used by MRC teachers in the network, while the latter was still under construction during the research.

The IEP fragmentation can, in part, be explained by the roles undertaken by the MRC teacher and the Special Educator. In accordance with the Specialized Educational Support Plan, the MRC teacher sought to develop

functional skills so that the student could understand the curricular contents defined by the IEP – led by the special education teacher. The goal of the SES Plan would ultimately be to facilitate the IEP implementation, helping the student develop the necessary skills to participate in regular classroom activities. This operational structure bears similarities to the Integration Paradigm, where it is required for the student to develop basic competencies to be integrated into the regular classroom (Carneiro, 2008).

Acknowledging the identified needs, the Department of Education expressed interest in participating in this study with the objective of collaboratively constructing an IEP model that emphasizes the individual rather than SES services provided. Consequently, the participation of teachers working with students with ASD in the 1st Regional Directorate of Education and Culture (1st DIREC), located in the city of Natal/RN, was proposed.

## Stage 2. Teacher Training

With the support of the Department of Education, 23 elementary school teachers were selected to participate in the training. The professional questionnaire administered during this phase revealed that 7 teachers worked with students from 1st to 5th grade, while the others were involved with those from 6th to 9th grade. Among them, 9 were special educators, 3 were regular 6th to 9th-grade teachers, and 6 were MRC teachers. Sixteen held undergraduate degrees in Pedagogy, and others had degrees in Mathematics, Literature, History, or Art Education. Nine had specialization courses in education. Importantly, only 3 teachers had prior experience with IEPs, and these educators worked in MRC or SES services.

To address the identified demands in the first stage of the research, the researchers proceeded with the preparation and implementation phase of the planned action, which involved a training course. Four themes were selected for the course: inclusive education, theoretical aspects of ASD, evidence-based practices for students with ASD, and Individualized Education Plans. Each topic was covered by two teachers in two four-hour training sessions. Additionally, ten four-hour practical study sessions (case studies) were conducted. During these sessions, participants worked in pairs and were guided by the research team to identify the special education needs of the students with ASD they were supporting. The purpose of this activity, conducted using a problematizing

methodology (Berbel, 2001), was to assist participating teachers in reflecting on the functional and academic demands to be addressed in the IEP.

In this stage of the research, participants utilized the virtual platform to delve into the scholarly content from the classes and generate written records of their acquired knowledge. They were tasked with describing how they could (or could not) implement what had been discussed in class. These records, referred to as field notes, played a crucial role in monitoring the impact of the training. Subsequently, the research team analyzed and discussed these field notes during class meetings.

Although the course covered various important topics, we will focus on the content presented in sessions 7 and 8, specifically addressing the Individualized Education Plan (IEP). These sessions centered on the collective identification of items to be included in the instrument. Following the presentation of the content, the course instructor proposed a dynamic activity, as outlined in the field notes of teacher 5 (T5).

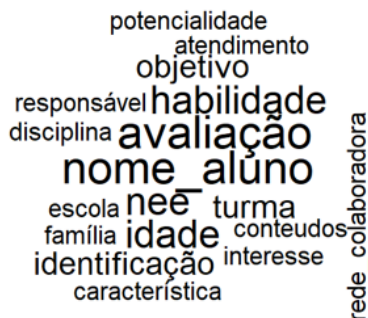
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The teacher (course instructor) [...] sought to collect information from the class about what we know about planning, and then we collectively built a concept for the term IEP, which was typed for everyone to see. Following that, we were asked to, in pairs, create a draft, only with topics necessary for building the IEP. Next, each pair presented to the class what was built. We were then able to see various models [...] (T5, 2020).

The written records underwent lexical analysis using Iramuteq software, resulting in the word cloud depicted in Figure 1.



Figure 1: Word Cloud generated from the activity related to IEP items

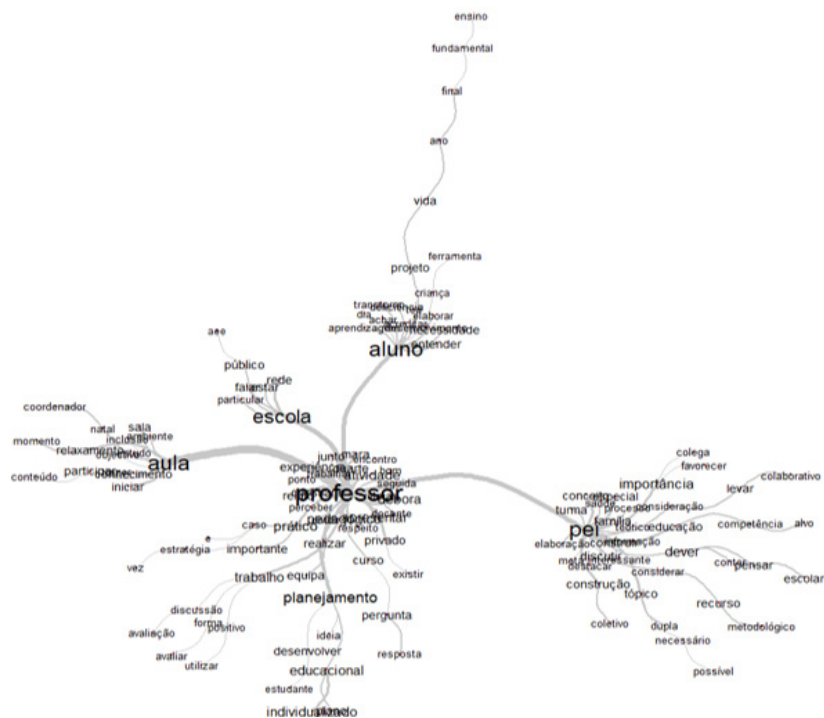


Source: The authors.

The figure highlights three groups of words. The first group relates to an Individualized Education Plan (IEP) model centered on the student (aluno), where data such as name (nome), age (idade), skills (habilidade), and educational needs (NEE – special educational needs) gain prominence. The second group pertains to the collaborative aspects of the instrument, with a high frequency of words like collaborative network (rede colaborativa) and family (família). Lastly, the third group encompasses the purpose of the IEP, which includes, in addition to identification (identificação) and characterization (caracterização), the student's evaluation (avaliação).

The components of the IEP, collectively identified during the dynamic activity led by the course instructor, were further enriched by the field notes of the teachers. Subsequently, the entries made by the participants on the online platform at the conclusion of sessions 7 and 8 were analyzed. Figure 2 illustrates a similarity analysis of these records:

Figure 2: Similarity analysis of field diaries from sessions 7 and 8



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Source: The authors.

This analysis facilitates the identification of connectivity between words, contributing to an understanding of the text's structural construction and the themes of relative importance. In the figure, five interconnected word groups are identified: *teacher* (professor), *IEP* (PEI), *class* (aula), *student* (aluno), and *school* (escola). The teacher group, which seems central in this model, is linked to terms like *planning* (planejamento) and *work* (trabalho), suggesting the teacher's role in the IEP construction process. The IEP group, in turn, connects with words such as *construction* (construção), *collaborative* (colaboração), *colleague* (colega), and *collective* (coletivo), referring to the teamwork nature of the process, extensively discussed in the sessions.

The connections apparent in the group related to class suggest elements associated with the training course. This is indicated by the 2 sessions conducted in the classroom, which included a relaxation moment before the content presentation. The *student* (aluno) group involves words such as

*teaching* (ensino), *elementary* (fundamental), *final year* (ano final), characterizing the participating teachers' focus. Lastly, the word *school* (escola) connects to terms like *public network* (rede pública), *private* (privada), and Specialized Educational Support - *SES* (AEE), which may indicate the places where the IEP would be developed.

The field notes from teacher 2, retrieved from the virtual platform, provide additional insights to complement this analysis. In this segment, the teacher precisely discusses the constitutive elements of the IEP:

Why? Because the student with a disability has the right to an adapted curriculum [...] for what? Because, in this way, it will be possible to assess them based on their own progress, to have a document that supports my practice and helps evaluate the student and the interventions carried out at school. For whom? So that the student and the teams that work with him can together develop coherent and complementary goals. What should it contain: this is one of the most difficult to think about. It must contain the contents, the objective of each content, the student's possibilities, necessary resources, and evaluation strategies. Who should participate? When possible, the student, teacher(s), school team, multiprofessionals (if any), and family (T2, 2020).

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The difficulty in identifying the components of the Individualized Education Plan (IEP), as noted by the teacher, can be attributed to two factors. Firstly, the public education system lacks a standardized model for implementation. Secondly, there is a deficiency in training for effectively utilizing this instrument.

Moreover, the teacher's responses align with the problematizations raised by the course instructor during session 7, reflecting knowledge consistent with the literature. The teacher underscores the right of students with disabilities to a curriculum tailored to their unique needs (Mascaro, 2020), emphasizing that assessments should be based on intraindividual parameters (Pletsch; Glat, 2012; Swain; Hagaman; Leader-Janssen, 2022).

Additionally, the teacher highlights the importance of a collaborative network involving the school, student, family, and multiprofessionals as an indispensable factor for the IEP (Pereira; Nunes, 2018; Silva; Camargo, 2021; Tannus-Valadão; Mendes, 2018).

### Stage 3. Collective Construction of the IEP

In the final stage of implementing the planned action, the researchers facilitated the collective construction of the IEP. In the last three sessions, each lasting 4 hours, models of IEP discussed in the course were projected onto a board. These models were supplemented by teacher records extracted from the field notes.

As a collaborative effort, seven sectors to be included in the instrument were collectively identified. The relevant information for these sectors was compiled into an electronic spreadsheet (Excel), featuring message boxes (pop-up) that guide users on filling each cell.

Sector I was designated for student identification and included fields for the student's name (*nome do aluno*), school name (*nome da escola*), names of guardians (*pais/responsáveis*), date of birth (*data de Nascimento*), education level (*ano de escolaridade/nível de ensino*), school shift (*turno*), diagnosis (*diagnóstico*), and IEP insertion/review date (*data de execução do PEI*). Additionally, there was a space labeled *student characterization* (*caracterização do aluno*) where functional abilities could be described. Figure 2 illustrates that guidance for entering information into these cells was provided through a pop-up message box. (this box reads *describe the socio-communicative, social, cognitive and sensorial characteristics of the student*).

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Figure 3: Sector II – Student Identification with example pop-up box in the cell

IDENTIFICAÇÃO DO ESTUDANTE		
NOME DO ALUNO(A)	Gustavo Cruz	
DATA DE NASCIMENTO	29/12/2010	
PAIS/RESPONSÁVEIS	Célia Cruz	
ANO DE ESCOLARIDADE	4º ano	
ESCOLA	E.T.I. Joaquim Torres	
NÍVEL DE ENSINO	Fundamental I	
TURNO	Matutino	
CARACTERIZAÇÃO DO ALUNO(A)	CALENDRÁRIO DE EXECUÇÃO DO PEI	
	Início	01.03.2021
	1ª revisão	01/05/2021
	2ª revisão	01/07/2021
	3ª revisão	01/09/2021
Conclusão	01/11/2021	
DIAGNÓSTICO CLÍNICO/ JUSTIFICATIVA DA NECESSIDADE DO PEI		

Source: The authors.

Sector II, as shown in Figure 3, collects information about regular classroom teachers, including their *names* (*nome*) and *teaching components*

(componentes curriculares). It also includes spaces for entering details about the *types of support services provided at the school* (tipos de apoio pedagógico especializado realizado na escola). This sector encompasses *MRC* (sala de recursos), *Brazilian Sign Language Teachers* (professor de LIBRAS), *class interpreters* (intérprete de sala de aula), and a section for including *other services* (outros).

Within this section, the SES teacher is expected to include in the *MRC* (atendimento na sala de recursos) segment, the *frequency* (frequência), *duration* (duração) and *arrangement* (individual or group; composição), as well as the individual work plan, referred to as the *SES Plan* (plano de AEE). Similar to the previous sector, informative boxes are provided to guide the user in entering information.

Figure 4: Sector II – Identification of teachers and types of services

PROFESSOR(A) DA SALA DE AULA COMUM			
COMPONENTES CURRICULARES	Nome	COMPONENTES CURRICULARES	Nome
1 Língua portuguesa	Sandra	5 Geografia	Gizelda
2 Educação Física	Clara		
3 Matemática	Paulo		
4 Ciências	Miriani		
<b>TIPOS DE APOIO PEDAGÓGICO ESPECIALIZADO REALIZADO NA ESCOLA</b>		São apoios pedagógicos especializados realizado dentro da escola destinados a atender às características dos estudantes em situação de deficiência e garantir o seu pleno acesso ao currículo em condições de igualdade, promovendo a conquista e o exercício de sua autonomia.	
<b>Tipo</b>			
<input checked="" type="checkbox"/> Sala de recursos			
<input type="checkbox"/> Professor de Libras			
<input checked="" type="checkbox"/> Intérprete de sala regular			
<input type="checkbox"/> Outro?			
Atendimento na Sala de Recurso Multifuncional			
<b>FREQUÊNCIA SEMANAL</b>	<input type="radio"/> 1 vez por semana <input checked="" type="radio"/> 2 vezes por semana <input type="radio"/> 3 vezes por semana Outro? _____		
<b>TEMPO DE ATENDIMENTO</b>	<input type="radio"/> 50 minutos por atendimento <input type="radio"/> Outro? Qual? _____		
<b>COMPOSIÇÃO DO ATENDIMENTO</b>	<input checked="" type="checkbox"/> atendimento indiv <input type="checkbox"/> atendimento em g <input type="checkbox"/> _____		
<b>PLANO DE AEE</b>	<a href="#">PLANO DE AEE</a> O professor de AEE deve clicar no hiperlink "PLANO DE AEE" e será aberta uma planilha para preenchimento desse documento cujo modelo vem sendo utilizado por essa categoria de professores do RN.		

Source: Pereira (2021).

In Sector III (Figure 4), information about professionals from different areas of expertise (área) working with the student was included, along with the frequency and duration (frequência/tempo de atendimento) of the assistance provided.

Figure 5: Sector III – Identification of other professionals

IDENTIFICAÇÃO DE OUTROS PROFISSIONAIS ENVOLVIDOS		
Área	Frequência	Tempo de Atendimento
Neurologista	1 vez ao ano	40 minutos
Terapeuta Ocupacional	1 vez por semana	30 minutos
Fonoaudióloga	1 vez por semana	30 minutos

Source: The authors.

Sector IV (Figure 5) served as a channel of interaction among all team members, including *family* (família), *professionals* (profissionais), and the *school* (escola).

Figure 6: Sector IV – Collaborative guidance

ORIENTAÇÕES COLABORATIVAS		
Área Origem	Expectativas	Orientações/Sugestões
Família	<p>A família do estudante deve inserir seu comentário aqui. Caso ocorra alguma dificuldade de preenchimento por parte da família, o professor de educação especial, da SRM ou da sala de aula comum podem transcrever as recomendações verbalizadas por ela.</p>	"Que os professores persistam nas estratégias propostas, mesmo que meu filho demore a aprender". Que meu filho consiga acompanhar e aprender os conteúdos em que está matriculado. (Vânia- Mãe)
Profissionais		
Escola		

Source: The authors.

The first column (área de origem) indicated the author of the record. The second column was used for inserting the student's *learning expectations* (expectativas), and the third column was dedicated to *assistance and suggestions* (orientações/sugestões) for each member of the IEP team.

Sector V encompasses the inclusion of the *student's strengths* (potencialidades) and *difficulties* (dificuldades).

Figure 7: Sector V – Characterization for learning

Caracterização para aprendizagem		
	Potencialidades	Dificuldades
1	Faz o mapeamento detalhado através de desenho do bairro onde mora	1 Não se locomove pela escola com independência
2	Compreende fala associada com figuras	2 Pouca compreensão verbal

Source: The authors.

Sector VI comprised fields for pedagogical work in the regular classroom, organized into three categories, as illustrated in Figure 7: (1) *Curricular components* proposed by the National Common Curricular Base (componentes curriculares); (2) *Modified Curricular Plans* (Planos curriculares modificados; PCM), which included plans for each curricular component (history, geography, sciences, etc.). Clicking on the curricular component (hyperlink) opened a PCM to be developed by regular classroom teachers; (3) *Type of curricular adaptation* (tipo de adequação curricular) - specifying the modifications the student needed to access the curricular content. *Curricular adaptations* could fall into two categories: 1. *Accommodations* (acomodações) and/or 2. *Modified Curriculum* (currículo modificado).

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Figure 8: Sector VI – Curricular Area

ÁREA CURRICULAR			
COMPONENTES CURRICULARES	Planos Curriculares Modificados	Tipo de adequação curricular	
Ciências Humanas e suas Tecnologias	<a href="#">História</a>	<input checked="" type="checkbox"/> Acomodações	<input checked="" type="checkbox"/> Currículo modificado
	<a href="#">Geografia</a>	<input type="checkbox"/> Acomodações	<input checked="" type="checkbox"/> Currículo modificado
Ciências da Natureza e suas Tecnologias	<a href="#">Ciências</a>	<input checked="" type="checkbox"/> Acomodações	<input type="checkbox"/> Currículo modificado
	<a href="#">Língua Portuguesa</a>	<input type="checkbox"/> Acomodações	<input checked="" type="checkbox"/> Currículo modificado
Linguagens, Códigos e suas Tecnologias:	<a href="#">Língua estrangeira</a>	<input type="checkbox"/> Acomodações	<input checked="" type="checkbox"/> Currículo modificado
	<a href="#">Artes</a>	<input checked="" type="checkbox"/> Acomodações	<input checked="" type="checkbox"/> Currículo modificado
	<a href="#">Educ. Física</a>	<input checked="" type="checkbox"/> Acomodações	<input checked="" type="checkbox"/> Currículo modificado

Source: Pereira (2021).

*Accommodations* (acomodações) encompass resources, aids, and supplementary services that a student requires to achieve academic goals without modifying them (Wright, 2012). In this section of the IEP, the teacher is tasked with indicating and/or describing the types of instruction, environmental accommodations, and assessments needed by the student. The figure below provides examples of accommodations:

Figure 9: Examples of accommodations presented in the tab

ACOMODAÇÕES	
Instrucionais	<input checked="" type="checkbox"/> Uso de materiais concretos
	<input type="checkbox"/> Notas guiadas de classe
	<input type="checkbox"/> Mapas mentais
	<input checked="" type="checkbox"/> Tutoria de amigos/pares
	<input type="checkbox"/> Instruções rotineiras nas paredes da sala de aula
Ambientais	<input type="checkbox"/> São mudanças ou suportes no ambiente físico da sala de aula e/ou da escola capazes de melhorar o nível de participação acadêmica do(a) aluno(a).
	<input type="checkbox"/> Permitir ao aluno o acesso total ou parcial aos seus livros didáticos e/ou
Avaliação	<input checked="" type="checkbox"/> Tecnologia assistiva, como software de fala para texto
	<input checked="" type="checkbox"/> Respostas pictográficas ou imagéticas
	<input type="checkbox"/> Fonte ampliada
	Qual?

Source: Pereira (2021)

The modified curriculum entails adjusting the student's academic curriculum expectations, aligning them with overall needs. When opting for this choice, the teacher is expected to access the tab or knowledge area of interest and formulate the modified annual curriculum plan.

Sector VII is designed for a descriptive and collective evaluative record of the student's school development across various knowledge areas. Each knowledge area has its dedicated registration space, and comments should highlight what the student learned on a bi-monthly basis. The transformation of this IEP structure into a web tool was a collaborative effort with a team of Computer Graphics professionals from Universidade do Estado do Rio Grande do Norte, as documented by Trindade (2021).



## Stage 4. IEP Validation

The evaluation of the planned action took place in the fourth stage of the research. During this phase, five external judges (university professors) and 16 internal judges (teachers who had participated in the training course) received, via email: (1) an invitation letter explaining the study's objectives and requesting the assessment of the IEP; (2) a copy of the instrument constructed in Stage 3; (3) an IEP implementation manual specifying how to fill out the instrument; (4) an evaluation form containing the validation criteria proposed by Santos and Munster (2012). This included the analysis items of language clarity (LC), theoretical relevance (TR), and feasibility of application (FA). Three scoring alternatives were provided for each item, assessing the level of adequacy: adequate, somewhat adequate, and inadequate.

The Content Validity Index (CVI) is calculated based on the percentage of judges who agree on the evaluated items. This value is determined by summing the total number of positive responses (marked as adequate by the judges) in each item, dividing by the total possible responses, and multiplying by 100 (Coluci, Alexandre, Milani, 2015). For example, if 8 out of 13 judges rate the language clarity of Sector I as adequate while the others rate it as *inadequate or somewhat adequate*, the CVI for that item would be 61%.

To determine the reliability of each assessed sector, the criteria set by Bauer and Gaskell (2005) were employed. Reliability levels are categorized as follows: values above 90% indicate very high reliability, values above 80% indicate high reliability, and values falling between 66% and 79% are considered acceptable. In the provided example, a value of 61% would be considered unacceptable.

The table below summarizes the level of agreement among judges (both external and internal) regarding the three analysis items (Language Clarity, Theoretical Relevance, Feasibility of Application) across the seven sectors constituting the IEP. Additionally, it includes the Content Validity Index (CVI). This information is presented in Table 1.

Table 1: Degree of agreement among judges and Content Validity Index

Setores do PEI	Degree of agreement between judges							
	Analyzed items							
	Lang. Clar.		Theo. Rele.		Feasib. appl		CVI	
	Ext.	Int.	Ext.	Int.	Ext.	Int.	Ext.	Int.
I – Student Id	100%	100%	80%	100%	80%	93%	87%	98%
II – Teacher Id	100%	100%	100%	100%	100%	93%	100%	98%
III – Other profs.	100%	100%	80%	100%	80%	81%	87%	84%
IV- Colab. Orient	80%	100%	80%	100%	80%	93%	80%	98%
V – Learning char.	100%	100%	60%	100%	100%	93%	87%	98%
VI – curric. area	80%	93%	60%	100%	80%	81%	73%	91%
VII – Report	80%	100%	60%	100%	100%	100%	80%	100%
Total IEP	91,4%	99%	74,2%	100%	88,5%	90,5%	84,8%	96,7%

Source: The authors.

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Out of the 21 participants recruited, 18 responded, consisting of 5 external judges and 13 internal judges. The Content Validity Index (CVI) for the complete IEP inventory was overall high, with external judges indicating 84.8% agreement and internal judges indicating 96.7% agreement. In the external judges' analysis, Sector II (identification of teachers) received the highest approval level, while Sector VI (curricular area) showed the lowest agreement at 73%. Although this level is considered acceptable, adjustments are necessary, particularly concerning theoretical relevance, which demonstrated low agreement among judges (60%). Other sectors were considered to have a high level of agreement, ranging between 80% and 87%.

For internal judges, a high Content Validity Index (CVI) was expected across all seven sectors of the IEP, given their significant role in constructing the instrument. Notably, Sector VII (report) achieved the highest approval level at 100%, while the participation of other professionals identified in Sector III received the lowest approval at 84%. A plausible explanation for the lower agreement in this item is the limited involvement of other professionals, especially from healthcare sectors, in the Brazilian school context (Pereira; Nunes, 2018). The formal inclusion of these professionals in a school document may be perceived differently by the group of teachers.

In a comprehensive evaluation of the complete IEP, language clarity was considered high by both internal judges (99%) and external judges (91.4%). Similarly, both groups deemed the instrument viable for application, with external judges at 88.5% and internal judges at 90.5%. Theoretical relevance, however, received varying scores, reaching 100% for internal judges and 74.2% for external judges. Notably, there was low agreement (60%) among external judges in Sectors V, VI, and VII. It's essential to highlight that this group of researchers provided numerous suggestions to enhance the instrument's theoretical relevance. These suggestions were incorporated into the final version of the IEP.

## Conclusion

The academic success of a significant portion of students diagnosed with ASD hinges on various factors, with curricular differentiation playing a crucial role. Nevertheless, studies indicate that many teachers are not familiar with such practices, and there are no national public policies providing specific guidelines for their implementation. One of the methodologies employed in the curricular differentiation process is the Individualized Education Plan (IEP). Consequently, the overarching aim of this study was to develop and validate, through a collaborative action research, an IEP model tailored for students with ASD within the context of Rio Grande do Norte.

Two main issues were identified in the initial phase of the research. First, there was an absence of an IEP model in public schools in Rio Grande do Norte. Second, teachers exhibited limited knowledge about the use of this tool. In response to these findings, an intervention was designed, involving the development of a theoretical-practical course that delved into topics related to the utilization of IEPs for students ASD.

To assess the impact of this initiative, class logs and teachers' field notes were scrutinized. These records revealed that teachers recognized the IEP as a valuable tool for structuring the student's curriculum, with the potential to enhance the quality of learning. Empowered by this newfound understanding, the collaborative group of teachers and researchers crafted an IEP model customized for implementation in the state of Rio Grande do Norte RN.

Subsequently, this model underwent validation by both internal and external project judges.

This study brings substantial contributions to both teaching practice and the research field. In the realm of teaching practice, the proposal holds considerable social significance, especially given the inadequate teacher training and the absence of an IEP model. Another critical aspect is the use of collaborative action research as an investigative methodology, highlighting the social validity of the proposal. In essence, the development and validation of the IEP by its natural agents (teachers) enhance its applicability in real-world contexts.

It is noteworthy that the Integrated Education Management System of the State of RN has adopted an electronic IEP structure based on the instrument developed in this research. The use of this tool establishes a shared computational environment for multidisciplinary teams to monitor the educational development of students with autism and other disabilities. It's important to mention that a prototype of the electronic version of the IEP is described in Trindade (2021).

20 Despite these contributions, limitations were identified in this study. Firstly, due to the COVID-19 pandemic – the period during which the study was conducted – it was not feasible to assess the effects of continuing education on the IEP in teachers' pedagogical practices, as well as the impact of this tool on the schooling process of students with ASD. Another limitation was the restricted participation of teachers from regular classrooms who were not released by school management to participate in the course. These limitations may affect the generalizability of the findings and underscore areas for further research and improvement.

Finally, it is important to highlight the non-participation of family members of individuals with ASD, as well as health professionals, who could have provided valuable contributions to the instrument. The exclusion of these stakeholders limited the potential for interdisciplinary collaboration and understanding of diverse planning realities within the regular teaching context.

We emphasize the significance of shared responsibility among all stakeholders in the creation, development, and evaluation of the IEP. This includes managers, coordinators, teachers, multiprofessionals, the student's family, and the student themselves whenever feasible. Future studies should consider

involving additional stakeholders in training initiatives focused on IEP development. Furthermore, it is recommended to evaluate the impact of the proposed IEP model on teachers' practices and the educational process of students with ASD.

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