English Vocabulary Learning for Deaf High Schoolers with Flipping Books

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Undergraduate thesis for the Degree of Bachelor in Foreign Languages with Emphasis in English

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Bucaramanga

2024

Dedication

To my mother María and my grandparents Elvia and Omar who with their light and love have inspired me every day to be a better person and to pursue my dreams.

To all my friends, especially Mabel, who in difficult times supported me and encouraged me to move forward.

Laura Vanesa Castro Teran

To God and my family, especially my parents Jimena and Wilson, for giving me the opportunity to achieve higher education with love and kindness.

To my friends, who never doubt my capacities.

To Apolo, for staying with me in the worst of the times, and always comforting me.

Valentina Hernandez Arenas

To my parents, Carlos and Mayerly, whose enlightenment and support encouraged me to chart the way forward and make the right decisions regardless of time and distance barriers.

To Eva, my sister, whom I would like to guide and support in everything that my abilities allow me to do.

Andrés Camilo Urbina Rodríguez

Acknowledgments

We received significant support and assistance during the project development process. Initially, we express our gratitude to Professor María Eugenia Rojas Villamizar, our director, whose proficiency, unwavering direction, and perceptive criticism enabled us to carry out suitable and engaging material. Secondly, we are grateful to Luisa Fernanda Hernández Valdivieso, Wendy Cristina Bretón Rueda, and Maria Camila Sanchez Acevedo, our CSL consultants and interprets, that guided us to create a relatable and accurate content for the Deaf community, and to instruct us for a better social understanding of the matter. We also thank Andrea, who allowed us the meaningful approach between the students' and the materialization of our project. Finally, we highly appreciate the experts' participation and their commitment to improve the final product.

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Abstract

Title: Flipping Book as a Didactic Resource for Learning Basic English Vocabulary for High School Hearing-impaired Students in Bucaramanga[1]

Authors: Laura Vanesa Castro Teran, Valentina Hernandez Arenas and Andres Camilo Urbina Rodriguez[2]

Key words: English Vocabulary, English Learning, Deaf Students, Colombian Sign Language, Flipping Book, Categories

Description: This study explores the required characteristics of the design of a flipping book as a didactic resource for teaching basic English vocabulary to high school hearing-impaired students in Bucaramanga. To carry out the research, we adopted the design-based methodology proposed by de Benito and Salinas (2016). The first stage consisted of the contextualization and documentation where the types of hearing loss, how Deaf people learn vocabulary, the influence of technology in foreign language learning, and the most influential features when creating material for Deaf learners were explored. For the data collection and analysis stage, two experts that currently teach written Spanish to the target population were surveyed to gather information about the students' background, interests, needs and English knowledge. For the design and validation stage, first, a graphic artist created the illustrations using Adobe Illustrator, then, the content was assembled in Canva, and finally, it was exported to Heyzine for its visualization. For the second part, to validate the prototype, a panel of four experts in Second Language Acquisition and Colombian Sign Language evaluated the flipping book. From the results emerged four main categories that must be considered to create material for Deaf students: content, language, illustrations and layout organization.

[1] Degree work

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Resumen

Título: Flipping Book como recurso didáctico para aprender vocabulario básico de inglés para estudiantes de secundaria con discapacidad auditiva en Bucaramanga[1]

Autores: Laura Vanesa Castro Teran, Valentina Hernandez Arenas and Andres Camilo Urbina Rodriguez[2]

Palabras clave: Vocabulario en Inglés, Aprendizaje de Inglés, Estudiantes Sordos, Lengua de Señas Colombiana, Flipping book, Categorías

Descripción: Este estudio explora las características requeridas para el diseño de un *flipping book* como recurso didáctico para la enseñanza de vocabulario básico en inglés a estudiantes de bachillerato con discapacidad auditiva en Bucaramanga. Para llevar a cabo la investigación, se adoptó la metodología basada en el diseño propuesta por de Benito and Salinas (2016). La primera etapa consistió en la contextualización y documentación donde se exploraron los tipos de pérdida auditiva, cómo aprenden vocabulario las personas Sordas, la influencia de la tecnología en el aprendizaje de lenguas extranjeras y las características más influyentes a la hora de crear material para estudiantes Sordos. Para la etapa de recopilación y análisis de datos, se encuestó a dos expertas que actualmente enseñan español escrito a la población sorda para recolectar información sobre los antecedentes, intereses, necesidades y conocimientos de inglés de los estudiantes. Para la etapa de diseño y validación, en primer lugar, una artista gráfica creó las ilustraciones utilizando Adobe Illustrator, luego, el contenido se estructuró en Canva y, por último, se exportó a Heyzine para su visualización. En la segunda parte, para validar el prototipo, un panel de cuatro expertas en Adquisición de la Segunda Lengua y Lengua de Señas Colombianas evaluó el *flipping book*. De los resultados surgieron cuatro categorías principales que deben tenerse en cuenta para crear material para estudiantes sordos: contenido, lenguaje, ilustraciones y organización del diseño.

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1. Introduction

For centuries the educational limitations faced by the Colombian minorities has been an enormous barrier to break down. The marginalization of these populations has taken many forms, including limited access to education, employment, and social opportunities, as well as the denial of linguistic and cultural rights.

In the Colombian context, the education for Deaf people started in 1924, thanks to the Sisters of Nuestra Señora de la Sabiduría. In 1938, the Federación de Ciegos y Sordomudos was created, which was diluted through Decree 1955 of 1955; this gave rise to the creation of the Instituto Nacional para Ciegos “INCI” and the Instituto Nacional para Sordos "INSOR". By the end of 1972, the INSOR was attached to the Ministry of National Education as a Public Establishment of the National Order, and its bylaws were approved. Another remarkable achievement in terms of recognition of linguistic rights was Law 324 of 1996 which not only acknowledged Colombian Sign Language (CSL) as the natural language of Deaf community but also granted them the right to use it in all institutions. This law aimed to ensure inclusivity and equal opportunities for the approximately 500,000 Deaf or hard-of-hearing individuals in Colombia (MINTIC, 2021). However, despite this significant recognition, challenges persist. One of the biggest struggles faced by the Deaf community is the lack of access to education. Many schools do not have the resources to provide sign language (SL) interpreters or other accommodations that would allow Deaf students to fully participate in the classroom (Fundación Sordos Colombia, n.d.).

Although it might be thought that limitations are only present in towns and small cities, within the primary cities of Colombia there are still numerous obstacles when it comes to Deaf people. Bringing these scenarios in the actual context of this research, Bucaramanga also faces the same problems. In the two public universities of the city, there are only about 20 students, 14 in Unidades Tecnológicas de Santander (Vanguardia, 2023) and 6 in the Universidad Industrial de Santander. In terms of employment, Deaf individuals may face discrimination and limited opportunities. According to the newest report made by Vanguardia (2020), the Deaf community in the city represents the third biggest population of Deaf people in the country, and 30, 2% percent of the 3,422 of people with this disability are part of the higher education age target.

In spite of the previously mentioned difficulties, there are organizations working to improve the lives of Deaf people in Colombia. For example, the INSOR is responsible for promoting and coordinating programs and policies related to the protection of the rights of Deaf people. Also, the Federación Nacional de Sordos de Colombia (FENASCOL) is a non-profit organization that provides education, support, and advocacy for the Deaf community.

Regarding CSL properties, it has a grammar and linguistic structure different from Spanish, so it is considered an independent and complete language. Despite its recent formalization, CSL is a language that has undergone modifications throughout the century and has been influenced by other sign languages, such as American, French and Spanish (FENASCOL, 2018). However, due to the necessity of connecting with Spanish speakers, Deaf Colombians have to learn Spanish as L2. Although CSL is the natural language of Colombian Deaf people, the vast majority of citizens do not know this language, hence, communication is generally done in Spanish. This phenomenon is defined as social bilingualism, which asserts that

practically all cultures are bilingual, even if the degree of bilingualism varies from one community to the next. Thus, in Colombia, Deaf people are a multilingual minority in both social and statistical terms, whereas hearing people, who make up the majority, hold authority and are predominantly monolingual (Appel and Muysken, 2005, as cited in Valencia-Méndez, D. L. 2022). Finally, despite the fact that the need for bilingual education (CSL and Spanish) for Deaf people is recognized, not every institution offers educational programs that appropriately combine both languages.

Considering the preceding arguments, we decided to support their movement by facilitating the learning of English vocabulary through the design of an interactive flipping book, where they can broaden their horizons by focusing on the vocabulary of English. Since we desire to focus mostly on their needs and their interests, we narrow our target population to high school students in Bucaramanga, Santander. Based on the aforementioned, the following research question arose: What characteristics should an interactive digital flipping book have to foster English vocabulary learning for Deaf students in a school in Bucaramanga?

2. Justification

People all across the globe use English for a multitude of purposes, including a variety of employment prospects, education, entertainment, communication, mobility, and access to global information (Pulat, 2021, p. 3). The main reason for conducting this study is that Colombia still does not meet the needs of the Deaf in terms of teaching foreign languages (FLs) such as English that is not even contemplated in the educational curriculum. This means that Deaf students do not have the same possibilities to study this language as hearing students, and English institutes do not accept them because of their hearing limitation (Molina, 2020, p. 604).

As future English teachers, our target is to provide the chances of different populations to broaden their horizons and avoid the gaps created for the language differences. Another important aspect to consider throughout this research is the influence of ICT tools in the learning process of Deaf people. When the digital improvements are used in different ways like searching new words, cultural exchange, and creative innovation the improvement of the language acquisition and equalities are more evidence than other context isolated of technological tools (Centro de Cooperación Regional para la Educación de Adultos en América Latina y el Caribe (CREFAL), 2012, p. 24, 25).

3. Objectives

3.1 General objective

To create a digital flipping book that facilitates the acquisition of English vocabulary for Deaf students in a secondary school in Bucaramanga.

3.2 Specific objectives

To determine the significant content of the flipping book that fulfills the needs of the participants when acquiring a new language; To identify and categorize the components and characteristics required for the creation of an interactive flipping book adapted to the specific needs of Deaf students into four main categories; and to validate the prototype of the flipping book through a panel of experts on LSC and SLA.

4. Theoretical framework

4.1 Precedents

According to Birinci & Sarıçoban (2021) “because of the lack of hearing, hearing impaired learners have great difficulty in learning new words through the incidental learning process which their hearing peers have”. Several authors describe alternatives for vocabulary development in DS. According to Dimling (2005, as cited in Birinci & Sarıçoban, 2021) Deaf learners' vocabulary development is influenced by three factors: “frequency of word use by parents, visual accessibility (signs, facial cues, or lips for speech reading need to be seen in order to be learned), and contingency (contingent naming or labeling objects when the child is attending to them)”. On the other hand, the interaction between the student and the environment is quite important, since interaction with their teachers and peers increases the flow in which Deaf students can learn and acquire vocabulary, for that reason, the development of vocabulary materials for learning should be correctly acknowledged by their parents and teachers so as to support the developmental process despite the environment (Birinci & Sarıçoban 2021).

Caballero and Riddle (2022) developed a research project about designing an English e-book for Deaf fifth-graders students. They concluded that “there is very little research about English Language teaching and learning to Deaf people in the Colombian context” (p. 52). That is why this project is one of the few resources created for teaching English to Deaf elementary school students in Colombia, which has contributed to this little-explored field.

Arroyave et al. (2016, p. 40) presented a web-based educational resource for learning basic CSL skills, where they included topics such as numbers, food, animals, etc. This resource helps both Deaf and hearing people who are interested to be familiar with CSL. The project was validated by different experts in terms of web development and CSL which also made contributions to the improvement of the tool. At the end of this paper, authors suggested the implementation of SL from other countries such as Brazilian or American sign languages.

4.2 Conceptual framework

4.2.1 Types of Hearing Loss

Hearing loss is the condition of people who are not able to hear the normal amount of dB, which is 20 (World Health Organization: WHO, 2024). There exist different types of hearing loss that affect the Colombian population in their daily routine. According to Vargas-Díaz & Neira-Torres (2015, p. 532), the air conduction and bone conduction may lead to three main types of hearing loss based on the location of the injury: conductive hearing loss, where sound and bone conductors are limited or other complications are absent; sensorineural hearing loss, showing a lack of connections within the cochlea, or the few connections do not function properly; and mixed hearing loss, when the structures of the cochlea and the conductive mechanism are dysfunctional. According to Kral (2013), Deafness is considered the absolute form of hearing loss, “clinically defined as a decrease of hearing sensitivity of more than 90 dB compared to normal hearing level” (p. 3). With the aim of covering as much population as possible for this project, we will adapt the flipping book for all of these hearing disabilities that have hearing thresholds of 20 dB or better in both ears.

4.2.2 Learning Vocabulary for Deaf People

Different authors have researched how Deaf people learn a foreign written language. For Deaf learners, “vocabulary knowledge gains more importance due to the fact that it is one of the restricted things they can learn in a foreign language” (Birinci & Saricoban, 2021, p. 623). Visual techniques are the ones that stand out the most when they learn vocabulary. According to Birinci & Saricoban (2021) drawings, pictures, photographs, graphs, flashcards, crossword puzzles, picture stories, realia in the classroom, diagrams, mime, films, gestures and facial expressions are examples of useful resources teachers can use in the classroom, in that way, students connect the presented material in a meaningful way. Furthermore, thanks to technological advances, visual aids have become easier and more accessible, which favors the acquisition of vocabulary (p. 624). Other studies also have highlighted relevant features when Deaf students learn a written language:

> The colored picture cards should be of real objects and include the printed word. Deaf or hard of hearing students can build their vocabulary through pictures established during storybook reading and use of the open-ended question and answer time. To increase vocabulary, a targeted word will be accompanied with a picture and discussed several times. (Gallion, 2016, p. 15)

On the other hand, among the vocabulary instruction strategies we find the Direct Instruction that “requires explicit vocabulary instruction through presentations of the exact meanings of the target word in stories, synonyms, and activities including using the word in different contexts” (Aldemir et al, 2023, p. 2832). From all this we can conclude that one of the best ways in which Deaf students can learn vocabulary is when it is in context and not isolated,

which makes the words more meaningful. The use of visual aids also facilitates and enriches children's learning and is necessary if a more successful process is to be carried out.

On the contrary, the learning and acquisition of a foreign language becomes a bigger challenge for a Deaf student rather than a hearing one. As Luckner (2010) presented in his research, Deaf children are exposed to a language that cannot be fully understood due to the barrier of sound, recognizing some fragments of it, and developing language communication skills with basic vocabulary and little knowledge about the world (p. 4). To overcome these difficulties and lack of information, it is important for educators to find different teaching alternatives to enhance the integration and improvement of Deaf population in the classroom.

On the other hand, a research conducted by Csizér and Kontra (2020) demonstrated that educational strategies such as cognitive or affective learning are meaningful in the Deaf educational process. Cognitive learning allows the adaptation of the language to be studied, while affective learning utilizes the management of the emotions about the learning (p. 239). Andreev (2023) describes cognitive learning strategy as an active style of study based on the memory and retention capacity of the pupil, improving the knowledge confidence and enhancing the comprehension when acquiring new information. As Csizér and Kontra (2020) presented, activities such as writing down several times the same information, making examples based on the students' contexts, or memorizing the notes taken during the class are effective for the Deaf community, especially for acquiring a new language. Also, cognitive learning strategies help the Deaf students through "stress-free educational context" and words of affirmation regarding their progress, creating a more comfortable environment for them to ask questions and explore the capabilities they have (p. 240-243).

4.2.3 The Use of Technology in Foreign Language Learning for Deaf People

"ICTs serve to develop new ways of learning, pedagogical innovations, and communication processes, as well as to break away from traditional training action" (Naranjo and Chávez, 2019, p. 60). Furthermore, technology has transformed FL learning for people with impairments, bringing up new avenues for successful communication and linguistic competency. Thanks to this, Deaf students may now engage in immersive language learning experiences that are personalized, thanks to specialized software and hardware.

It is said that Deaf people can learn just as well as hearing people, but they need more help, and technology can step in to maximize the exposure time as they are found to be the most common means of additional teaching tools (Sousa, Ferreira & Rodrigues, as cited in Pulat, 2021, p. 1). On the contrary, teachers are looking for less time consuming methods such as computer software; nevertheless, there aren't many possibilities that teach English vocabulary to DHH students (as mentioned in Pulat, 2021, p. 8).

4.2.4 Features of Foreign Language Material for Deaf People's Learning Process

As previously stated, Deaf persons may have significant difficulties accessing foreign language learning resources that suit their requirements. Materials must be designed with relevant elements that are not only accessible but also attractive and practical. Caballero and Riddle (2022) propose a series of characteristics that become crucial when designing material for teaching English to Deaf students. According to Najar and Fonseca (2019, as cited in Caballero and Riddle, 2022), technology makes it possible for knowledge to be presented using a variety of representational strategies, which is advantageous for Deaf students generally. Furthermore,

Caballero and Riddle propose Flexibility, which can be accomplished by using a variety of representational techniques, including pictures, interpretations in Colombian Sign Language, and grammatical explanations (2022, p. 35). Other authors had supported the ideas proposed previously. As Pappas et al. highlighted in their case study, the use of special graphics, fluid continuity between modules of the material, the shortness of each unit, explanatory videos with their respective sign language are also remarkable features for e-learning modules for Deaf population, since they provide efficient, meaningful, and optimum acquisition of the target language (2018, p. 9).

4.3 Legal References

This project is based on relevant national and international legal regulations that address the categorization of Deafness and educational standards for the Deaf community (see Table 1).

Table 1

International and national framework

Year	Name	Contribution
	International	
1980	International Classification of Impairments, Disability, and Handicaps (ICIDH) (World Health Organization, 1980)	Established the parameters for identifying limitations, impairments, disabilities, and handicaps.

1993	Standard Rules on the Equalization of Opportunities for Persons with Disabilities (United Nations, 1993)	Promoted the rights and inclusion of individuals with disabilities so they can fully participate in all aspects of life.
2006	Convention on the Rights of Persons with Disabilities (UN, 2006)	International human rights treaty of the United Nations intended to protect the rights of persons with disabilities.
2008	International Conference on Education “Inclusive Education: The Way of the Future”. (UNESCO, 2008).	Addressed strategies, policies, and practices to create inclusive learning environments.
	National	
1955	Decree 1955	Creation of the INSOR.
1972	Decree 1823	INSOR is attached to the Ministry of National Education as a National Public Establishment.
1991	Political Constitution of Colombia (1991)	Social integration and specialized care for people with disabilities.
1996	Law 324	Created some regulations in favor of the Deaf

		population.
2009	Law 1346	Approves the “Convention on the Rights of Persons with Disabilities” from the UN.
2013	Statutory Law 1618	Established provisions to guarantee the full exercise of the rights of people with disabilities.
2017	Decree 1421, 2017	Regulated the educational attention to the population with disabilities.

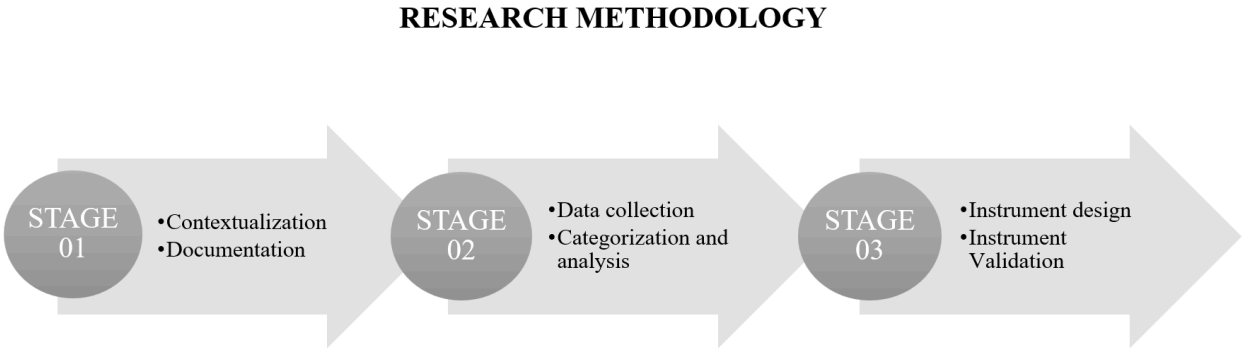
5. Methodological Design

5.1 Type of Study

For the following research, we addressed the transformative paradigm explained by Creswell in 2014. According to Cresswell, the transformative paradigm contains an action agenda where the main target is changing the participants' life in a political way by fighting against inequities, confronting social oppressions, and raising their voices (Creswell, 2014, p. 38). Disabilities in general are considered a group minority since their medical and physical conditions are not only the factors that isolate them for the average of the population (K. Schroeder, 2015). For instance, we decided to shape our research into the transformative paradigm to accompany the Deaf community of Bucaramanga to settle a difference in the way they learn a third language. Bearing in mind the essence of the transformative paradigm, researchers established design-based research as the research outline. As McKenney & Reeves stated, design-based research aims to produce both theoretical development of learning material and practical implementation that leads to educational practice improvement (2021, p. 85), reinforcing the transformative model principle of an action agenda. Conclusively, we choose and adapt the 3-steps-methodological design interpreted by de Benito and Salinas (2016) (see Figure 1).

Figure 1

Methodology stages based on de Benito and Salinas design



5.2 Stages of the Methodological Design

5.2.1 Stage 1: Contextualization and Documentation

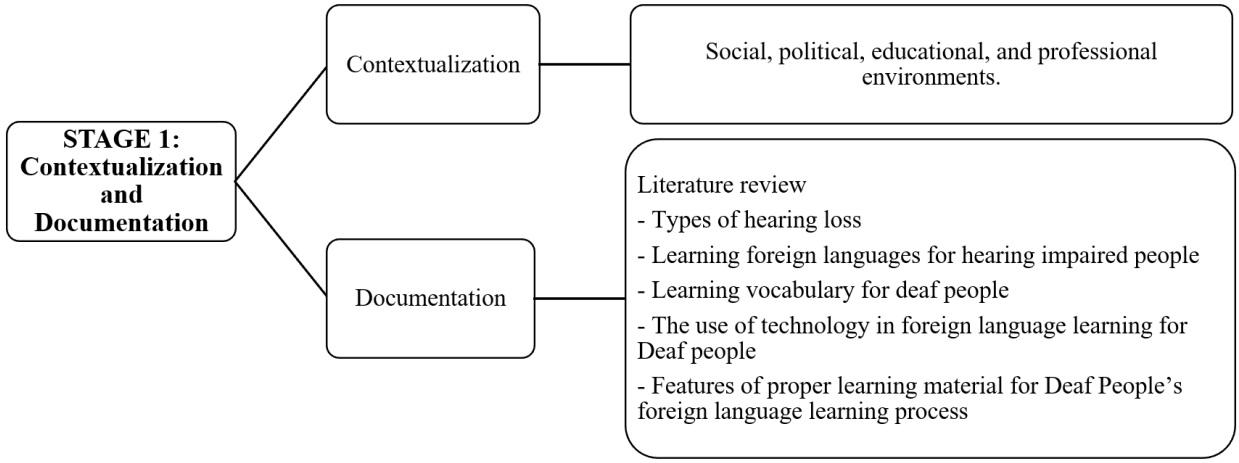
In the first stage, the social, political, and educational conditions of the Deaf community were examined by the researchers, considering the national and international contexts (see Figure 2). It was found that Deaf community has been marginalized and excluded, which has led to a limitation of educational and professional opportunities. An evidence of this marginalization in educational aspects is the lack of official National Curriculum for all the academic fields, especially in English, since Deaf students never face an English class in their regular classes. According to Sánchez, in 2021 only five Deaf students from Bucaramanga obtained their bachelor's degrees thanks to the access program of the Higher Normal School. Even though it is

a huge achievement for the students, this amount of graduates is extremely low in comparison to the graduated auditing students.

From the documentation stage, it was found that students that have some type of hearing loss struggle more (in terms of access to information) than hearing students due to the barrier of sound. To overcome these challenges, authors propose alternatives such as a Direct Instruction, that involves using visual aids and vocabulary in different situations and contexts. These types of strategies have been influenced by the increase of ICT's tools that allow the design and creation of more attractive and engaging visual materials. In the search for didactic materials and educational resources for teaching foreign languages, it was noted that there is not much material designed for the Colombian Deaf population (see Figure 2). Additionally, it was concluded that the didactic resource (in this case, the flipping book) should contain a variety of visual sources like diagrams, pictures, photographs to reinforce the representation of the word (Birinci & Saricoban, 2021, p. 634), accompanied by interpretations in Sign Language. Finally, we concluded that explicit vocabulary with familiar contexts for the students also improves their effectiveness in the learning process of vocabulary (Aldemir et al, 2023, p. 2854).

Figure 2

Stage 1: contextualization and documentation



5.3 Data Collection and Analysis

In design-based research, different data collection instruments can be adapted and implemented during the studies. De Benito and Salinas (2016) highlights case studies, structured and/or semi-structured interviews, various questionnaires, tests, etc. Among these, we chose the semi-structured interviews and surveys, as they are the most appropriate according to our research objectives and the transformative paradigm of our project, since we considered the impact of this material on the Deaf community educational environment. The process of this stage is seen in Figure 3.

The data was collected from 2 participants. The first participant, T1, is a sixth to eleventh-grade hearing Spanish teacher at Higher Normal School in Bucaramanga. She has been a Spanish writing teacher of the target population for almost seven years, improving her professional perspective of the Deaf community through analytical research as a result of the lack of a National Curriculum in the Plan Nacional de Bilingüismo in Colombia (National Plan of Bilingualism). The second participant, T2, is a Deaf linguistic model that supports Deaf high school students in learning written Spanish as a Second Language. She has also been working at Higher Normal School since 2019.

Firstly, we conducted a semi-structured exploratory interview with T1 to gather information about the students' context, their previous knowledge, and the resources, among others (see Annex A). We considered this tool to be one of the most suitable for our aims and the paradigm of our project, since acknowledging the students' backgrounds served us to identify their linguistic needs required for the design of the flipping book, and provided us with an in-depth understanding of the research problem (Mahboob, 2018, p. 71). Once the interview was transcribed, it was analyzed by the color coding technique. This "use of color for encoding information can greatly improve the observer's understanding of the information depicted by image and his/her capacity for remembering it" (Bianco et al, 2015, p. 85).

During the data examination, four different categories emerged: Resources, Limitations, Topics learned in written Spanish, and Teaching strategies (see Annex B). The resources category showed an evident absence of a National Curriculum for Deaf students, and educators of all content areas try to standardize the teaching material and implementations unofficially. Regarding the limitations observed in the Higher Normal School, Deaf students do not have

contact with English as their hearing peers do. Instead, they take written Spanish classes in “parallel rooms”. Another remarkable finding is the slow progress of Deaf students compared to an auditing student due to the adaptation of the content. Regarding the topics learned in the written Spanish class, T1 encourages the students to work with books that have audiovisual alternatives such as graphic novels, movie adaptations, and songs translated into CSL. T1 also remarked on the importance of showing the literal meaning of the words, in the same way as providing different definitions based on the context. For specific grammatical structures, the use of likes and dislikes was chosen by T1 as one of the topics for the academic curriculum. Regarding Teaching strategies, T1 highlighted the use of vocabulary in real-context sentences; likewise, she recommends comparing the grammatical structure of written Spanish, and the structure used in CSL. Activities such as repeating the same activity structure with some variations in the assessment exercises and utilizing recognizable spaces for vocabulary led us to the first notions for the flipping book prototype.

As soon as the analysis of the first set of data was done, a Google-forms survey was designed and administered asynchronously to T1 and T2. We aimed to gather supplementary information about perceptions, and missing information from the initial interview with T1; as well as deepening into the vocabulary the students might be interested in learning in English. The survey for T1 was divided into five contrasting sections: Section 1: Perceptions about the teaching and experience with Deaf students; Section 2: Interest in studying English vocabulary; Section 3: Vocabulary topics in written English interest; Section 4: Specific vocabulary; and Section 5: Study and content methodology. On the other hand, T2 survey addressed only sections 3, 4, and 5 since we required another point of view about the students' interests and specific

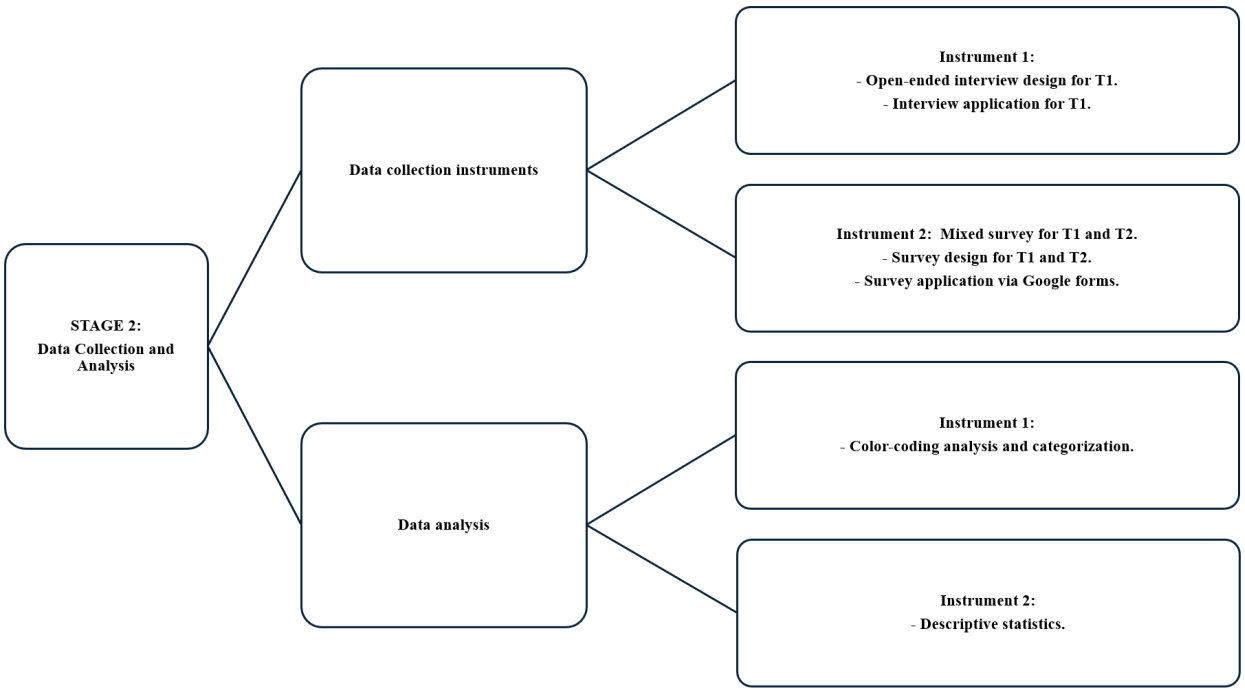
lexical content for our prototype. To analyze the information obtained in both surveys, the descriptive statistics was used. In essence, descriptive statistics are specific methods used to effectively, strategically, and meaningfully assess, describe, and condense collected study data (Vetter, 2017, p. 1797).

For the selection of the thematic units included in the survey, two aspects were taken into account: the information given by T1 about the words that the students know in written Spanish, and also the suggested contents of the Mallas de Aprendizaje de Inglés: para Transición a Quinto de Primaria (English Learning Grids: for Transition to Fifth Grade of Primary) proposed by the Ministerio de Educación Nacional (2016). Since the students do not know English vocabulary, we took the lexicon and grammatical structure of the second grade of primary school, which, according to the framework, corresponds to the Pre-A1 level, an adequate level for beginning learners (p. 120 - 121).

Accordingly, five different topics that, according to T1, are recurrent in the student's lives: animals, adjectives, food, drinks, and sports were chosen. As Domagała-Zyśk & Kontra (2016, p. 145) claim, the teacher must choose a set of vocabulary suitable for the student, especially the one that is attached to their daily experiences, leisure activities, and fields of interest. From these topics, T1 chose the three main topics that are well-known by the target students in their L1 and L2: Food, drinks, and sports (see Figure 3). According to T2 results, all the topics available in the survey are moderately interesting for the students, but none of them stands out considerably (see Figure 4). The results from both surveys matched with the initial proposal aligned to the document from the Ministerio de Educación Nacional.

Figure 3

Stage 2: data collection and analysis



5.4 Design and Validation

5.4.1 Flipping Book Planning Stage

In the early stages of planning the prototype book, we considered that it would contain five units (Animals, Physical traits, Food, Drinks, Sports). However, the number was reduced to three, since we initially planned to pilot the resource with tenth and eleventh grade students, which at the end could not be carried out because of the lack of access to the population. Pappas

et al. (2018, p. 10) also stated the importance of short and concise content for Deaf students to achieve a better and meaningful learning of the vocabulary. Due to the various difficulties, the methodology of our research changed from a pilot study with students to a validation of the prototype by a group of experts. For the final design, we chose the three categories Food, Drinks, and Sports, based on the results from the surveys to T1 and T2.

5.4.2 Lexical Content

The first aspect to consider for the creation of the prototypes was a product that would be the entrance to language learning, with simple and easy-to-understand structures because, as mentioned by T1, the target population has already faced difficulties adapting to written Spanish and the use of Colombian Sign Language. For this reason, we focused on developing a resource that would be meaningful and take into account the needs and limitations of the students.

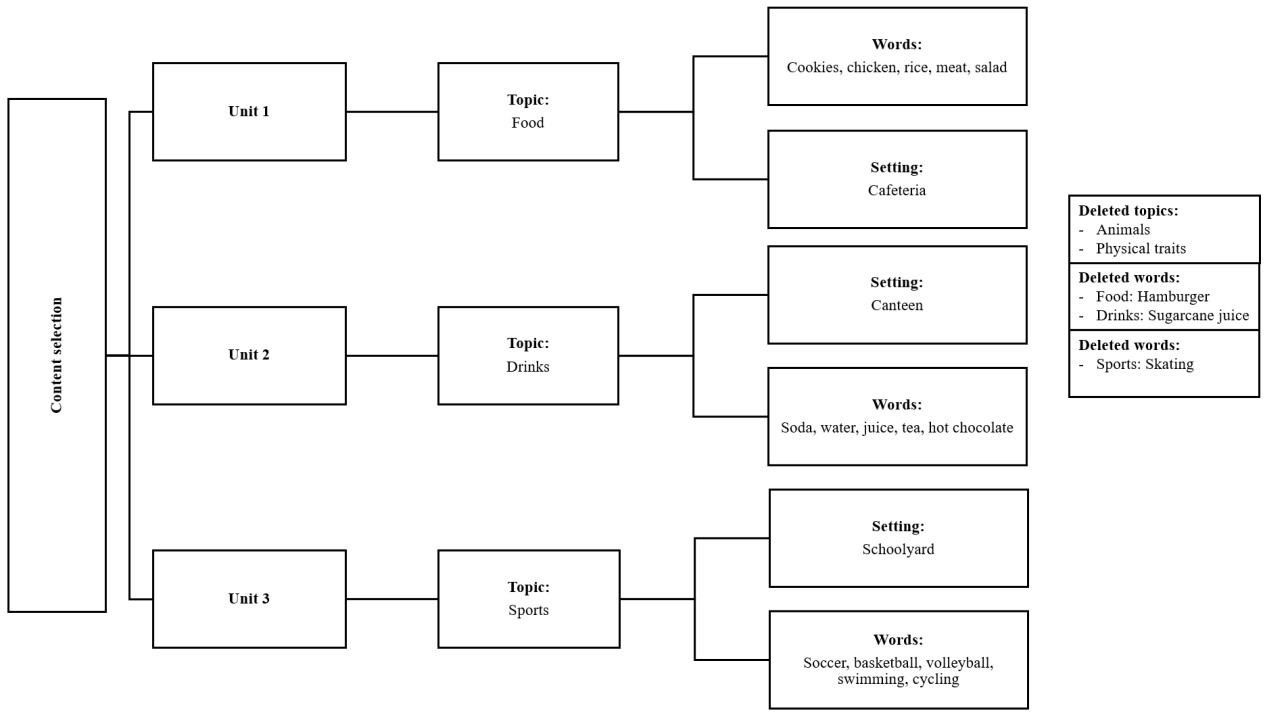
Based on the results obtained from T1 and T2, each of the three vocabulary topics were presented in three units individually (see Figure 4). For Unit 1, we presented the food category, including the words voted by T1: Cookies, Rice, Chicken, Meat, and Salad. On the other hand, Unit 2 approached the drinks category, with words such as: Soda, Water, Juice, Tea, and Hot chocolate. Finally, for Unit 3 we focused on presenting sports vocabulary, using the following words: Soccer, Basketball, Volleyball, Swimming, and Cycling.

Apart from the aforementioned individual words, T1 confirmed that the structure *I like/I dislike* was already known by the students in written Spanish, therefore, we added it to provide a context and to avoid presenting the words in isolation, since teachers must adjust the English curriculum of the Deaf students to consider their limitations and to adjust the planning based on

their needs and current academic contexts (Yunisari et al., 2021, p. 352). Also, these grammatical structures are relevant since they can be used with all the words displayed in the flipping book and it is one of the grammatical structures for Pre- A1 level according to the Mallas de Aprendizaje de Inglés: para Transición a Quinto de Primaria (English Learning Grids: for Transition to Fifth Grade of Primary). It was decided to repeat these syntactic structures throughout diverse vocabulary settings due to the effectiveness of rote learning in memory for short sentences and repetitive structures, demonstrating a better students' performance and significant knowledge acquired (Schönström & Hauser, 2021).

Figure 4

Content selection for the prototype



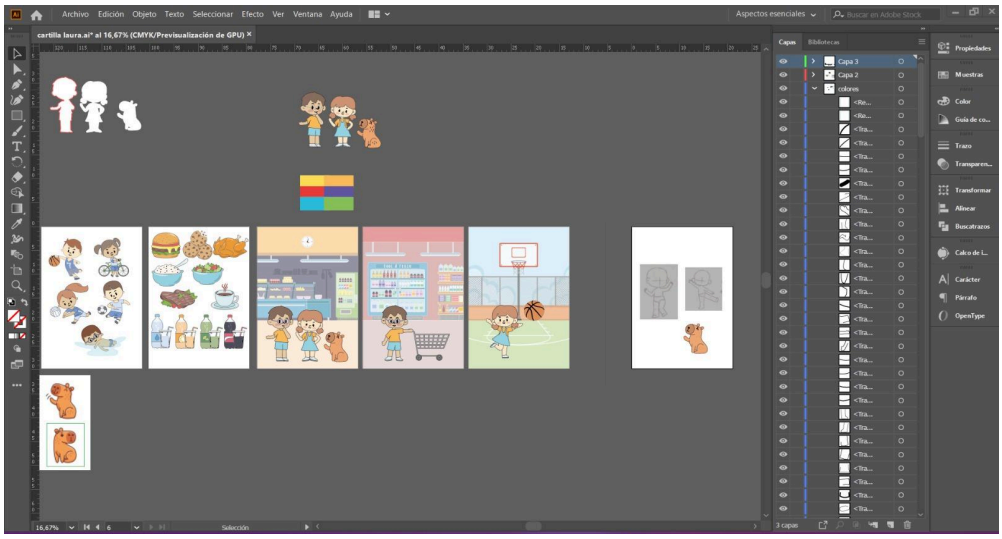
5.5 Flipping Book Design

To accomplish the design of the first prototype of the flipping book, three digital applications were used: Adobe Illustrator, Canva, and Heyzine Flipbooks.

For the first stage of the design is the creation of the illustrations (characters and pictures) to plan the layout of each unit. To create the different characters and pictures for the vocabulary, Adobe Illustrator was employed (see Figure 5). This Adobe extension provides a complete and easy-to-use tool thanks to the variety of available gadgets of this software. From keyboard shortcuts to the workspace interface, it is a complete digital platform that allows not only the drawing of different types of shapes, colors, and sizes, but also the possibility to enhance the creative process of the illustrator (Semwaiko & Chang, 2022, p. 3).

Figure 5

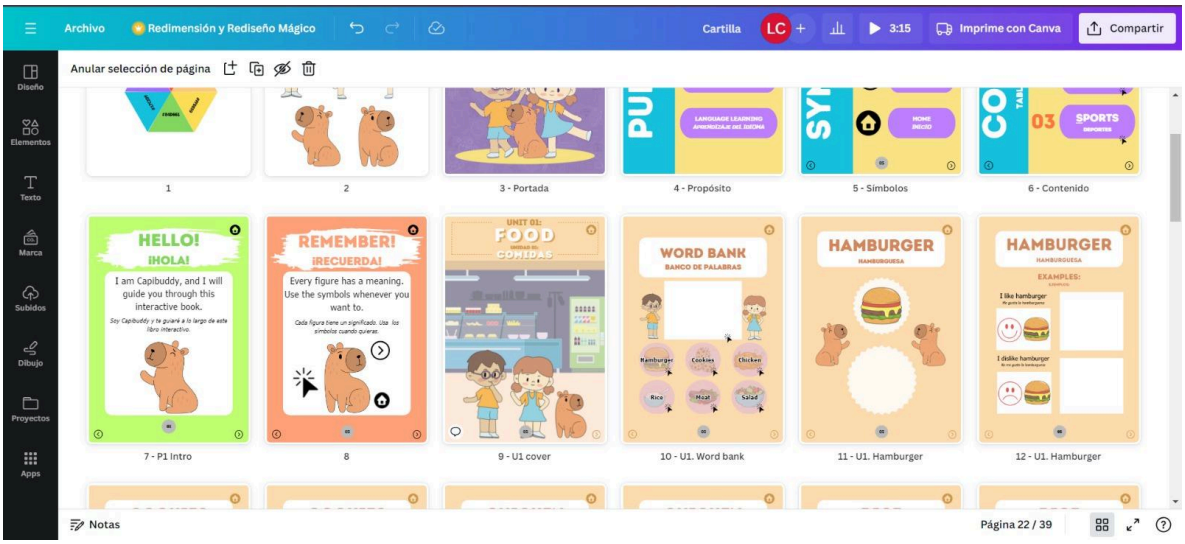
First stage of design



At the same time that the illustrator was finishing the sketches, we started assembling the overall structure in Canva (see Figure 6). This technological application demonstrates to be useful since it creates a pleasant learning atmosphere for students; it is a really complete tool, specially for people who are not expert designers, as a result of the vast amount of resources such as icons, images, fonts, hyperlinks, among others; and it is easy to navigate due to its design, material, and effectiveness in performance in the educational field available for every person with or without internet access. Thanks to these characteristics, Canva provides the opportunity to improve the English learning process and also improves the teaching design process of the educators (2022). In another study conducted by Hazel, Canva App gives compatibility with popular educational platforms, and enhances the new teaching methods while improving the creativity skill in the pupils. Apart from these advantages, Canva provides a range of varied low cost material, and the encouragement of achieving a bigger digital literacy and self-expression for the students (2023).

Figure 6

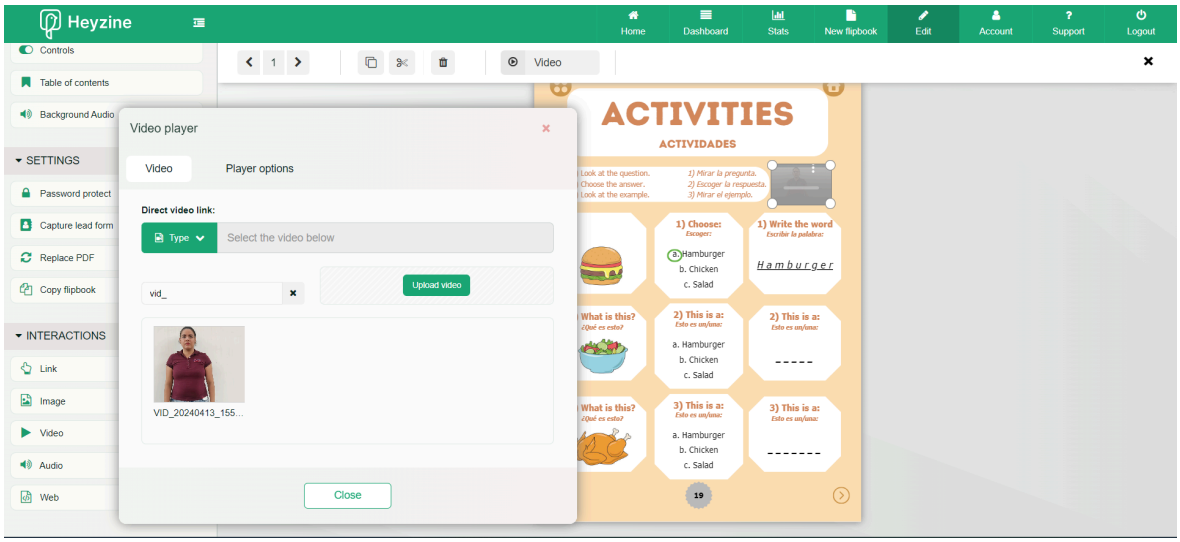
Second stage of the design



For the final stage, in order to obtain the interactive and attractive aspects of the prototype as a flipping book, the first draft was exported to Heyzine Flipbooks (see Figure 7). It is a web-based application that allows the possibility to add videos, pictures, graphics, and links to different content across the material to captivate student's focus, and also give them the feeling they are reading a physical book due to its animations of passing a page (Haniah et al., 2023, p. 58). Additionally, we chose this platform since Canva permits publishing its designs in Heyzine as dynamic flipping books that are interactive and trackable.

Figure 7

Third stage of the design



5.6 Prototype validation

The third specific objective is to validate the prototype through a panel of experts on Colombian Sign Language and Second Language Acquisition. To do so, four experts evaluated the prototype of the flipping book through a rubric that used the Likert scale to measure the validity of the content. E1 belongs to the Faculty of Human Sciences at Universidad Industrial de Santander, better known as UIS, as a professor. The main field of this expert is digital content for learning processes, obtaining her last degree in Master in Didactics of the Language. On the other hand, E2 corresponds to the CSL professor of the Industrial University of Santander. She has been teaching CSL with her sister for almost six years, improving the bond between the sociocultural aspects of CSL that must be considered and the student who is willing to learn

them. Similar to E1, E3 is an active professor of the Faculty of Human Sciences at UIS. She has been working in varied domains such as research foundations, didactics for different ages, among other important fields of study to achieve a good education in teaching. Finally, E4 is a Deaf teacher of the Higher Normal School, becoming part of the "Plan Nacional de Bilingüismo" (National Plan of Bilinguism) to achieve a future population able to communicate in CSL, and to include the Deaf community in their daily basis.

This instrument was adapted from the previous work by De Souza Alexandre et al. (2020) and Yang & Chan (2008) since these authors proposed similar ideas regarding the materials and contents to evaluate (see Figure 11).

The standard we chose for measuring the prototype abides by Content Validity, which, according to Lynn (1986), is the "determination of the content representativeness or content relevance of the elements/items of an instrument by applying a two-stage process'' (p.382). First, the Development stage establishes the structuring of the content through the delimitation and identification of the knowledge and contents that the material must have before carrying out the space for assembly and design. Second, the Judgement-Quantification stage involves a group of experts confirming the content validity of specific components and the complete instrument. Content validity can be quantified using the Content Validity Index (CVI) (Waltz and Bausel, as cited in Lynn, 1989, p. 383).

In terms of population, Obilor & Miwari (2022) state that Content Validity requires the use of acknowledged subject matter experts to determine whether test items accurately assess defined content. Content validity is most commonly addressed in academic testing, where items must represent the knowledge necessary for a specific topic area (p. 62). A minimum of five

experts would offer a sufficient degree of control for chance agreement; nevertheless, it could be challenging to find and get the participation of this many topic/domain specialists in some content areas. Consequently, at least three experts should be utilized in content/domain regions that are sufficiently restricted to exclude a substantial number of experts (Lynn, 1989, p. 383).

As we acknowledged experts on Colombian Sign Language and Second Language Acquisition, along with the didactic resource, a general rubric design was made (see Annex C), being the language of Google Forms the only difference between both resources.

5.6.1 Content Validity: Instrument Construction

According to Yussof (2019), The preparation of the content validation form is the first stage in content validation, which guarantees that the review panel of specialists will know exactly what to anticipate and how to do the assignment (p.50).

As mentioned before, we relied on previous work from De Souza Alexandre et al. (2020) and Yang & Chan (2008). whose research previously assessed and validated educational materials. In the case of De Souza Alexandre et al. (2020), their study "intended to create and validate the content of a printed educational tool (booklet) concerning typical oral language development to inform and advise family, as well as health and education experts''. In the case of Yang & Chan (2008) was "to develop a complete, specific, and validated set of evaluation criteria for English learning websites which can assist English teachers/course designers in designing effective websites for their English courses."

Based on previous research, it was pertinent to adopt a questionnaire design by sections, where 14 questions with a Likert-type response scale were derived. After a thorough analysis and

reflections on the characteristics experts could evaluate in the material, it was decided to address the categories of a) content, b) language, c) illustrations and d) layout. The categories were the same for both groups of experts to make the validation material as complete as possible, and the researchers carefully translated and adapted the LSC rubric to a written Spanish that was easy to understand for sign language experts.

Finally, Google Forms was selected to be the way to deliver the information. According to Yussof (2019), when methodical follow-up is applied to improve response rates and turnaround times, the non-face-to-face technique proves to be very effective (p. 52). Moreover, online or web-based surveys have gained importance due to their lower administration costs, capacity to reach a broad population, advantages in terms of location and time, ease of contacting specific populations, and other benefits (Vasantha & Harinarayana, 2016, p. 13).

5.6.2 Content Validity: Results and Analysis

To analyze the data, most of the authors address the use of the Content Validity Index as a framework to assess the designed materials. According to Yussof (2019), before calculating CVI, the relevance rating should be re-coded as 1 (relevance scale of 3 or 4) or 0 (relevance scale of 1 or 2)(p.52). In the case of the present research, since a 5-point Likert scale was planned, the values from 1 (I strongly disagree with the statement) to 3 (Neither agree nor disagree with the statement) were taken as relevance 0, and the values of 4 (I agree with the statement) and 5 (I strongly agree with the statement) were taken as relevance 1.

For calculating the CVI for each item (I-CVI), Rubio et al. (2003) propose tallying the number of experts who rated it 3 or 4 and dividing that number by the total number of experts

(p.97). This shows the proportion of experts who thought the item was content-valid (see Figure 8).

Figure 8

Calculation of the Content Validity Index

$$CVI = \frac{\text{Number of raters giving a rating of 3 or 4}}{\text{Total number of raters}}$$

Davis (1992, as cited in Rubio et al. 2003, p.97), recommends a CVI of .80 or 80% for new measures. In contrast, Lynn (1989) and Yussoff (2019) point out that for less than five experts, all must agree on the validity of the content for their assessment to be considered reasonable, which means that all the items should have a rating of 1(p.383)(p.51).

Moreover, in order to provide a more complete analysis, a complementary measurement method described by Yussof (2019) was taken into consideration. It consists in calculating the average of I-CVI by dividing the sum of the scores by the number of items (p. 53), as shown in Figure 9. By presenting a parallel method, it will be able to establish with greater precision and reliability whether the items, as well as the material to be evaluated, meet the necessary requirements to be considered as valid (see Figure 9).

Figure 9

Calculation of the Average Content Validity Index

$$\text{S-CVI/Average} = \frac{\text{Sum of I-CVI scores}}{\text{Number of items}}$$

Finally, after analyzing and calculating the results (see Table 2), it became noticeable that all the experts agreed on the item and average validation since an index of 1 was obtained in both methods. It can be concluded that the experts decided the content was valid, despite the suggestion made and applied for the final prototype.

Table 2

Validation results

Items	Expert 1 (CSL)	Expert 2 (CSL)	Expert 3 (SLA)	Expert 4 (SLA)	Experts in agreement	I-CVI
Q1	1	1	1	1	4	1
Q2	1	1	1	1	4	1
Q3	1	1	1	1	4	1
Q4	1	1	1	1	4	1
Q5	1	1	1	1	4	1
Q6	1	1	1	1	4	1
Q7	1	1	1	1	4	1
Q8	1	1	1	1	4	1
Q9	1	1	1	1	4	1
Q10	1	1	1	1	4	1
Q11	1	1	1	1	4	1
Q12	1	1	1	1	4	1
Q13	1	1	1	1	4	1
Q14	1	1	1	1	4	1
					S-CVI/Ave	1

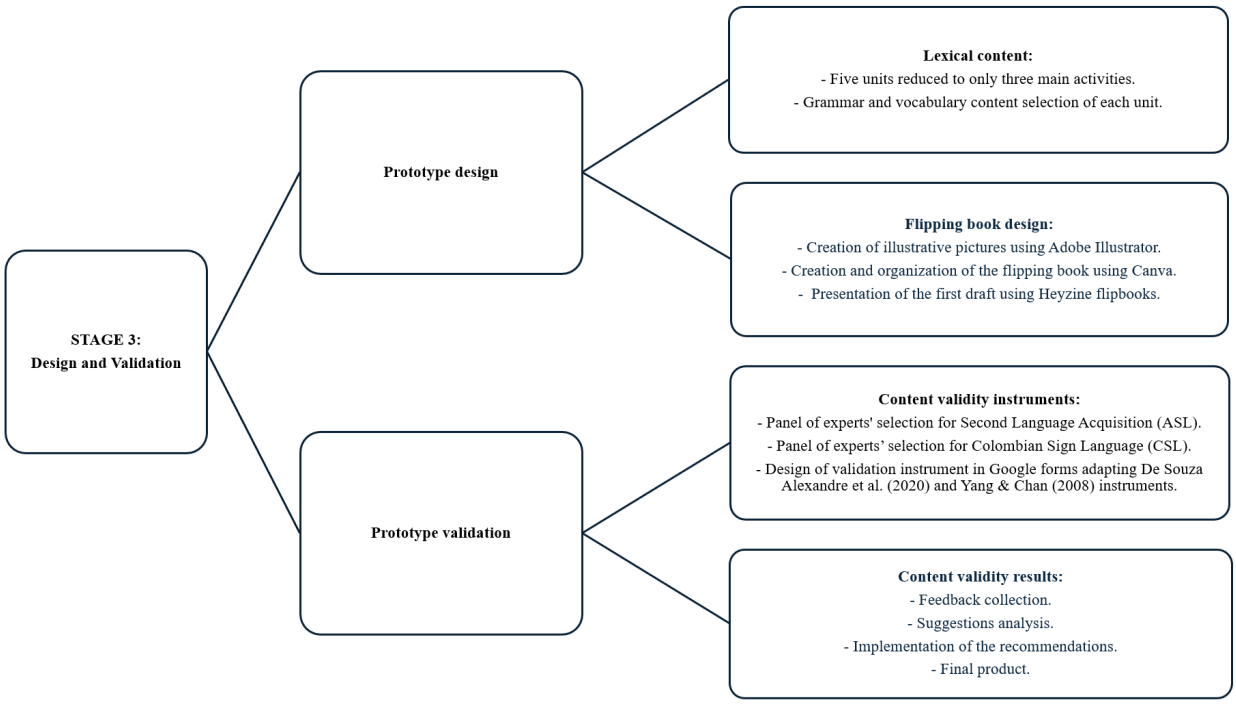
In addition to the validation, experts made some recommendations about the material. First, experts suggested increasing the size of some videos since sometimes it was difficult to view them correctly. This was a problem we considered in the early development process, but it was not possible to make a significant change due to the structure of the flipping book, as well as the size of the pages. On the other hand, experts suggested using more specific signs for a concept to avoid confusion and more specific signs that provide instructions on the activities to be developed. These corrections were implemented to deliver a more accurate experience when using the flipping book and thus fulfill the learning requirements of Deaf students.

Finally, regarding data analysis and in agreement with Lynn (1989), the 4-point rating scale is better, as it excludes the ambivalent mean rating, typical of odd rating scales, although a 3- or 5-point scale could be considered. The use of a 4-point rating system should provide the

instrument developer with clear and sufficient data to calculate a meaningful CVI (p. 384). Figure 11 shows the complete process of the stage 3 of the methodology.

Figure 10

Stage 3: design and validation



6. Findings

This section aims to answer the initial research question: What characteristics should an interactive digital flipping book have to foster English vocabulary learning for Deaf students in a school in Bucaramanga? The findings were addressed from the four categories obtained across the research: Content, Language, Illustrations, and Layout. To achieve a wider and professional perception of each category, we considered the suggestions made by the four experts that validated the flipping book to have a better result of the final product. Therefore, “E1, E2, E3, and E4” will be the abbreviations for each one of the professional experts.

6.1 Content

After completing the entire research process, one important characteristic found when creating a flipping book as an educational resource is that vocabulary selection should not be taught in isolation. On the contrary, the more contextualized it is, the greater the opportunities students will have to learn the target vocabulary, as it was stated by Aldemir et al. (2023, p. 2832). For instance, we defined the aspects that input and output activities must contain for a significant learning approach. As Birinci & Saricoban presented in their research (2021), the content has to be presented in diverse forms (pictures, videos, graphics, puzzles), in that way, students will connect the presented material in a more meaningful way (p. 624). For that reason, the input and output of the flipping book were shown in different manners so the students could have various opportunities to learn the lexicon.

Apart from varied contexts for the vocabulary presentation, the types of words that are regularly used by the Deaf and hard of hearing population must be taken into account. In their academic writings, Deaf students usually utilize more nouns and verbs than adverbs, adjectives, and conjunctions, which leads to more detailed descriptions and complex sentence structures (Alqraini & Paul, 2020, p. 470). For instance, the totality of the words chosen for the flipping book are nouns that the target population certainly understand, and are also part of the regular context of the Deaf students, as Domagała-Zyśk & Kontra claimed in their study (2016, p. 145).

6.1.1 Diverse Types of Inputs

One of the most valuable types of inputs in this flipping book is the Colombian Sign Language interpretations. The presence of a sign language interpreter in the videos results in a greater reception and understanding by the Deaf and hard of hearing population than using conventional teaching methods. According to Debevc et al., the use of videos as a resource enables the Deaf community to reach out to the content and use it to study independently, as well as the further repetition of the material and the activities that are signed (2010, p. 210). Keeping this in mind, we made contact with a Deaf linguistic consultant at Higher Normal School, who helped us interpret the signs for the vocabulary and instructions of the prototype. This process was challenging in a way that we observed how our lack of knowledge of CSL had a negative impact on the accurate interpretation of what was being said. For instance, the interpreter signed 'proposal' instead of 'purpose' and 'points' instead of 'symbols'. It was E2 who noticed these inconsistencies and helped us to correct the signs recording a video that we later showed to the interpreter for him to record again. From the SLA point of view, E1 and E4 agreed that the input presentation was fine as we provided diverse forms of representations to convey meanings. However, they suggested changing the font style of some sentences such as: ‘I like cookies’, to make more emphasis on the different vocabulary used. These results indicated that the more variety of resources we provided to the learners for a better understanding of a particular concept, the more advantages they would get when grasping and internalizing the given information.

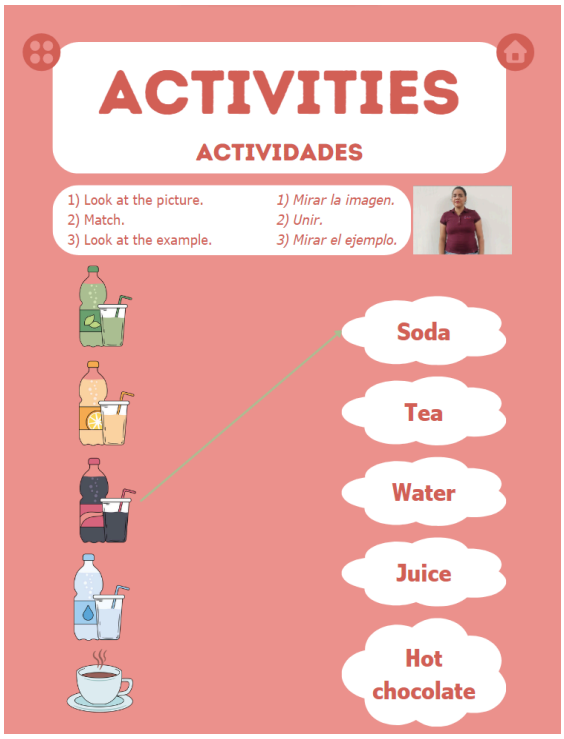
6.1.2. Output Activities

Regarding the output tasks, we decided to design matching and definition-choosing activities, as well as word searches. The matching activities (Figure 12) are suitable for

populations that require a connection between words and pictures. This game is a funny method to obtain a basic understanding of words and definitions and to promote the active participation of the students, working as an alternative to standard matching activities (Rachmawati, 2019, p. 22).

Figure 11

Example of matching activity

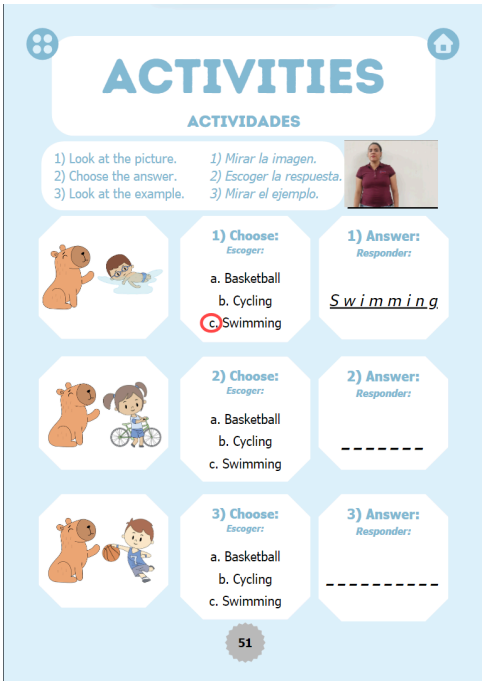


According to a study conducted by Valdehíta and Chacón-García, the receptive knowledge of word meaning is essential to select the accurate definition and fill in the gaps in activities (2019). Keeping this in mind, we combined both of them into one single activity to

reinforce the vocabulary acquired (Figure 13). During the first part of the activity, students are supposed to look at the picture and choose the accurate word for what they perceive. Then, to support the receptive knowledge, they must fill the gaps using the word they chose. This way, the content is given twice during the activity, fulfills the writing goals and makes it easier for students to acquire the vocabulary.

Figure 12

Example of definition-choose and filling in the gaps activity

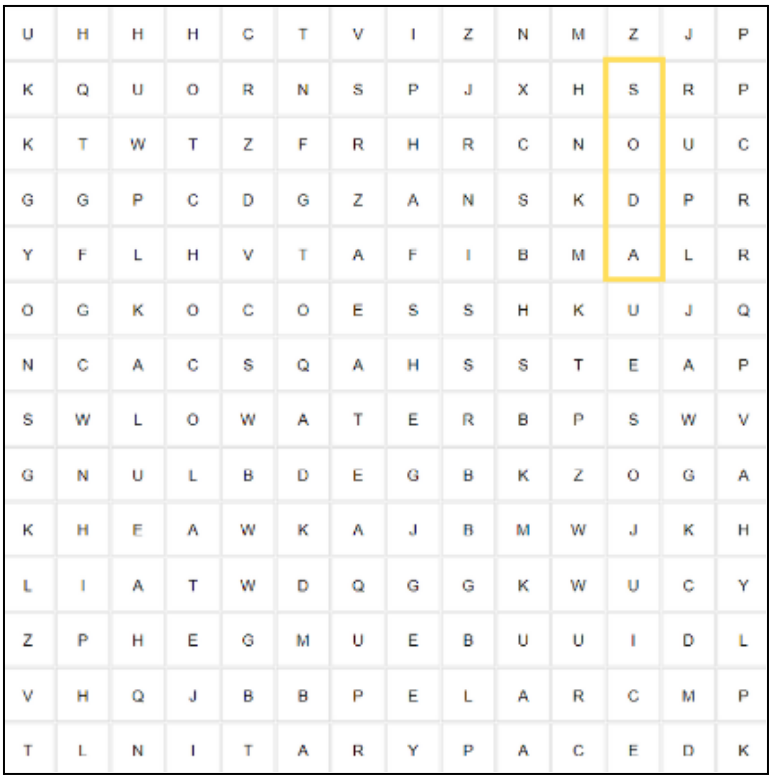


Furthermore, we also decided to create word search activities. As Ningsih (2021) proved in his study, word searches offer an effective method to students in language classrooms and can support the process of learning new vocabulary (p. 58). In each unit, we attached a word search

with all the words they learnt throughout the unit (Figure 14) and “this medium not only adds an enjoyable dimension to the learning process but also instills enthusiasm” (Wahyudi, M. A., & Kusumahwardani, A., 2024, p.49).

Figure 13

Example of word search

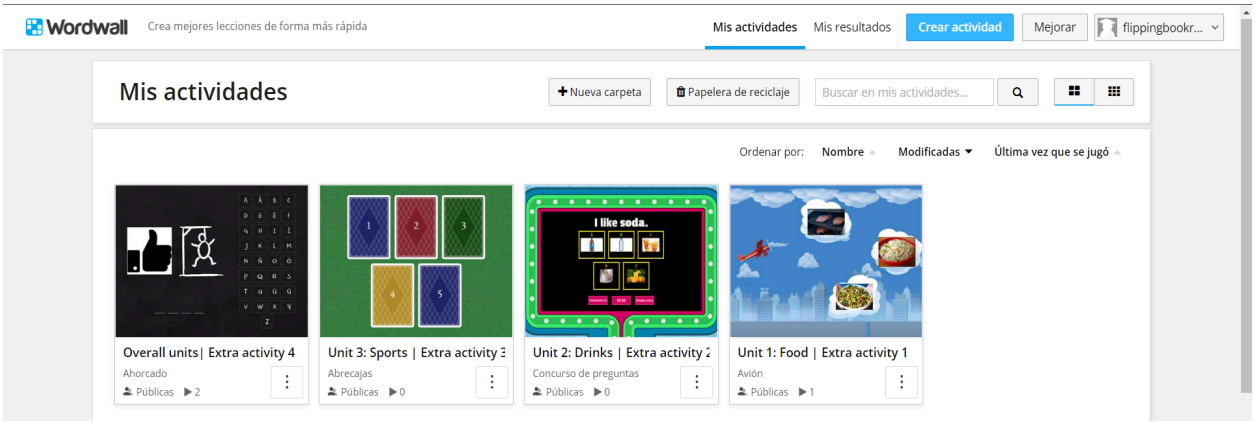


However, E1 suggested adding reinforcement activities in different external platforms. To achieve that, we used another interactive website, Wordwall, which was also highly recommended by E4. Based on the research conducted by Hasram et al., using this external website improves the students’ vocabulary and comprehension through images, videos, and other

resources available on the web page. Wordwall also engages students with repetition strategies (2021, p.1061). This essential characteristic addresses as well the cognitive learning method proposed by Czisér and Kontra, where the memory plays an essential role in Deaf students' learning (2020, p. 240 - 243). Furthermore, we resolved to create four different activities to reinforce all the content learnt in the flipping book (Figure 15): three vocabulary activities per unit, and one activity to review *I like/I don't like* and the three lexicon topics. As E4 advised, we designed other activities on Wordwall such as hangman and memory cards to provide a wide range of exercises. These applied changes reinforce not only the content diversity of the flipping book, but also the language acquisition of our target population.

Figure 14

Wordwall extra activities



6.1.3 Grammatical Structures

The creation of this flipping book was mainly focused on teaching specific words rather than structures. However, for the words to be meaningful, they need to be contextualized; because of that, we decided that the structure '*I like / I don't like*' would be present in all the units, allowing students to "produce English words and sentences in spontaneous, authentic, and motivated reactions" (Adrimurlan et al., 2024, p.45) and helping them to express their preferences. With T1, we proved that the students were familiar with this structure, making it possible to integrate it, and finally it served as the foundation of the three units. Nevertheless, E1 suggested adding more verbs such as 'eat, drink, and play', as an opportunity for students to learn more vocabulary. Eventhough we desired to implement the expert's suggestion, we followed the idea presented by Gallion in 2016, where the constant repetition of the content plays a key aspect to consider when building vocabulary for Deaf students (p. 15). For instance, we decided to leave E1's recommendation for further research. On the other hand, E4 proposed a modification regarding the negative form of the structure. Instead of saying *I dislike*, E4 recommended using the structure *I don't like* since it is a more common expression in both Spanish and English languages. On the other hand, Deaf experts 2 and 3 rated the structures a 5/5. Keeping these aspects in mind, we were able to identify the importance of providing relatable content for the students through a simple but effective grammatical structure.

6.2 Language

To facilitate learning learning for the Deaf students, the accessibility of the vocabulary, the clearness in every instruction given, and the proper instructions' structure play a key role.

With the development of technological resources, Deaf students can learn with pedagogical innovations apart from the traditional experiences they have already faced (Naranjo and Chávez, 2019, p. 60). With the integration of CSL videos in each unit presented in the flipping book, we provide an immersive language learning experience for the students while they feel connected with the material (Sousa, Ferreira & Rodrigues, as cited in Pulat, 2021, p. 1). Another essential aspect to consider for the creation of the flipping is that instructions must be clear and concise. As Pappas et al. stated in their research, Deaf students respond positively when the instructions are short and compressed, since it provides effective results regarding their learning process (2018, p. 9).

6.2.1 Accessibility of the Vocabulary

To support the written information and instructions of the flipping book, we found necessary the use of videos with the accurate sign in CSL. As we studied different researchers that used videos in the corresponding sign languages, we noticed that this strategy led to good results. Based on a study conducted by Golos and Moses, the target vocabulary was related to the most often expressed behavior after the presentations of the videos in sign language, supporting the significant impact in the students' process (2015, p. 9). Cavaletto also proved the learning improvement in the vocabulary of his target population by adding the sign of the word to his experimental program. Cavaletto also highlighted the importance of using a linguistic model for this role (2015, p. 65). In order to follow his advice, we requested the assistance of a native user of CSL. Our signer was a linguistic consultant of Higher Normal School who had already worked

and signed different types of literacy resources, such as short stories, vocabulary, and rote learning videos.

6.2.2 Clear and Concise instructions

To support children' language development, a variety of pedagogical techniques had to be developed in the material. According to Dostal et al. (2019), contrasting and comparing languages and making connections between ideas through fingerspelling, drawing, gesturing, signing, and writing enhance the understanding of Deaf students (as cited in Wolbers et al., 2021, p. 198). To accomplish those important aspects, we compared the content in English, Spanish, and CSL throughout the flipping book. Firstly, the text was presented in written English with simple grammatical structures, using the bare form of the verbs in the activity section. Once the instructions in English were finished, the written Spanish translation was attached below. Finally, to enhance the connection and clarify the information, we left a blank space to add the video in CSL. According to E2, the organization of the content previously mentioned was "visually easy to link for the students", promoting a deeper comprehension of the subject matter and helping them to better assimilate difficult ideas. Contrasting, comparing, and signing the instructions not only enhances the educational process, but also accommodates a range of learning preferences, allowing every student to grasp the material in the most convenient way. Clear and concrete instructions is an essential characteristic was evidenced in the study conducted by Aldemir et al., where the importance of presenting the vocabulary with the exact meaning of the word, and designing activities including the word in a variety of context stood out (2023, p. 2832).

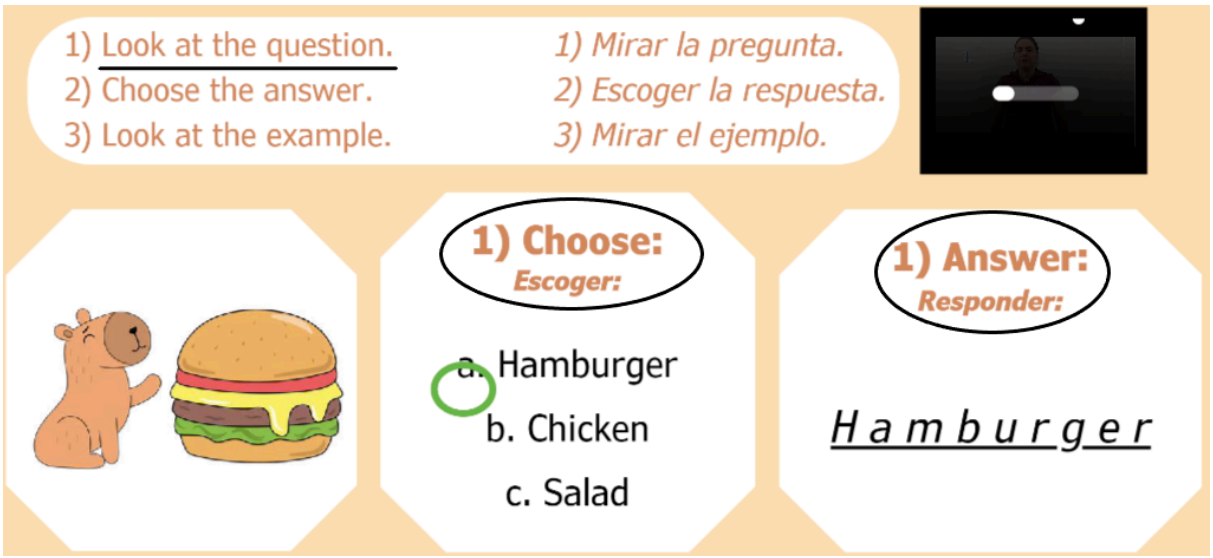
6.2.3 Proper Instructions

The activities' instructions were designed according to the instructions guide suggested by El Kemma (2019). During his research, he found out that teachers should minimize their speaking time and when providing instructions for a specific task, their language should be concise and clear enough for students to understand it; otherwise, students may not follow the instructions; for that reason, teachers should "use short sentences — one sentence for each key piece of information" (p. 75) are giving to the students. The instructions of every exercise were written both in English and Spanish, limited to three sentences of no more than four words each. Additionally, the corresponding CLS instruction videos were attached. The goal was to make the instructions explicit to avoid any confusion among the students and ensure the activities could be carried out properly and efficiently.

Nonetheless, this was one of the categories where the experts made the most suggestions, as they found some writing errors. E1 pointed out that in the word search activity, it was mentioned the word "picture", but it was actually a video, and in the multiple-choice activity, it was said "look at the question", but there was no question (Figure 16). E2 highlighted that the instructions in Spanish were well-structured, however, the instructions in CSL were not clear and some information was missing. Furthermore, both E1 and E2 suggested making the videos bigger since they were too small and it was hard to watch them. On the contrary, E3 and E4 did not suggest any changes. Finally, after receiving the feedback, we decided to edit the size of the videos that contained the instructional information and re-record them more fluently and with no interruptions during the signing.

Figure 15

Wording errors of the instructions



6.3 Illustrations

6.3.1 Illustrations Purpose

Students require multiple means and strategies when learning English vocabulary. The design of activities and resources needs to match their interests and motivations to ensure a meaningful and successful learning process.

Among all the possible means of representation when it comes to designing the material, we resolved to use cartoon designs to support our vocabulary units, since cartoons arise children's imagination and make the whole process easier and more appealing to students than conventional

illustrations, and that is because of the cartoons' immediacy to reality and their colorful motion. (Mansha et al, 2019, p. 291).

Regarding the use of Cartoons in teaching English to Deaf students, there is not enough literature available. However, the research of Setiati & Gemilang (2019) showed that Deaf and hard-of-hearing children struggle to communicate themselves through paragraph writing, using syntax and vocabulary correctly, and found that using image series improved the students' writing abilities as well as the quality of the teaching environment from cycle 1 to cycle 2 (p. 18). Moreover, the research shed light on the benefits of the usage of picture series, such as the increase of the students' participation, enthusiasm, writing skills, and a more fun environment during the classes.

6.4 Layout

6.4.1 Font and Size

The font of the flipping book was chosen taking into account aspects that improve the positive experience with the material and the effectiveness when reading it. According to a study conducted by Josephson, *Verdana Sans Serif* font shows great results in number of regressions (amount of times when the student goes back in the reading activity) and also proves to be aesthetically nice, easy to read, legible, and large, since the size 12 looks bigger in comparison to other *Serif* fonts like Times New Roman (2008, p. 67). Based on the results of the previously mentioned research, we focused the meaningful content on vocabulary presentation and activity

sections to achieve an unintentional comfortable experience for the reader. To find the font size, a variety of characteristics were taken into consideration. Shank highlights the use of fonts larger than 12 points, especially for digital resources such as online courses, articles, and other learning materials (2021). Halamish et al. also pointed out the memory enhancement in the young adults population when the font is larger than 12 points, especially for instructional materials (2018, p. 6). For instance, the size font across the flipping book oscillates from 15 points, being the shortest one, to 125 as the largest one. To place greater emphasis on the English writing, all the content in this language has a larger size compared to the Spanish written content, making the target information more noticeable across the final result (Table 3).

To set aspects such as the cover, titles, subtitles, and the introduction of the flipping book, the fonts *Intro Pro* and *Intro Rust* found in the Canva App were used due to its nature being part of the *Sans Serif* font family. In a study by Dogusoy et al. (2016, p. 8), it was revealed that the participants read from the *Sans Serif* typeface faster and more accurately than the *Serif* typeface, making this type of font the most accurate to use during the prototype design.

Table 3

Font size and its purpose

Font	Size for written English	Size for written Spanish	Purpose	Section	Exemplification
Intro Rust	65 points	25 points	Titles	• Purpose • Symbols • Content • Unit 1: Food; Unit 2: Drinks; Unit 3: Sports • Word bank • Activity; Extra activities	AA AA
Intro Pro	35 points	15 points	Subtitles	• Purpose • Symbols • Content	Aa Aa
Verdana Pro Condensed	35 points	15 points	Grammar and vocabulary content	• Unit 1: Food; Unit 2: Drinks; Unit 3: Sports • Activity instructions; Activity points.	Aa Aa

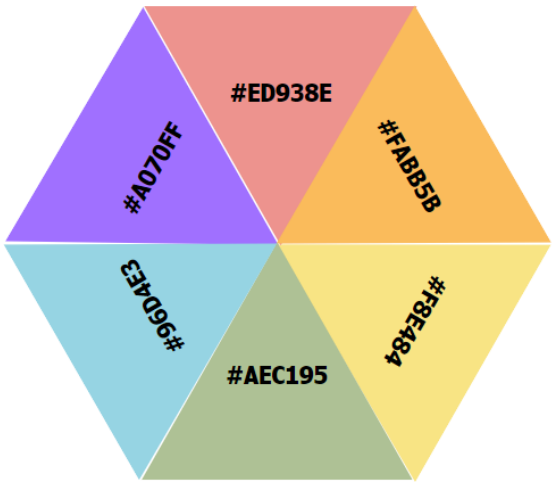
6.4.2 Color Palette

Our color palette was chosen based on different scientific studies regarding the impact of colors on the memory. Multiple investigations, such as Diachenko et al., revealed that “colors of the warm scheme have a higher impact on attention as compared to cold colors”(2022, p. 6-7). Because of this, we decided to use red, orange, and yellow as the main color range for the flipping book, as we wanted the content to be easy to remember and to stimulate the students' memory. Greene, Bell, and Boyer (1983) stated that these three colors have a better effect on the retention of information in the human memory than colors such as brown and gray (as cited in Khan, J., & Liu, C., 2020, p. 4). Regarding the design, we studied the Complementary Scheme of

Color, which “uses direct opposites in the color wheel” (Whelan, 1994, p. 23), and grants harmony to the design. Figure 16 shows the main colors that constitute the final product.

Figure 16

Flipping book Color Palette



6.4.3 Layout Organization

Regarding the organization of electronic books, we found that the final version of the layout is “produced through an interaction among three factors: (1) the content representation; (2) the eBook software; and (3) reader-controlled settings” (Marshall, 2010, p. 22). In general, experts were satisfied with the structure of the flipping book, as they defined it as appealing and organized. Concerning the page size of the flipping book, we decided to use the A4 format, with 21 centimeters width and 29.7 centimeters height. According to Adobe, the A4 format size is the most commonly used in different types of publications, such as brochures, magazines, leaflets,

among others. Due to its popularity, the A4 page size is considered the standard paper size, due to its adaptability in academic and personal contexts (2024).

7. Conclusions

In this study, we aimed to create a digital flipping book that facilitates the acquisition of English vocabulary for Deaf students in a secondary school in Bucaramanga, with a focus on the identification, validation, and implementation of the significant content that fulfills the needs of the target population when acquiring a new language.

Our analysis revealed the absence of a National curriculum for Deaf students, limiting them in their learning processes compared to their auditing peers, especially learning a foreign language like English. It is important to highlight the adequacy of the material that teachers from the Deaf community must do to achieve a homogeneous education, enhancing the possibilities to provide an accurate representation of the knowledge. Through the creation of this interactive flipping book, it is intended to lay the foundations of learning English to Deaf people, providing them with more opportunities for integration at social and academic levels. To do so, four categories arised to address important aspects that Deaf students required in learning materials: content, language, illustrations, and layout. From the Colombian Sign Language and Second Language Acquisition point of view, the final digital flipping book contains an accurate content selection through a variety of input and output activities placed in contextualized spaces, as well as recurring grammatical structures for Deaf students; an approachable language for the population with the use of CSL, contrasting languages, and proper instructions; a precise illustrative aspect thanks to the creation of cartoons; and an aesthetical optimum performance with a harmonized color palette, easy-to-read fonts, and a popular page size. These findings not

only achieve the main goal of the research, but also allow the creation of more learning material in the future.

It is essential to acknowledge the limitations of our study. Firstly, the limited access to the target population did not allow the piloting of the flipping book, restricting possible changes or recommendations provided by the Deaf students directly. Also, there is a considerable absence of qualified experts to participate in the validation process, missing other valuable aspects that may be assessed in further research. Finally, the language barrier to interact with the interpreter directly meant an enormous effort and additional work to sign accurately the instructions and content of the flipping book. Despite these limitations, our study employed rigorous methods to assess the key aspects and elements of each guideline to create a significant outcome.

8. Recommendations

Based on the existing research and the project's constraints, the following recommendations are made to support and to encourage the teaching and learning of English for Deaf individuals in Colombia. Firstly, it is important to know deeply the impact of the material in Deaf High Schoolers of Bucaramanga and how it can be improved based on their experiences and opinions. To do so, researchers suggest carrying the material with teachers of the target population in the future. Also, it would be considered the creation of the 'teacher's version' of the flipping book, providing instructions to interested educators about the recommended use of the material. Another remarkable aspect to consider is to be as specific and careful as possible when choosing and designing each illustration in order to avoid misunderstandings or confusion when presenting other designs and, consequently, not being able to communicate a clear message. We encourage further research to explore different platforms to design the material, allowing changes in space distribution with bigger layouts to maximize some important elements such as the videos in CSL. Also, we recommend exploring different layouts and distributions for illustrations so they could be placed differently on some pages, making the content more interesting and engaging for specific circumstances. Finally, it is highlighted to make extensive use of the available illustrations, and use them to present activities and instructions for each activity or required action.

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Annexes

Annex A. Interview questions

Interview Format

Pedagogical Practice

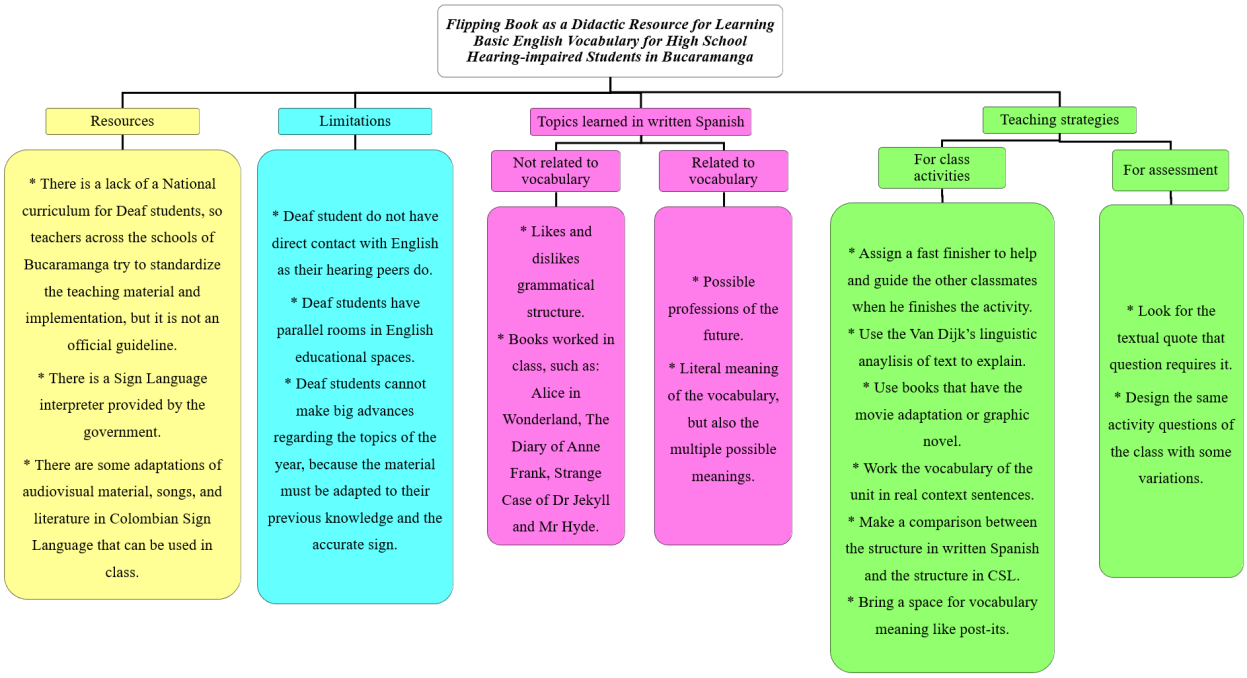
Participant: Written Spanish teacher (T1) **Date:** February 6th/2024 **Length:** 47 minutes 19 seconds

Objective:

To collect information about different aspects related to students' background and experiences at the school, in order to create a broader view to intervene in an appropriate and enriching way for the entire educational community.

Factor	Questions	Answers
Inclusion	¿La institución cuenta con la infraestructura adecuada para estudiantes con discapacidades?	
	¿Hay formación docente para abordar estudiantes con necesidades especiales?	
Resources	¿La institución cuenta con dispositivos tecnológicos que ayuden al desarrollo de las clases?	
	¿Cómo acceden los estudiantes al material complementario de las clases, ya sean libros, fotocopias, etc?	
Socioeconomic Background	¿Actualmente con cuántos estudiantes cuenta la institución? ¿De qué partes de la ciudad son los estudiantes que asisten a la institución?	
	¿Qué estratificación social tienen los estudiantes que asisten a la Institución?	
	¿Qué contexto social y familiar tienen los estudiantes que asisten a la Institución?	
Needs	¿Cuáles son las necesidades más evidentes que se presentan actualmente dentro de la institución?	
	¿Qué servicios presta el colegio de apoyo a los estudiantes de familias en vulnerabilidad? Transporte escolar, comedores, o qué otros servicios?	
	¿Cómo hace la institución para solventar las necesidades de sus estudiantes?	
Curriculum	¿De qué forma se aborda la materia de inglés en la institución?	
	¿El colegio brinda algún tipo de actividad extracurricular para sus estudiantes?	

Annex B. Color coding process sample

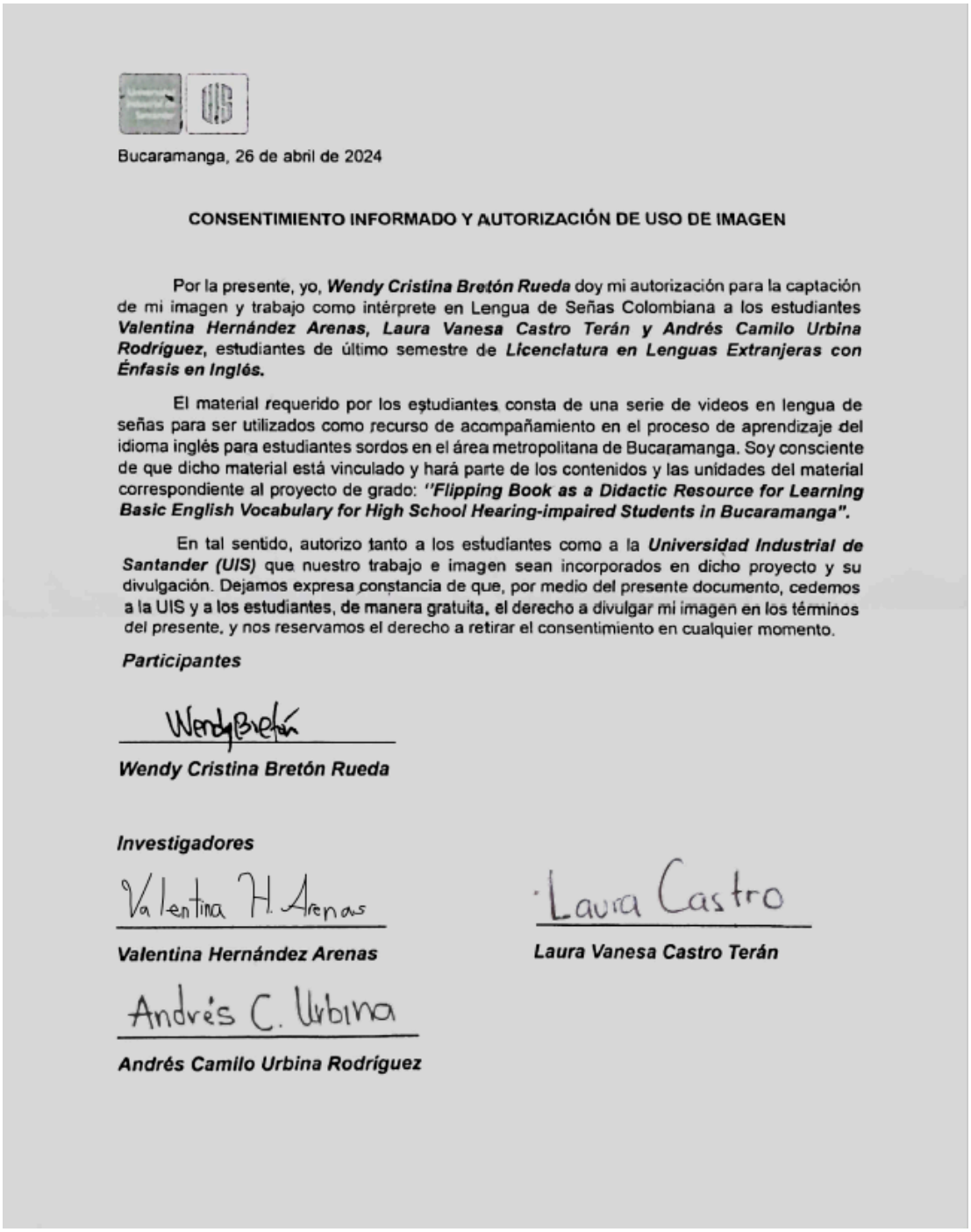


CODING	
COLOR	**DEFINITION**
Light yellow	Resources available for Deaf students.
Light blue	Limitiations found for in educational context of Deaf students.
Light pink	Topics learned for Deaf students in written Spanish.
Light green	Teaching strategies used for

Annex C. Rubric of the validation stage

Category	Question	E1	E2	E3	E4	Average
Content	1. There are different types of input representation for the target audience (Colombian Sign Language videos, illustrations, diversity of vocabulary)					
	2. The variety of activities is accurate to the target audience.					
	3. The grammatical structures are easy to understand for High School Deaf students.					
Language	4. The vocabulary used in the flipping book prototype is accessible to the target audience.					
	5. The written text is clear and concise.					
	6. The instructions for each unit are clear and concise.					
Illustrations	7. The illustrations help to have a better understanding of the content.					
	8. The illustrations capture target population's attention.					
	9. The illustrations clarify the ideas presented in the content.					
	10. The amount of illustrations is adequate to the content of the material.					
Layout	11. The text is adequately formatted regarding font type and size.					
	12. The visual layout is attractive and organized.					
	13. The colors are adequately chosen.					
	14. The size of the pages is adequate.					

Annex D. Informed consent and image use authorization



Bucaramanga, 26 de abril de 2024

CONSENTIMIENTO INFORMADO Y AUTORIZACIÓN DE USO DE IMAGEN

Por la presente, yo, ***Wendy Cristina Bretón Rueda*** doy mi autorización para la captación de mi imagen y trabajo como intérprete en Lengua de Señas Colombiana a los estudiantes ***Valentina Hernández Arenas, Laura Vanesa Castro Terán y Andrés Camilo Urbina Rodríguez,*** estudiantes de último semestre de ***Licenciatura en Lenguas Extranjeras con Énfasis en Inglés.***

El material requerido por los estudiantes consta de una serie de videos en lengua de señas para ser utilizados como recurso de acompañamiento en el proceso de aprendizaje del idioma inglés para estudiantes sordos en el área metropolitana de Bucaramanga. Soy consciente de que dicho material está vinculado y hará parte de los contenidos y las unidades del material correspondiente al proyecto de grado: ***"Flipping Book as a Didactic Resource for Learning Basic English Vocabulary for High School Hearing-impaired Students in Bucaramanga".***

En tal sentido, autorizo tanto a los estudiantes como a la ***Universidad Industrial de Santander (UIS)*** que nuestro trabajo e imagen sean incorporados en dicho proyecto y su divulgación. Dejamos expresa constancia de que, por medio del presente documento, cedemos a la UIS y a los estudiantes, de manera gratuita, el derecho a divulgar mi imagen en los términos del presente, y nos reservamos el derecho a retirar el consentimiento en cualquier momento.

Participantes

Wendy Bretón

Wendy Cristina Bretón Rueda

Investigadores

Valentina H. Arenas

Valentina Hernández Arenas

Laura Castro

Laura Vanesa Castro Terán

Andrés C. Urbina

Andrés Camilo Urbina Rodríguez

Annex E. Flipping book

Link: https://heyzine.com/flip-book/3f6c393b6c.html