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# Development of prototype educational software for children with hearing disabilities for kids

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**Abstract.** At present, there are different factors that lead to creating this auditory difficulty as a medical diagnosis. Becoming an impediment to the integral development of the people since a greater effort must be made for their formation and communication in the daily life. In this way, that in the process of academic training for these people, who have this type of difficulty should be based on the use of new methodological strategies, generating new learning scenarios for the best class development. It will contribute in that space given that its condition of absolute deficiency of listening makes it difficult to understand a specific context, in this case in Spanish, this fundamental matter being a communication mechanism in their daily lives and in the framework of interpretive and argumentative competences. For this subject and given the condition of the student, is considered important to accompany the learning with ICT tools that allow the process to be more dynamic, from the virtual context where the student will directly interact with a learning content in a didactic way understanding in a better context this information that is taught in a classroom with a traditional methodology. Among the main advantages of using these computing resources in class is: having a homogeneous group with respect to the knowledge that corresponds to the degree they are studying and improving their lexicon ability for communication in their daily lives as they go to enrich their vocabulary and understand some words they did not understand. One of the many reasons of the distractions today, are the new technologies, the mobile devices like cellphones, videogames, audio and video players, among other things which don't allow keep the needed focus in class.

Through the use of the developed web application it will dynamically offer a virtual space to interact with the contents of the Spanish subject to the student improving their communication and understanding the context where they live in their daily lives. Applying technological tools searching to solve this problem. The development of this research starts by generating a tool in this case a web application that, in a dynamic way, provides spaces and training activities in the basic contents of primary in Spanish, offering the student a variety of levels in those who can improve knowledge and apply the acquired notions in their training process. Additionally, you can keep track of your progress and score in the levels you are surpassing. By De la Torre S [1].

## 1. Introduction

During the development of this research we are looking the improvement of the learning in the Spanish area. In some countries, having a disability can more than double a child's schooling options, compared with those that do not. In Burkina Faso, having a disability increases the risk of children not receiving



school education by two and a half times. It is therefore not surprising that in many countries children with disabilities make up the vast majority of those who do not attend school. For example, in Nepal, 85% of all out-of-school children are disabled. By Discapacidad Colombia, s.f [2] .

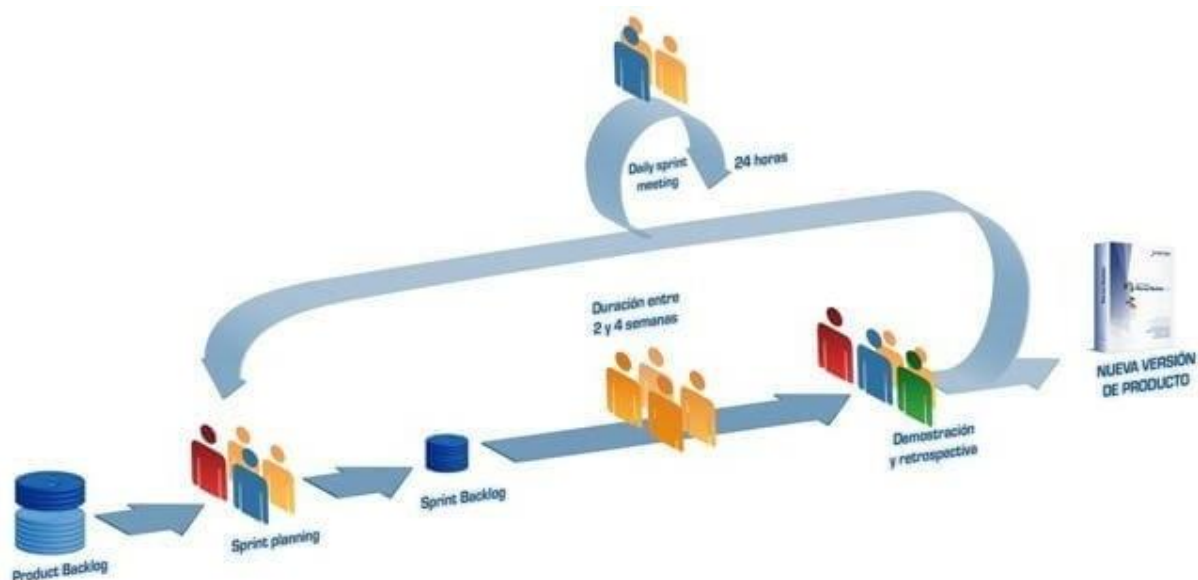
During the development of this research we are looking the improvement of the learning in the Spanish area. In some countries, having a disability can more than double a child's schooling options, compared with those that do not. In Burkina Faso, having a disability increases the risk of children not receiving school education by two and a half times. It is therefore not surprising that in many countries children with disabilities make up the vast majority of those who do not attend school. For example, in Nepal, 85% of all out-of-school children are disabled. By Discapacidad Colombia, s.f [2] . For this purpose, the construction of a web application is proposed, which in an interactive and dynamic way is a support tool in the training process in the main notions of the subject of Spanish. The website allows, among other things, the student's access, since it can be installed in an easy and intuitive way locally, so that its use can be from the computers of an institution. Or, it can be installed in a private hosting that would allow its use from anywhere.

This ease of use is also generated by the simple programming language that will be used, being this PHP, which comes by default in paid hosting plans or locally through XAMPP.

The design will be very visual with basic interactions to make easier the process of any user, independent of disability or academic level, and to strengthen inclusive education, visual assistance with sign language and on-screen text will be presented.

This is how it seeks to provide inclusive education with technological tools that are pleasant to the student and easily accessible. Obtaining as a benefit the strengthening in this area of knowledge.

## 2. Methods



**Figure 1.** Methodology of development

The development is done iteratively and incrementally. Each iteration, called Sprint, has a pre-established duration that on this occasion will be one (1) week, resulting in a software

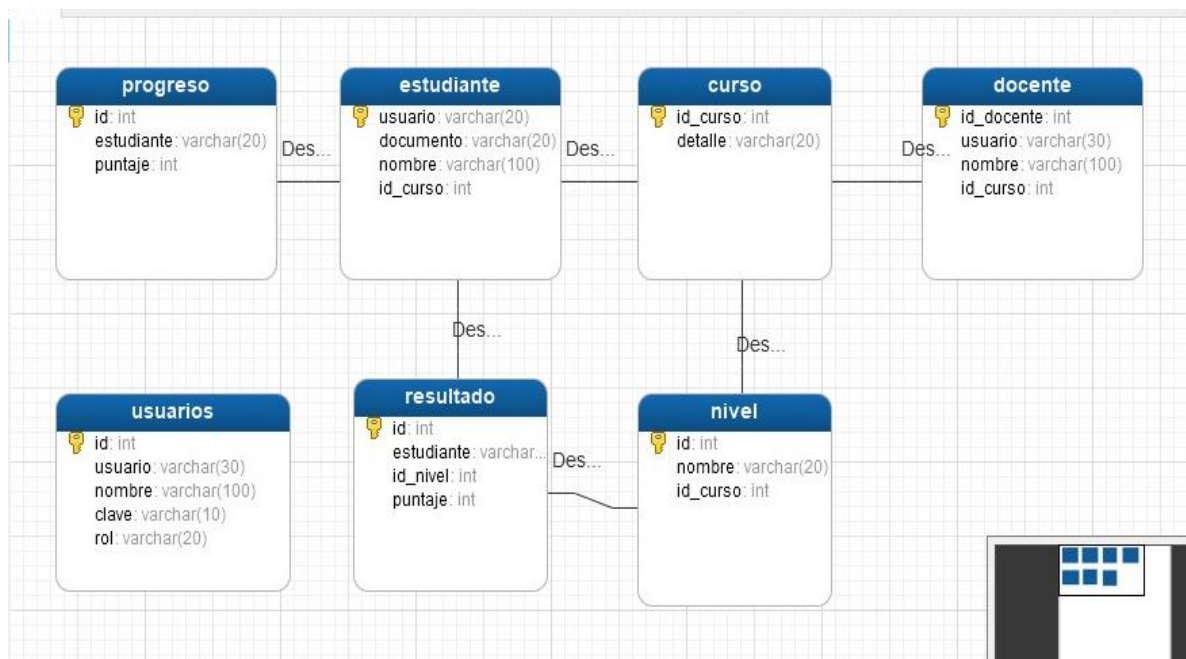
update with new features ready to be used. In each new Sprint, the functionality already built is adjusted and new features are added, always prioritizing those that provide the most business value. By Dyba, T. Dingsoyr . [3]

**Product Backlog:** Set of requirements called stories described in a non-technical language and prioritized by business value, or what is the same, by return of investment considering its benefit and cost. The requirements and priorities are reviewed and adjusted during the course of the project at regular intervals. By Fowler [4]

On this point of the process, requirements indicated by the user are raised. It is in this initial phase, when the information of agendas and questions proposed for the levels that will be scheduled on the website and will be presented to students is collected.

**Sprint Planning:** Meeting during which the Product Owner presents the backlog stories in order of priority. The team determines the number of stories that can be committed to complete in that sprint, for a second part of the meeting, decide and organize how you will get. By Schwaber. [5]

On this point of the process, requirements indicated by the user are raised. It is in this initial phase, when the information of agendas and questions proposed for the levels that will be scheduled on the website and will be presented to students is collected.



**Figure 2.** Data base model

In this way it is considered by the development team that the most optimal programming language is PHP with JavaScript. And the design is developed in HTML and CSS with the Bootstrap framework. The text editor that allows us to link all these tools with ease and productivity that has been chosen is Sublime Text. Then, you can see an image that demonstrates this process.

**Sprint:** Iteration of fixed duration during which the team works to convert the stories of the Product Backlog to which it has committed, in a new version of the fully operational software. Poppendieck M [6].

In each Sprint of seven (7) days duration, twenty levels will be delivered with questions related to the one-year syllabus. Sign language videos, multiple choice questions and text interpretation are presented.

```

19 <meta http-equiv="X-UA-Compatible" content="ie=edge">
20 <link rel="stylesheet" href="dist/css/bootstrap.css">
21 <link rel="stylesheet" href="dist/css/estilo.css">
22 <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.3.1/jquery.min.js"></script>
23 <script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/popper.min.js"></script>
24 <script src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
25 </head>
26
27 <body>
28
29
30
31
32 <?php
33 require_once 'php/conexion.php';
34
35 $consulta=mysqli_query($con,"SELECT puntaje FROM progreso WHERE estudiante='$nombre'");
36 $row = mysqli_fetch_row($consulta);
37
38 $consulta2=mysqli_query($con,"SELECT MAX(id_nivel) FROM resultado WHERE estudiante='$nombre'");
39 $continuar = mysqli_fetch_row($consulta2);
40
41 if ($continuar[0]>20) {
42
43     $nivel_actual=$continuar[0]+1;
44     $consulta3=mysqli_query($con,"SELECT nombre FROM nivel WHERE id=$nivel_actual");
45     $actual = mysqli_fetch_row($consulta3);
46 }
47
48 else{
49
50     $nivel_actual=1;
51     $consulta3=mysqli_query($con,"SELECT nombre FROM nivel WHERE id=$nivel_actual");
52     $actual = mysqli_fetch_row($consulta3);
53 }
54
55 $puntaje = $row[0];
56
57 ?>
58
59 <div class="jumbotron jumbotron-fluid">
60 <div class="container">

```

Figure 3. Source code

Table 1. Sprint Levels

Week number	Level	Grade
Week one	1 to 20	1st
Week two	1 to 20	2nd
Week three	1 to 20	3dr
Week four	1 to 20	4th
Week five	1 to 20	5th

**Sprint Backlog:** List of tasks necessary to carry out the stories of the sprint. (Softeng, s.f.) The list that will take as a base each Sprint, is the one corresponding to the table 1, where the thematic one corresponding to each course is indicated, and work will be done in the delivery of the levels taking into account these questions.

**Daily sprint meeting:** Daily meeting with 15 minutes max of duration, where the team get synchronized and work on the best way. Each one comment what they do the last day, and what is going to do today and if have any issues.

Every meeting is focused on the main thematic of the level planted, the presentation of the questions

and the feedback which allows accelerate and improve the development and designs times.

**Demo and restropective:** Meeting held at the end of the sprint where the team presents the stories obtained through a demonstration of the product. Later, in the retrospective, the team analyzes what was done well, what processes could be improved and discusses how to perfect them.

The weekly delivery of each course with twenty (20) levels, is accompanied by software tests, in which it is expected to participate in the solution of the levels and evaluate the presentation performance.

In Scrum, the team focuses on building quality software. The management of a Scrum project focuses on defining what are the characteristics that the product should have to build (what to build, what not and in what order) and to overcome any obstacle that could hinder the task of the development team. By Cockbun. [7]

The Scrum team consists of the following roles:

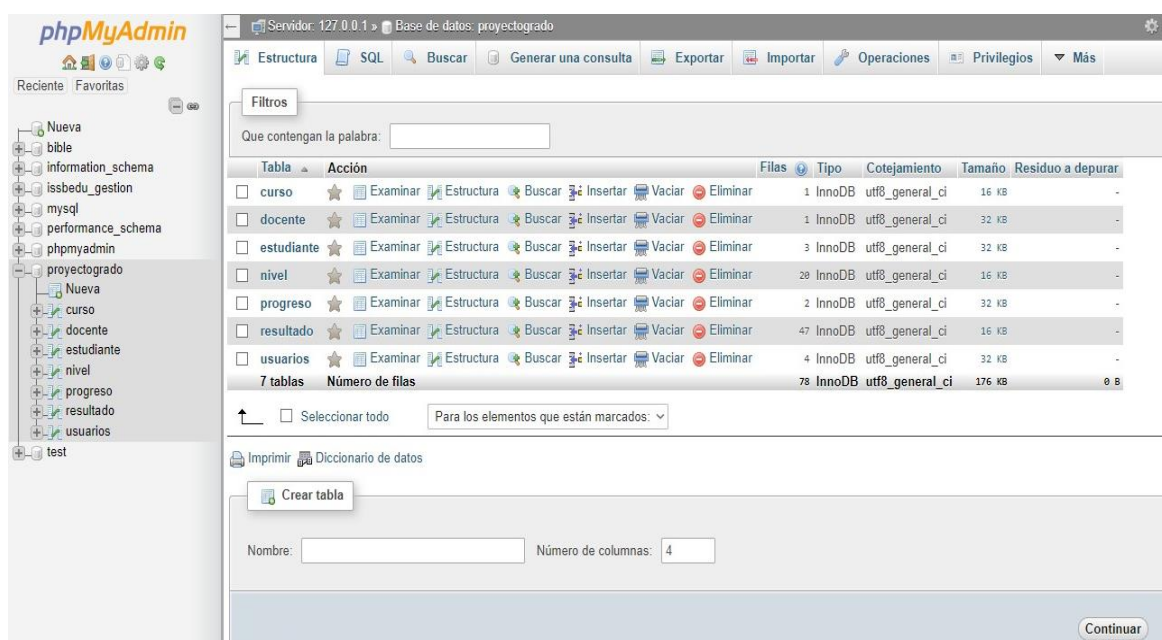
**Scrum master:** The development team leader, in this case corresponds to Juan David Castrillon Gomez. He works directly with the Product Owner.

**Product Owner:** Representative of shareholders or clients, for the times of this project we take as reference the director: engineer Leidy Polo.

**Team:** Professional team, represented by the authors of the project.

### 3. Results

**Web application:** The purpose of this project since its conception was to develop an interactive web application for teaching Spanish to children with hearing disabilities. This web, connects to a database worked in MySQL, it presents a graphical interface that allows the management and interaction of each user and the separation of them with roles and the result obtained in this project can be seen below.



**Figure 4.** Data base model.

Through phpmyadmin, you can access the graphical interface where you can perform all the own management of the database. Since the creation of the same and its tables, deletion and data insertion processes. Through this tool you can also export and import the database together with its content.

Additionally, phpmyadmin has a console for managing the database through SQL code. In the following Figure 4 we can see the console.



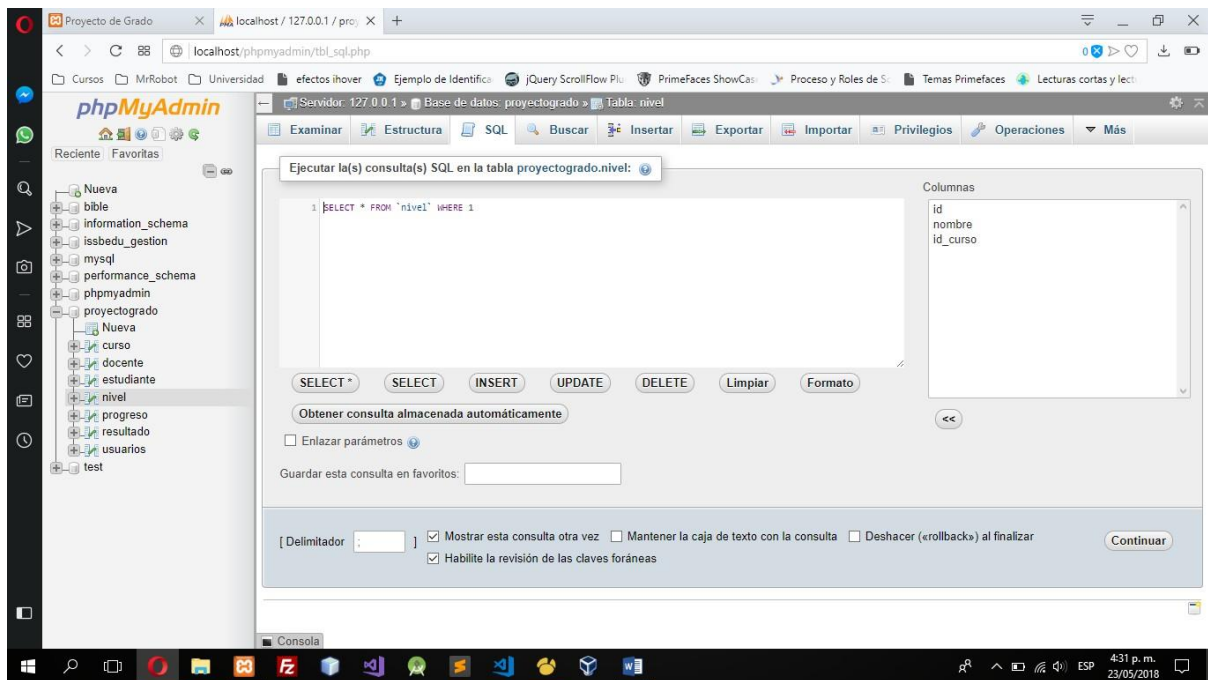


Figure 5. Data base administrator

The next result generated by the project refers to the web page itself. Which initially presents an interface to log in, register in the system as a teacher or access a nice game as a guest.

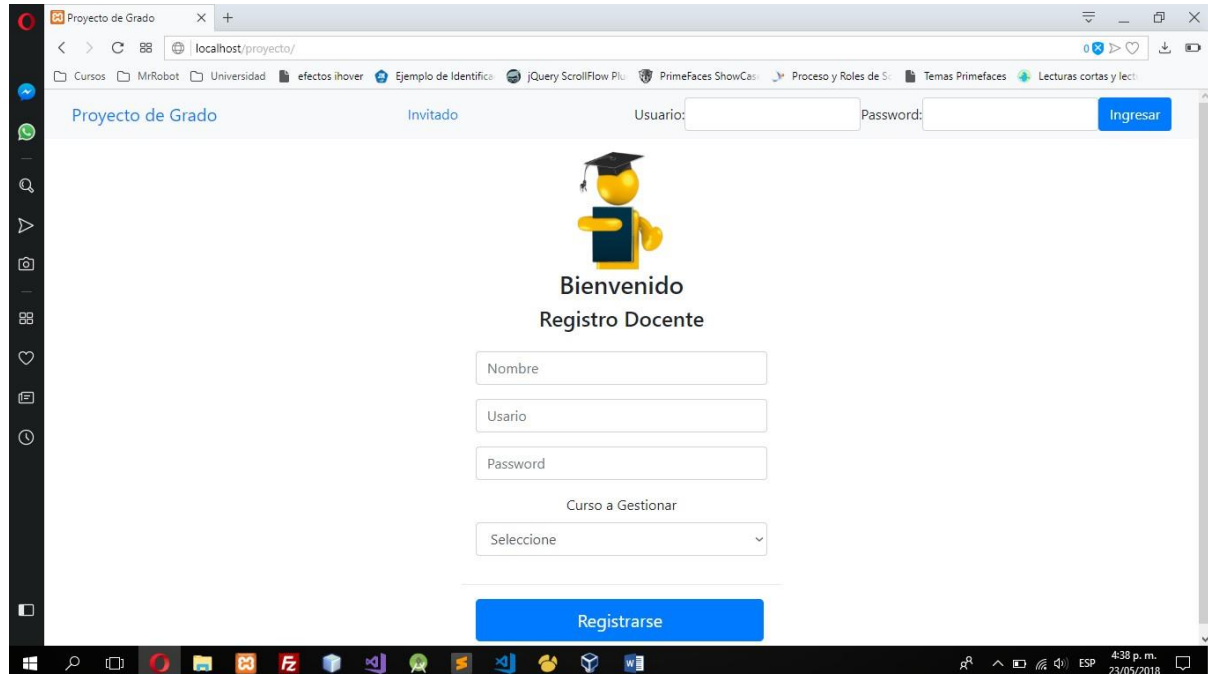


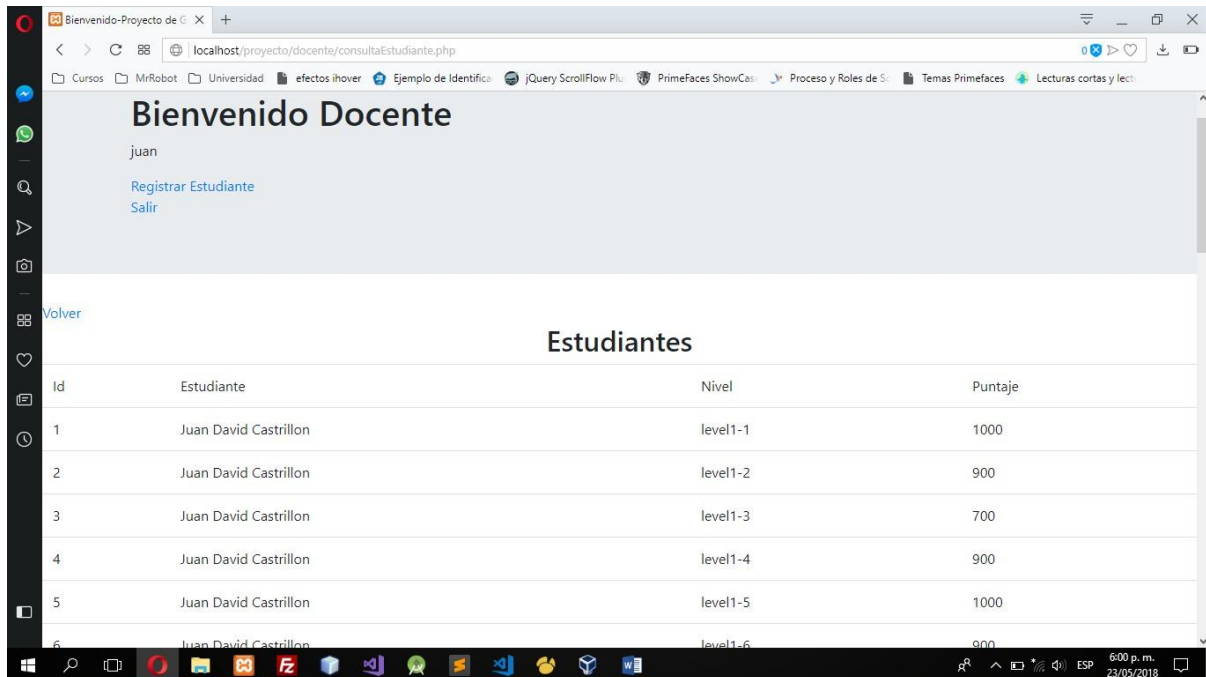
Figure 6. Log in screen.

From this home screen, the user can log in. In this process, the system validates what type of role the person trying to access has.

For this purpose, two roles have been registered, one as a teacher and the other as a student. Next, we can see the start screen that receives a user that has been validated with the role of teacher. Clearly exposing three basic aspects of management for this case.

- (i) Student registration, where you can create new students who will later use the application.
- (ii) Find news from students to know what levels they have passed and know their score. In this search part, you can perform this process both by student name and by document.

Review the highest scores, in the descriptive table, you can quickly see which student leads the most progress.



Id	Estudiante	Nivel	Puntaje
1	Juan David Castrillon	level1-1	1000
2	Juan David Castrillon	level1-2	900
3	Juan David Castrillon	level1-3	700
4	Juan David Castrillon	level1-4	900
5	Juan David Castrillon	level1-5	1000
6	Juan David Castrillon	level1-6	900

**Figure 7.** List of students.

Then, the student's access to continue their activities is evident. In this screen you will always have the top banner visible where you can return to the initial screen or close session.

The questions have a multiple choice and a score that will reduce its value if the answer you choose is incorrect. Sometimes, these questions will be accompanied by stories or video instructions, with the use of sign language.



Bienvenido juandacas

Volver Salir

Identifica el verbo correcto

Corriendo Corrió Correr Correrá

Valor actual: 1000

Valor Inicial de la pregunta: 1000

**Figure 8.** Interactive action.



### Caperucita Roja



La caperuza fue regalo de la mamá

La caperuza fue regalo del lobo

La caperuza fue regalo del cazador

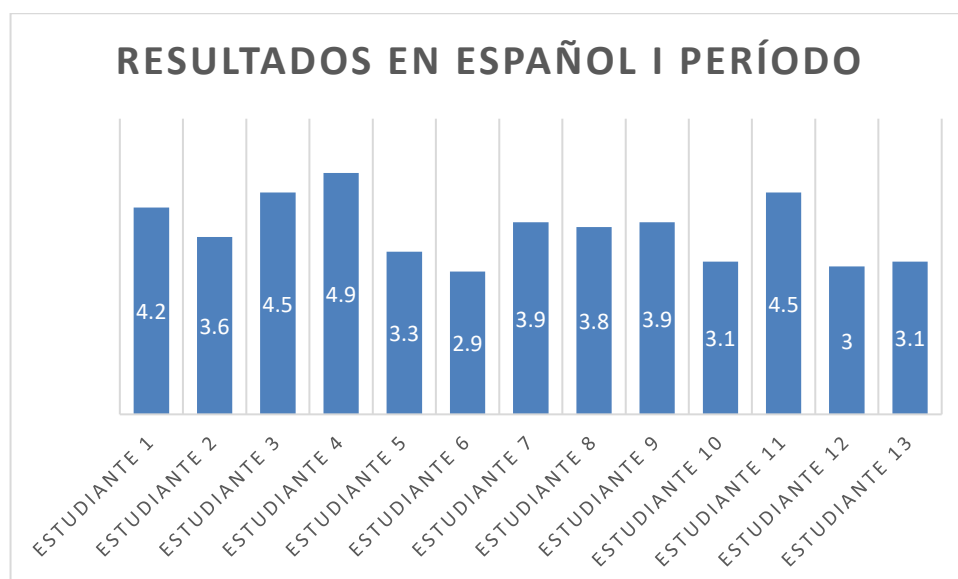
La caperuza fue regalo de la abuela

Valor actual:

Valor Inicial de la pregunta: 1000

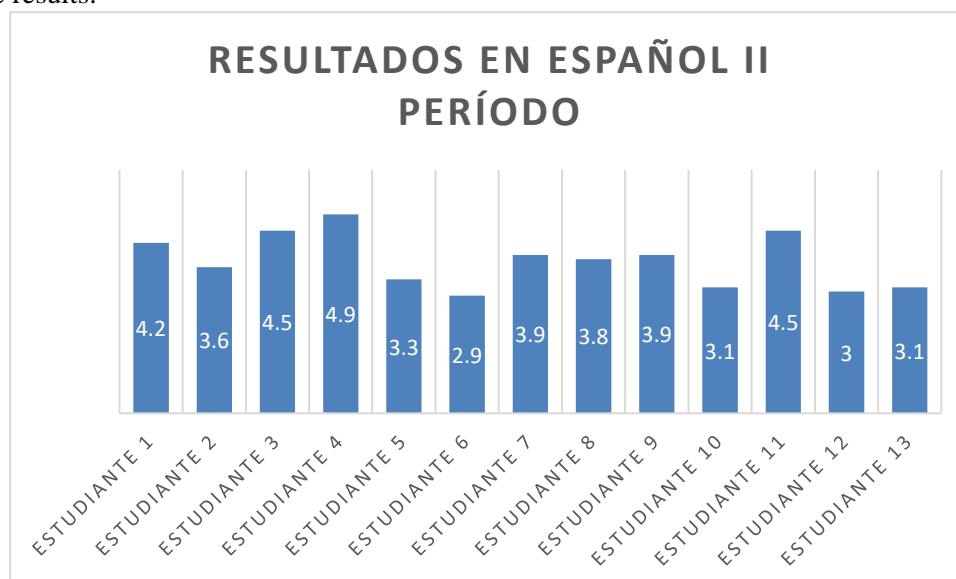
**Figure 9.** Reading comprehension, interactive activity.

The no usage of the application to a 13 students same, where we can find the following results.



**Figure 10.** First period results.

After the implementation and the application usage during the second period in Spanish. We could see these results.



**Figure 11.** Second period results.

#### 4. Discussion

Through the development of this research project, it was possible to generate measurable results of great importance in the field of inclusive education, directly in Spanish taught in primary basic education. It is evidenced by way of conclusion, how important it is to offer learning alternatives for students with hearing disabilities should not limit their educational process.

This is how you get to a web product that, in a simple, dynamic and visually pleasing way, presents hearing disable student in basic training in the subject of Spanish. Given that, through multiple choice questions, with videos in language of signs and activities of reading comprehension levels and forms in an inclusive manner and based on principles of equal formation. This is because the curricular content of the subject is the same for all students and is also implemented in the web application, but with visual aids thinking about this population.

In the levels faced by the student as user of the application, there are questions that have a purely cognitive focus and academic training purposes. To arrive at this type of deliverable, there was the problem of choosing and writing the questions and solutions for each level, but this was faced and solved with teacher information gathering. Where the main shortcomings of this group of students were evident. Through an academic research, the best alternative was presented in each presentation of the website.

Through simple computer tools and application of programming languages, it is concluded that inclusive education is a broad field to discuss, but with the use of ICT tools can be offered tools that support and enrich the training process.

A social approach is created that is not very casual from software engineering, system or its derivatives and that in turn creates awareness and improvements to the development of the country, thinking of education as an alternative of growth in all possible areas of a nation.

#### 5. Conclusion

The project "Development of prototype software for children with hearing impairment", developed here, leaves great possibilities open mainly in three fields. The first one refers to the creation of spaces for inclusive education, adaptation of classrooms and academic training sites and special training for teachers who will directly face the challenge of educating a young person with a hearing disability.

The second field is the one about extending the project, an alternative is creating a web service, allowing access through mobile applications, or the creation of an app for devices. It is also recommended continuing the creation of more levels and thus extend the durability of this tool, given that its development was in php language without using any framework and can be taken as a basis for learning this language.

And finally, the third field, corresponds to generate software, web tools or mobile applications that contribute to inclusive education in new academic areas, such as mathematics, science, languages, history and other subjects that provide training to people with hearing disabilities in the different educational levels.

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